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DEPARTMENT OF EDUCATION

Investigating post-school education, training and employment pathways for secondary students who enrol in vocational education and training

Centre for Education Statistics and Evaluation

Centre for Education Statistics and Evaluation

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Executive summary

Focus of this report

The Centre for Education Statistics and Evaluation (CESE) has conducted an investigation into the post-school education, training and employment pathways of NSW students who recently enrolled in at least one vocational education and training (VET) course as part of their senior secondary education. In this report, we present information about the characteristics (for example, academic achievement, socioeconomic status) of these students and compare them to those of students who did not enrol in VET. We also present the results from our investigation into how each characteristic independently contributed to student enrolment in VET. This up-to-date information allows future research to detect whether certain changes (for example, changes in policy, changes in labour market conditions) influence the types of students who enrol in these programs.

Later in this report, we present the results from our analysis that compares the post-school education, training and employment pathways of the students who recently enrolled in VET to those of similar students who did not enrol. This information allows us to better understand the impact that enrolling in VET has on post-school destinations. We also present some information about the features of VET delivery (certificate level, delivery mode and work placement) that were associated with post-school destinations.

Data used in our analysis

We used data from the following sources in our analysis:

- NSW secondary students post-school destinations and expectations survey data;
- participation and achievement data from the National Assessment Program – Literacy and Numeracy (NAPLAN)
- administrative data from the NSW Education Standards Authority (NESA).

Research questions and methodology

We investigated four main research questions:

1. What are the characteristics of the secondary students who enrolled in VET and how do they compare to those of students who did not enrol?
2. Which characteristics independently predict secondary student enrolment in VET?
3. What are the post-school destinations of the secondary students who enrolled in VET and how do they compare to those of students who did not enrol?
4. Which features of VET delivery were associated with post-school destinations?

We investigated the first research question using a series of weighted generalised linear regression models (one for each characteristic of interest). These models estimated the differences between the secondary students who enrolled in VET and those who did not enrol. We investigated the second research question using a weighted multivariable logistic regression model. This model estimated each characteristic's independent contribution to the probability of student enrolment in VET. We investigated the third research question using propensity score matching (PSM). This method was used to control for some of the pre-existing differences between the secondary students who enrolled in VET and those who did not enrol. By using PSM, we were able to examine differences in post-school destinations across the secondary students who enrolled in VET and students with similar characteristics who did not enrol. We investigated the fourth research question using a series of weighted logistic regression models. These models estimated the post-school destinations for groups of secondary students who experienced different features of VET delivery.

Summary of results

We used the cut-points in Table 1 to define different effect sizes based on estimated absolute risk differences. When interpreting our effect size estimates, we used the lower and upper bounds of the relevant 95% confidence intervals (CIs) to reflect the uncertainty in our estimates.

Table 1
Effect sizes used to summarise our results

Absolute risk difference range	Verbal label
Between -1 and 1 percentage point difference	Equally likely
Between -3 and -1 or between 1 and 3 percentage point difference	Slightly less/more likely
Between -5 and -3 or between 3 and 5 percentage point difference	Moderately less/more likely
Between -10 and -5 or between 5 and 10 percentage point difference	Much less/more likely
Less than -10 or greater than 10 percentage point difference	Substantially less/more likely

What are the characteristics of the secondary students who enrolled in vocational education and training and how do they compare to those of students who did not enrol?

The following results are presented in order from largest to smallest difference. Our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were:

- substantially more likely to have below average Year 9 NAPLAN Numeracy scaled scores
- substantially more likely to have below average Year 9 NAPLAN Reading scaled scores
- substantially more likely to attend schools with below average Index of Community Socio-educational Advantage (ICSEA) values
- substantially more likely to attend government schools
- substantially more likely to have below average socioeconomic status scores
- substantially less likely to attend independent schools
- substantially less likely to attend metropolitan schools
- substantially more likely to attend provincial schools;
- much more likely to substantially more likely to speak only English at home
- moderately less likely to much less likely to attend Catholic schools
- moderately more likely to much more likely to identify as an Aboriginal and/or Torres Strait Islander person
- slightly more likely to moderately more likely to take a Life Skills course at school
- equally likely to attend remote or very remote schools
- equally likely to moderately more likely to be male.

Overall, our results indicated that the characteristics of the secondary students who enrolled in VET were somewhat different to those of students who did not enrol. This up-to-date information allows future research to detect whether certain changes (for example, changes in policy, changes in labour market conditions) influence the types of students who enrol in these programs.

Which characteristics independently predict secondary student enrolment in vocational education and training?

The following results are presented in order from largest to smallest independent contribution. Our results indicated that:

- students with low NAPLAN Numeracy scores were substantially more likely to enrol than similar students with high scores
- students who attended remote or very remote schools were substantially more likely to enrol than similar students who attended metropolitan schools

- students who attended independent schools were substantially less likely to enrol than similar students who attended government schools
- students with low NAPLAN Reading scores were much more likely to substantially more likely to enrol than similar students with high scores
- students who took a Life Skills course were moderately more likely to substantially more likely to enrol than similar students who did not take a Life Skills course
- students who attended schools with low ICSEA scores were much more likely to substantially more likely to enrol than similar students who attended schools with high scores
- students who spoke only English at home were moderately more likely to much more likely to enrol than similar students who spoke a language other than English at home
- students with low SES scores were slightly more likely to much more likely to enrol than similar students with high scores
- students who attended Catholic schools were slightly less likely to much less likely to enrol than similar students who attended government schools
- students who attended provincial schools were slightly more likely to much more likely to enrol than similar students who attended metropolitan schools
- students who identified as an Aboriginal and/or Torres Strait Islander person were equally likely to moderately more likely to enrol than similar students who did not identify as an Aboriginal and/or Torres Strait Islander person
- students who were male were equally likely to slightly more likely to enrol than similar students who were female.

When we controlled for the effects of the other assessed characteristics, we still found independent relationships between most characteristics and student enrolment in VET. This means that each characteristic contained unique information about why students enrolled in VET. For example, there appears to be something about attending a remote or very remote school that increased the likelihood that a student enrolled in VET. This had nothing to do with the fact that these students tended to have lower academic achievement and come from lower SES backgrounds.

Contrary to expectations, our results indicated that secondary students with very low NAPLAN Numeracy scores were less likely to enrol in VET than similar students with low scores. We also found similar results for SES. As there is evidence that these students may particularly benefit from taking VET, future research should investigate why these types of students are less interested in pursuing VET pathways and how they may be better supported.

What are the post-school destinations of the secondary students who enrolled in vocational education and training and how do they compare to those of students who did not enrol?

Our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were:

- substantially more likely to be engaged in post-school VET
- substantially less likely to be studying at university or working
- moderately more to much more likely to be not working or studying.

When we controlled for some of the differences between the two groups of students, our results indicated that, compared to matched students who did not enrol in VET, those who did enrol were:

- slightly more to much more likely to be engaged in post-school VET
- equally likely to moderately less likely to be studying at university or working
- equally likely to moderately less likely to be not working or studying.

Our findings with respect to the chances that a young person will be not working or studying after they leave school are particularly encouraging. These results provide evidence that the provision of VET as part of senior secondary education may help students transition into work or study after they leave school.

Which features of vocational education and training delivery were associated with post-school destinations?

Our results indicated that, compared to the secondary students who did their VET course(s) at external registered training organisations (for example TAFE), those who did their VET course(s) at school were:

- slightly less likely to substantially less likely to be engaged in post-school VET
- moderately more likely to substantially more likely to be studying at university or working
- slightly more likely to moderately less likely to be not working or studying.

Compared to the secondary students who did not do a work placement as part of their VET course(s), those who did a work placement were:

- slightly more likely to substantially less likely to be engaged in post-school VET
- slightly more likely to substantially more likely to be studying at university or working
- equally likely to substantially less likely to be not working or studying.

Compared to the secondary students who enrolled in certificate II VET program(s), those who enrolled in certificate III VET program(s) were:

- slightly more likely to much less likely to be engaged in post-school VET
- slightly more likely to substantially more likely to be studying at university or working
- equally likely to much less likely to be not working or studying.

While our results showed that these three features of VET delivery were associated with different post-school destinations, these results do not provide strong evidence that the assessed relationships are causal. Due to certain limitations of the data, we were not able to control for some of the other differences between the groups of students.

1. Introduction

Vocational education and training (VET) programs have featured in the Australian secondary school curriculum since the mid-1990s. Around this time, the Adelaide Declaration on National Goals for Schooling specifically recognised the provision of VET programs as a national goal. These programs were targeted at upper secondary students and originally aimed at increasing retention of less academically engaged youth in school and preparing students for employment and further training (Anlezark et al. 2006; Karmel 2007). However, about 20 years since the introduction of VET programs in schools, there is inconclusive evidence about the extent to which their aims and vision have been realised (Polidano & Tabasso 2013).

Definitions used in this report

In 2001, the New Framework for Vocational Education in Schools referred to VET programs that are delivered to secondary students as VET in schools (and abbreviated as VETiS). However, in 2014, the updated framework, Preparing Secondary Students for Work, identified that VET programs in schools are no different to VET programs that are delivered to students who are not enrolled in secondary school and that use of the term VET in schools (and VETiS) should be discontinued.

In this report, we follow the recommendation of the Education Council and do not distinguish between VET in schools and VET programs more generally. We refer to:

- those students who enrolled in at least one VET program as part of their senior secondary education as secondary students who enrolled in VET
- students who enrolled in at least one VET program in the year after they left secondary school as students enrolled in post-school VET.

Research questions

We investigated four main research questions in this report:

1. What are the characteristics of the secondary students who enrolled in VET and how do they compare to those of students who did not enrol?
2. Which characteristics independently predict secondary student enrolment in VET?
3. What are the post-school destinations of the secondary students who enrolled in VET and how do they compare to those of students who did not enrol?
4. Which features of VET delivery were associated with post-school destinations?

Population of interest and sample properties

We used data from the NSW secondary students post-school destinations and expectations survey (referred to in this report as the destinations survey) to investigate these research questions. These surveys provide information on the education pathways, attainments and destinations of young people in NSW. Each year, the destinations survey uses a stratified sampling frame to survey two groups of former secondary students:

- HSC completers
  - students who were enrolled in Year 12 in the previous year and who completed their HSC.
- early school leavers
  - students who were enrolled in Year 10 in the previous year and left school
  - students who were enrolled in Year 11 in the previous year and left school
  - students who were enrolled in Year 12 in the previous year and left school without completing their HSC.

While the destinations survey data includes sampling weights to accommodate the stratified sampling frame, these weights were designed to represent the population of students who left school the year before. Our research, however, seeks to make inferences about a population of students who were faced with a certain decision at a particular point in time (a cohort of Year 10 students who were deciding whether to enrol in a VET course(s) as part of their senior secondary experience). This meant that only some of the respondents from the destinations surveys could be included in our analysis. Specifically, we included:

- students who were enrolled in Year 10 in 2013 or 2014 and left school
- students who were enrolled in Year 11 in 2014 or 2015 and left school
- students who were enrolled in Year 12 in 2015 or 2016 and left school
- students who were enrolled in Year 12 in 2015 or 2016 and completed their HSC.

To ensure that the sample data accurately represented the population of interest (students who were enrolled in Year 10 in 2013 (N = 87,306) and students who were enrolled in Year 10 in 2014 (N = 87,532)), we used population tables to modify the original sampling weights that were provided with the destinations surveys. Once we applied our selection criteria, the sample included 14,192 survey respondents across the two student cohorts. Of these respondents, 5,486 had enrolled in at least one VET course (representing 58,540 Year 10 students) whereas 8,706 did not enrol (representing 116,298 Year 10 students). The estimated VET enrolment rate across the two student cohorts was 33 per cent (95% CI [32, 35]).

Statistical significance versus estimation

When assessing the effects of a policy or intervention, the true effects of that policy or intervention are impossible to know with absolute certainty. While it is often possible to estimate the true effects with some degree of precision, uncertainty necessarily arises when a finite number of observations (a particular cohort of students) are sampled from a larger population (all possible students). To account for this limited representativeness – commonly known as sampling error – researchers use various statistical techniques.

One way of accounting for sampling error involves null hypothesis significance testing (NHST). This process calculates the probability of a range of results based on the assumption that no true effect exists in the population. When this probability is sufficiently small, researchers reject the null hypothesis (for example the intervention did not have an effect) and instead conclude that there is a true effect in the population (for example the intervention did have an effect).

While NHST has been the preeminent approach to statistical inference, there is mounting evidence that the results from NHST are commonly misinterpreted. Critics argue that NHST promotes dichotomous thinking that simply focuses on whether an observed result is statistically significant or not (Cumming 2014). This thinking can result in statistical significance being incorrectly equated with importance or practical significance on a policy level.

In recent years, some researchers have begun to move away from NHST and towards the notion of estimation. In contrast to NHST, which relies on the calculation of p values, estimation relies on the calculation of point and interval estimates, emphasising the magnitude of the estimated effect and the precision with which it has been estimated. Advocates of this approach claim that a focus on estimation promotes a greater appreciation of the practical significance of research findings, rather than just a narrow focus on whether or not findings are statistically significant.

We contend that, for the purposes of this work, NHST does not best support evidence-based decision-making. For this report, we used effect sizes rather than NHST when making inferences. To this end, we interpret the results of our analyses using point estimates and 95% CIs. We consider a point estimate to be the best estimate of the true value under investigation, and we consider any value within an interval as a plausible value for the true effect. We consider any value outside the interval as relatively implausible, although not impossible.

The results sections in this report present our findings in two ways:

- using (adjusted) risk ratios (with 95% CIs) in text
- using (adjusted) absolute risks (with 95% CIs) in figures. From the absolute risks, absolute risk differences are easily derived.

Risk ratios (RRs) represent the ratio of the likelihood (risk) of an outcome under some condition of interest (for example enrolment in VET) to the likelihood of the outcome under an alternate condition (for example, no enrolment in VET). The denominator of the ratio is commonly called the baseline risk (the likelihood of the outcome with no enrolment in VET). While RRs represent the ratio of two risks, absolute risk differences (ARD) represent the difference between the likelihood of the outcome under the condition of interest and the likelihood of the outcome under the alternate condition.

When investigating the first research question, we used a series of weighted generalised linear regression models where each characteristic (for example, school location, school sector) was modelled as a function of VET enrolment status. In this instance, RRs do not allow us to compare strengths of association across different models as the baseline risk for each characteristic is different (for example, the baseline risk for attending a remote or very remote school is not the same as the baseline risk for attending a Catholic school). However, ARDs do allow us to compare the differences across the various characteristics because they present the estimated differences on a common scale (a percentage point difference). We therefore preference ARDs when qualifying the various effect sizes.

While we acknowledge that there is a degree of subjectivity in the scale presented in Table 2, we used these cut-points to define different effect sizes using the estimated ARDs. When interpreting our effect size estimates, we used the lower and upper bounds of the 95% CIs to reflect the uncertainty in our estimates. For example, our results showed that the estimated percentage of male students for the VET group was about 2.12 percentage points higher (95% CI [-0.39, 4.64]) than the estimated percentage for the no VET group. Using the scale in Table 2, this means that our results showed that, compared to the secondary students who did not enrol in VET, students who did enrol were equally likely (lower bound of the ARD) to moderately more likely (upper bound of the ARD) to be male. While these results may appear to be contradictory, we consider all values within this interval as plausible for the true difference in the population.

Table 2

Effect sizes used to summarise our results

Absolute risk difference range	Verbal label
Between -1 and 1 percentage point difference	Equally likely
Between -3 and -1 or between 1 and 3 percentage point difference	Slightly less/more likely
Between -5 and -3 or between 3 and 5 percentage point difference	Moderately less/more likely
Between -10 and -5 or between 5 and 10 percentage point difference	Much less/more likely
Less than -10 or greater than 10 percentage point difference	Substantially less/more likely

Data used in our analysis

Our analysis used an integrated dataset that contained information from three main data sources. The data items from each data source are listed below, with more detailed information about the more complex data items presented in Appendix A.

NSW secondary students post-school destinations and expectations survey

We used the following data items from the destinations surveys in our analysis:

- post-school destination
  - engaged in VET – doing an apprenticeship, traineeship, VET certificate I-III, or VET certificate IV+
  - studying at university or working
  - not working or studying.
- student socioeconomic status (SES) score
  - a continuous measure calculated from respondents reporting of parent(s) main occupation and highest level of education.
- language spoken at home
  - only English spoken at home
  - language(s) other than English spoken at home.

- Aboriginal and/or Torres Strait Islander person
  - identified as being an Aboriginal and/or Torres Strait Islander person
  - did not identify as an Aboriginal and/or Torres Strait Islander person.

National Assessment Program – Literacy and Numeracy

In addition to the destinations survey data, we used data from NAPLAN in our analysis. In Australia, students in Years 3, 5, 7 and 9 participate in NAPLAN tests in May each year. The testing program spans the Catholic, independent and government school sectors, thereby providing a nationwide assessment of student achievement. While NAPLAN tests are intended to complement other formal and informal assessments, they provide a standardised measure of student progress in literacy and numeracy that can be used to inform teaching practice and education policy.

We included the Reading domain in our analysis because it measures more strands of literacy than the Spelling and Grammar and Punctuation domains. We also included the Numeracy domain because it represents a conceptually distinct set of skills. We used the scaled scores from these assessments because they represent the most granular level of measurement produced by the NAPLAN assessments. Finally, we used the Year 9 scores as they were the most proximal baseline measures of the assessed skills.

NSW Education Standards Authority

The NSW Education Standards Authority (NESA) is responsible for setting and monitoring quality teaching, learning, assessment and school standards across the NSW government, Catholic and independent school sectors. As part of their charter, NESA holds various types of administrative data for each student in NSW. We used the following data from the NESA in our analysis:

- VET enrolment status[1]
  - enrolled in at least one VET course
  - not enrolled in VET.
- registered training organisation (RTO)
  - school
  - external RTO.
- work placement
  - completed
  - not completed.
- certificate level
  - certificate I
  - certificate II
  - certificate III
  - certificate IV.
- school sector[2]
  - government
  - Catholic
  - independent.
- gender
  - male
  - female.

1 Secondary students were classified as enrolled in VET if they had one or more enrolments in any VET course. We did not use course completion information in our analysis because our aim was to investigate the potential downstream effects that experience of VET produces. As experiences of VET may influence the likelihood of school completion, with school completion influencing post-school destinations, including course completion status in our analysis would likely distort our effect estimates (see Montgomery, Nyhan & Torres (2018)).

2 Independent (non-systemic) Catholic schools were classified as independent schools.

- Life Skills enrolment status
  - enrolled in Life Skills course
  - not enrolled in Life Skills course.
- school Index of Community Socio-educational Advantage (ICSEA) value
  - a continuous measure representing the average levels of educational advantage for each school. It is calculated based on student and school characteristics.
- school location [3]
  - metropolitan
  - provincial
  - remote or very remote.

3 Defined using the Ministerial Council on Education, Employment, Training and Youth Affairs Classification of Geographical Location remoteness categories: metropolitan, provincial, remote and very remote (Jones, 2004). We combined the remote and very remote categories for our analyses due to small sample sizes in these categories.

2. What are the characteristics of the secondary students who enrolled in vocational education and training and how do they compare to those of students who did not enrol?

Prior research has shown that certain types of secondary students are more likely to take VET than others. However, the most recent research in the area uses VET related data from 2006. As there have been some policy reforms since 2006 that may have altered the characteristics of the population of secondary students who enrolled in VET (including the raising of the school leaving age in 2010), there is a need to reinvestigate the characteristics of this population using up-to-date data. The following section describes the characteristics of the secondary students who recently enrolled in VET and compares them to those of students who did not enrol.

Methodology

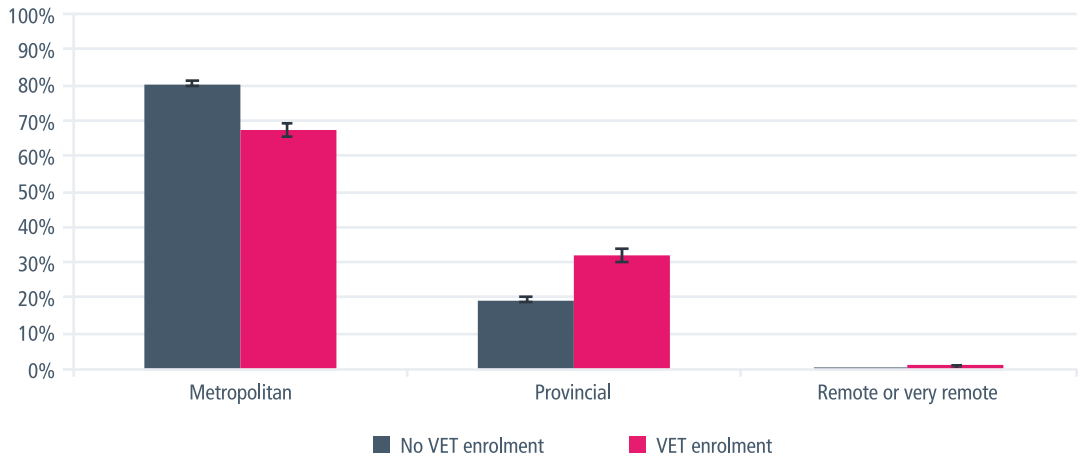
We used a series of weighted generalised linear regression models (one regression per characteristic of interest) to investigate whether the characteristics of the secondary students who enrolled in VET differed from those of students who did not enrol (each characteristic was modelled as a function of VET enrolment status). In addition to these simple bivariate analyses, we also ran a series of regression models that included a student cohort indicator (2013 versus 2014), with the interaction between the student cohort indicator and the VET enrolment indicator representing the change in the relationship of interest across the two student cohorts. As most of the results from these tested interactions indicated that there had been no meaningful changes across the assessed student cohorts, we only present those results that suggest there may have been a meaningful change.

Results

As shown in Figure 1, our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were about 1.19 times less likely (95% CI [1.16, 1.23]) to attend a metropolitan school; about 1.64 times more likely (95% CI [1.52, 1.77]) to attend a provincial school; and about 7.62 times more likely (95% CI [4.35, 13.36]) to attend a remote or very remote school.

Figure 1:

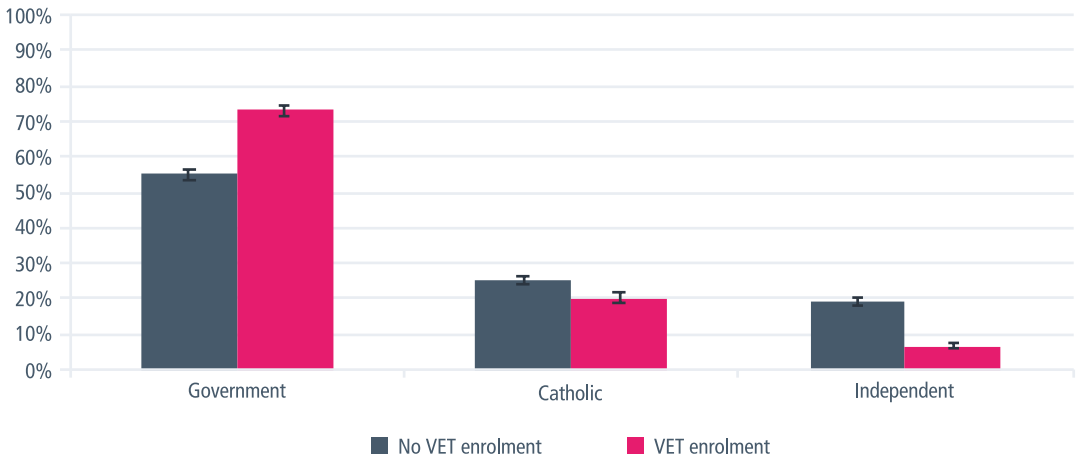
Estimated proportions of students attending each school location by VET enrolment status



As shown in Figure 2, our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were about 1.32 times more likely (95% CI [1.28, 1.37]) to attend a government school; about 1.27 times less likely (95% CI [1.16, 1.38]) to attend a Catholic school; and about 2.85 times less likely (95% CI [2.52, 3.23]) to attend an independent school.

Figure 2:

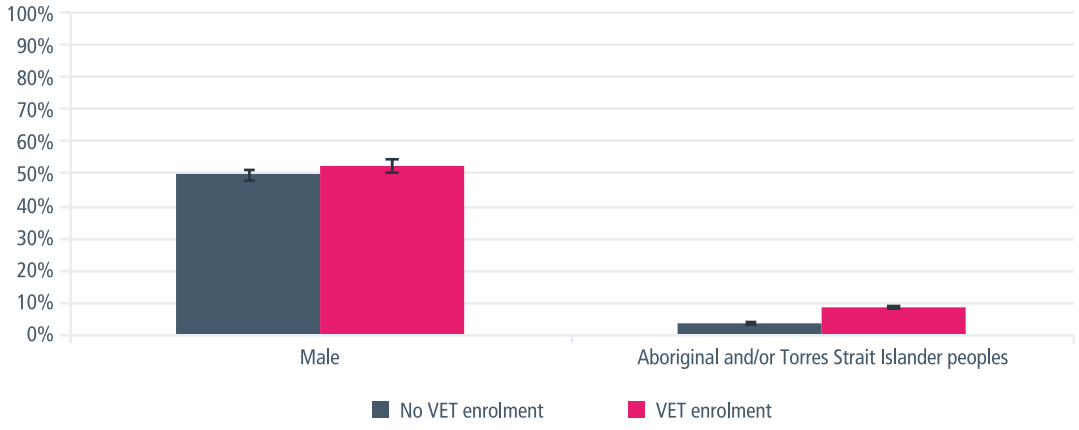
Estimated proportions of students within each school sector by VET enrolment status



As shown in Figure 3, our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were about 1.04 times more likely (95% CI [0.99, 1.09]) to be male; and about 2.37 times more likely (95% CI [2.16, 2.60]) to identify as an Aboriginal and/or Torres Strait Islander person.

Figure 3:

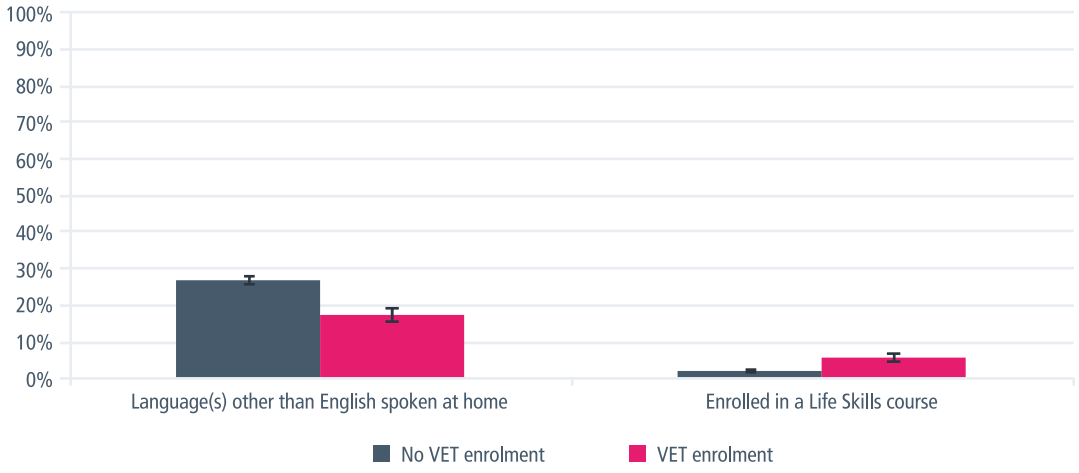
Estimated proportions of male students and Aboriginal and/or Torres Strait Islander peoples by VET enrolment status



As shown in Figure 4, our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were about 1.55 times less likely (95% CI [1.38, 1.73]) to speak languages other than English at home; and about 2.93 times more likely (95% CI [2.19, 3.94]) to have taken a Life Skills course in school.

Figure 4:

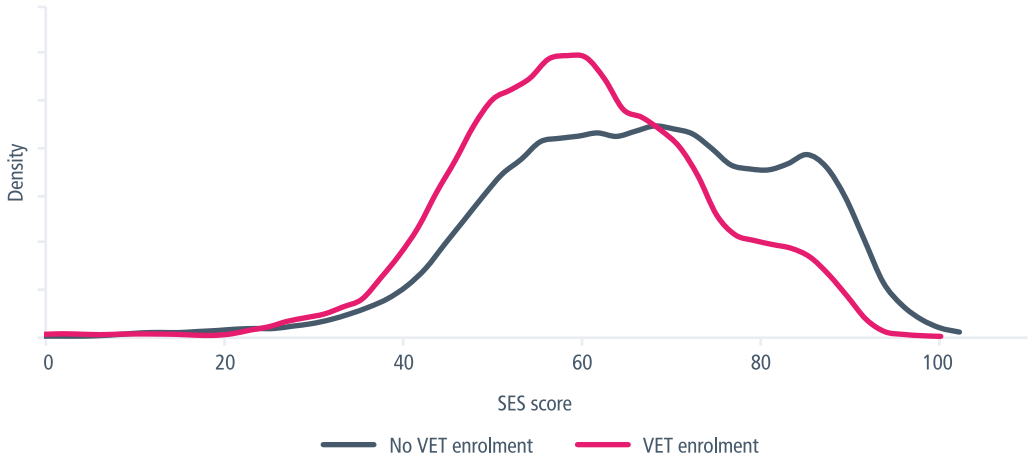
Estimated proportions of students who speak a language other than English at home and students who enrolled in a Life Skills course by VET enrolment status



As shown in Figure 5, our results indicated that the mean SES score for the secondary students who enrolled in VET was about 0.43 standard deviations lower (95% CI [-0.38, -0.47]) than the mean score for those who did not enrol.[4] Our results also indicated that the two score distributions had considerable overlap. That is, while the secondary students who enrolled in VET tended to come from lower SES backgrounds (the bulk of the density for those who enrolled in VET was to the left of the bulk for those who did not enrol), a considerable number of these students came from medium and high SES backgrounds.

Figure 5:

Estimated kernel density of SES scores by VET enrolment status

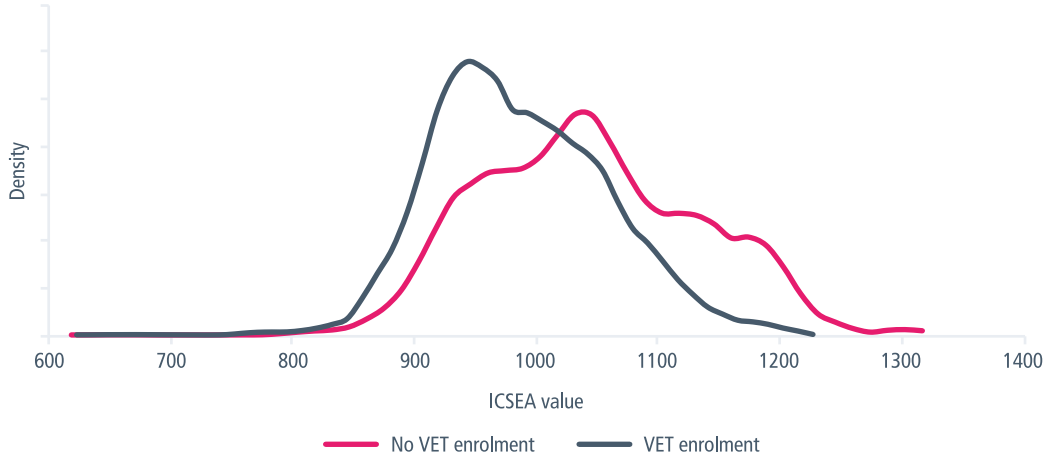


4 Kernel density estimation is a method used to visualise the shape of data smoothly. The lines show estimates of the underlying distributions of the data, in this instance, the estimated distributions of SES scores for students who enrolled in VET and those who did not enrol.

As shown in Figure 6, our results indicated that the mean ICSEA value for the secondary students who enrolled in VET was about 0.65 standard deviations lower (95% CI [-0.60, -0.70]) than the mean value for those students who did not enrol. Our results also indicated that the two score distributions had considerable overlap. That is, while the secondary students who enrolled in VET tended to attend schools with lower ICSEA values, a considerable number of these students attended schools with above average ICSEA values.

Figure 6:

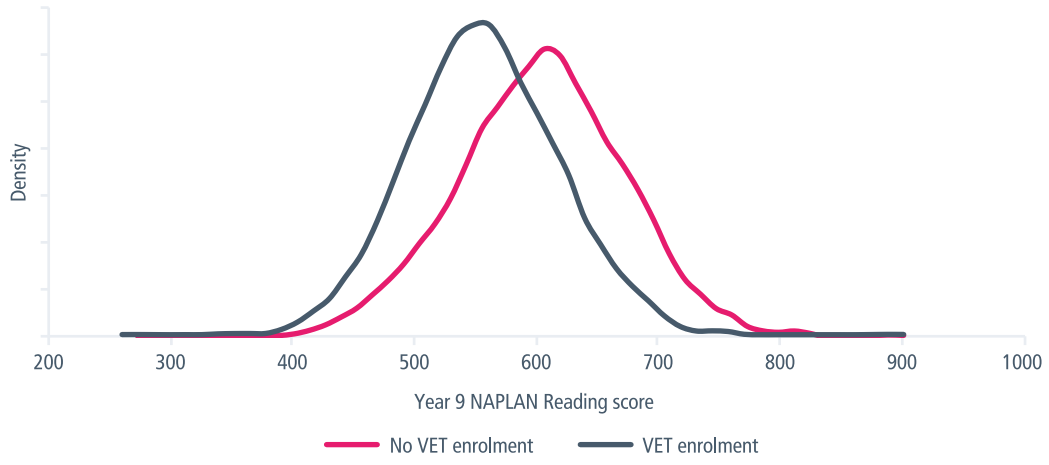
Estimated kernel density of ICSEA values by VET enrolment status



As shown in Figure 7, our results indicated that the mean Year 9 NAPLAN Reading score for the secondary students who enrolled in VET was about 0.68 standard deviations lower (95% CI [-0.64, -0.73]) than the mean score for those students who did not enrol. Our results also indicated that the two score distributions had a moderate to large amount of overlap. That is, while the secondary students who enrolled in VET tended to have lower Year 9 NAPLAN Reading scores, a moderate number of these students had above average Year 9 NAPLAN Reading scores. Finally, for the secondary students who enrolled in VET, the results indicated that the mean Year 9 NAPLAN Reading score for the 2014 cohort was about 0.15 standard deviations higher (95% CI [0.07, 0.23]) than the mean score for the 2013 cohort.

Figure 7:

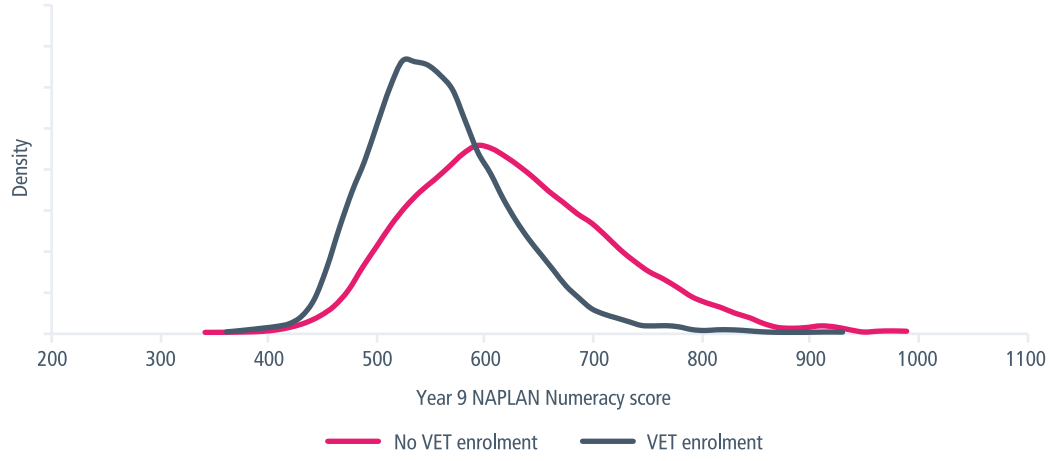
Estimated kernel density of Year 9 NAPLAN Reading scores by VET enrolment status



As shown in Figure 8, our results indicated that the mean Year 9 NAPLAN Numeracy score for the secondary students who enrolled in VET was about 0.76 standard deviations lower (95% CI [-0.72, -0.81]) than the mean value for those who did not enrol. Our results also indicated that the two score distributions had a moderate amount of overlap. That is, while the secondary students who enrolled in VET tended to have lower Year 9 NAPLAN Numeracy scores, a moderate number of these students had above average Year 9 NAPLAN Numeracy scores.

Figure 8:

Estimated kernel density of Year 9 NAPLAN Numeracy scores by VET enrolment status



Summary

The following results are presented in order from largest to smallest difference. Our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were:

- substantially more likely to have below average Year 9 NAPLAN Numeracy scaled scores
- substantially more likely to have below average Year 9 NAPLAN Reading scaled scores
- substantially more likely to attend schools with below average ICSEA values
- substantially more likely to attend government schools
- substantially more likely to have below average SES scores
- substantially less likely to attend independent schools
- substantially less likely to attend metropolitan schools
- substantially more likely to attend provincial schools
- much more likely to substantially more likely to speak only English at home
- moderately less likely to much less likely to attend Catholic schools
- moderately more likely to much more likely to identify as a Aboriginal and/or Torres Strait Islander person
- slightly more likely to moderately more likely to take a Life Skills course at school
- equally likely to attend remote or very remote schools
- equally likely to moderately more likely to be male.

Overall, our results indicated that the characteristics of the secondary students who enrolled in VET were somewhat different to those of students who did not enrol. For the most part, these differences appeared to be consistent across the 2013 and 2014 student cohorts. However, there was some evidence that the Year 9 NAPLAN Reading scores of the 2014 VET student cohort were slightly higher than those of the 2013 VET cohort. While this may be early evidence that student perceptions of VET are changing, the effect was rather small and further data will need to be collected to examine changes over longer time periods.

3. Which characteristics independently predict secondary student enrolment in vocational education and training?

The results from our bivariate analyses clearly showed that the characteristics of the population of secondary students who enrolled in VET were somewhat different than those of the students who did not enrol. However, these results do not necessarily reflect the independent contribution of each characteristic. As shown in Table 3 in Appendix B, all the assessed characteristics were related to one another (for example as NAPLAN scores increased, SES scores also tended to increase). In this section, we present the results from our analysis that attempts to estimate the independent contribution of each characteristic to student enrolment in VET.

Methodology

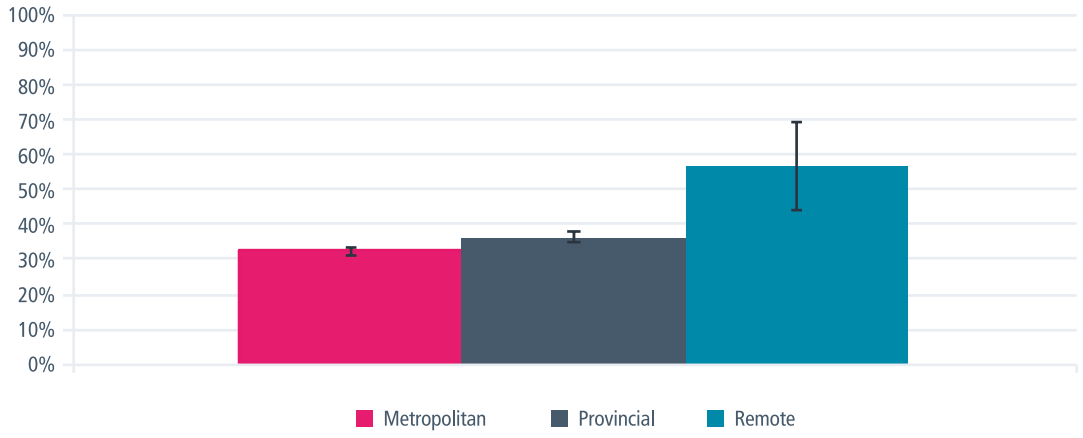
To investigate how each characteristic contributes to student enrolment in VET, we entered the same characteristics that were assessed in the previous section of this report into a weighted multivariable logistic regression model. This model simultaneously regressed the log odds of secondary student enrolment in VET on all the variables of interest. The results from this model indicated the contribution of each characteristic, controlling for the other variables in the model. We then used the estimated parameters from the model to calculate predictive margins for each assessed characteristic. These predictions represent the expected VET enrolment rate assuming that the population of secondary students had the characteristic of interest (for example the expected VET enrolment rate if the population of secondary students attended a metropolitan school). As the other characteristics of each student (for example their SES score) are left unchanged, this method allows us to easily compare the independent contribution of each characteristic. While we acknowledge that these predictions will only be accurate under strict conditions (which will not hold in this instance), this method still allows us to capture insights into why students enrol in VET. We present more information about the weighted multivariable logistic regression model and the predictive margins in Appendix C.

Results

As shown in Figure 9, our results indicated that, compared to similar students who attended metropolitan schools, those who attended provincial schools were about 1.12 times more likely (95% CI [1.05, 1.20]) to enrol; and those who attended remote or very remote schools were about 1.75 times more likely (95% CI [1.39, 2.20]) to enrol.

Figure 9:

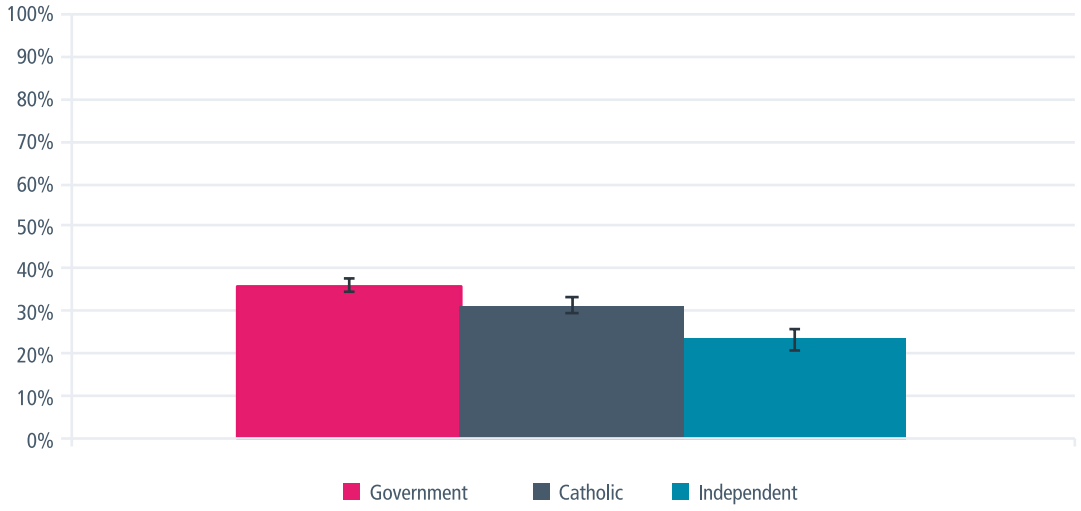
Predictive margins for each school location



As shown in Figure 10, our results indicated that, compared to similar students who attended government schools, those who attended Catholic schools were about 1.15 times less likely (95% CI [1.07, 1.25]) to enrol; and those who attended independent schools were about 1.54 times less likely (95% CI [1.37, 1.73]) to enrol.

Figure 10:

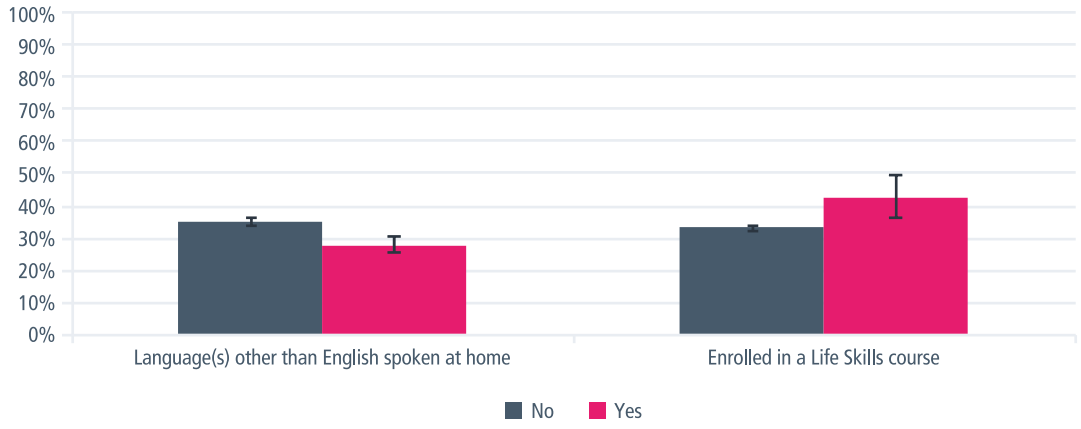
Predictive margins for each school sector



As shown in Figure 11, our results indicated that, compared to similar students who spoke English at home, those who spoke a language other than English at home were about 1.26 times less likely (95% CI [1.15, 1.38]) to enrol. Furthermore, compared to similar students who did not enrol in a Life Skills course at school, those who did enrol in a Life Skills course were about 1.29 times more likely (95% CI [1.10, 1.51]) to enrol in VET.

Figure 11:

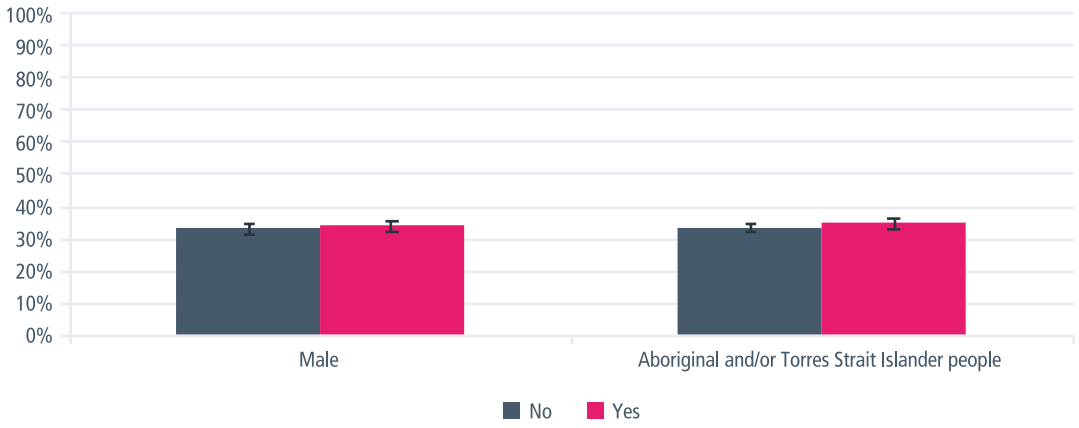
Predictive margins for student language background and enrolment in a Life Skills course



As shown in Figure 12, our results indicated that, compared to similar female students, male students were about 1.03 times more likely (95% CI [0.97, 1.09]) to enrol. Furthermore, compared to similar students who did not identify as an Aboriginal and/or Torres Strait Islander person, those who did were about 1.04 times more likely (95% CI [0.98, 1.11]) to enrol.

Figure 12:

Predictive margins for gender and Aboriginal and/or Torres Strait Islander peoples

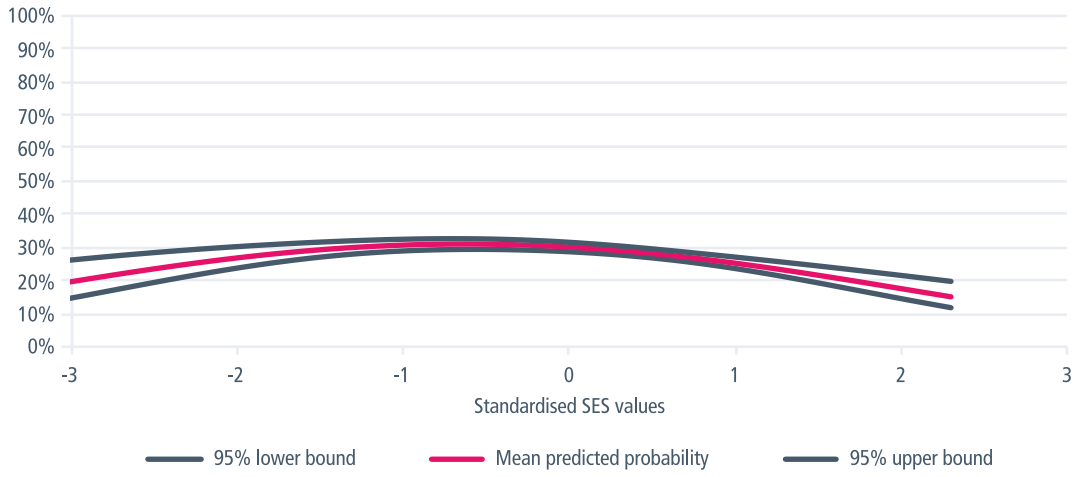


Controlling for the other variables in the model, the shape of the relationships between SES scores, ICSEA values, Year 9 NAPLAN Reading and Numeracy scaled scores and the log odds of student enrolment in VET were all nonlinear. As such, these relationships are best interpreted using visual methods.

As shown in Figure 13, our results indicated that there was a quadratic relationship between SES scores and the log odds of student enrolment in VET. For the lower half of the SES scores, the relationship between SES and student enrolment was positive (as SES scores increased, the expected enrolment rate increased). For the upper half of the SES scores, however, the relationship between SES scores and student enrolment was negative (as SES scores increased, the expected enrolment rate decreased).

Figure 13:

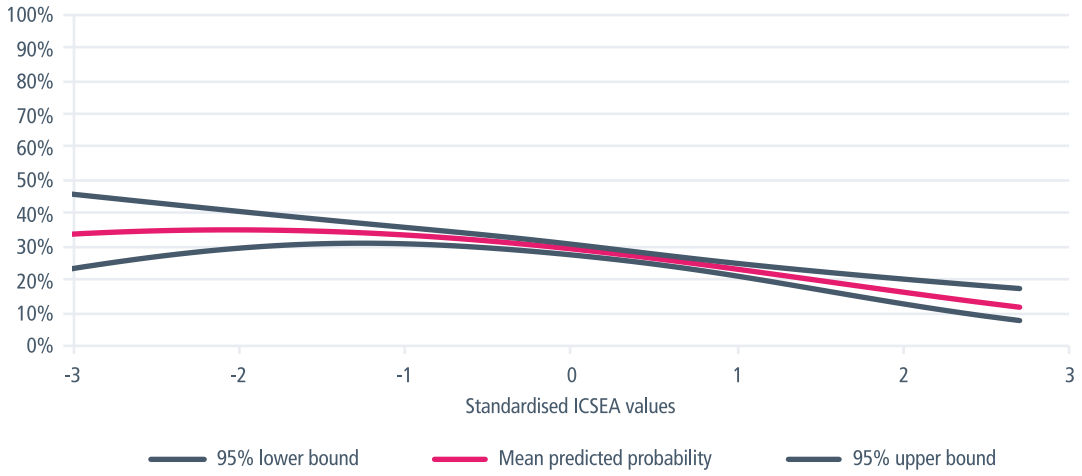
Predictive margins for each standardised SES value



As shown in Figure 14, our results indicated that there was a quadratic relationship between ICSEA values and the log odds of student enrolment in VET. For the lower half of the ICSEA values, the relationship between ICSEA and student enrolment was negligible (as ICSEA values increased, the expected enrolment rate did not change much). For the upper half of the ICSEA values, however, the relationship between ICSEA values and student enrolment was negative (as ICSEA values increased, the expected enrolment rate decreased).

Figure 14:

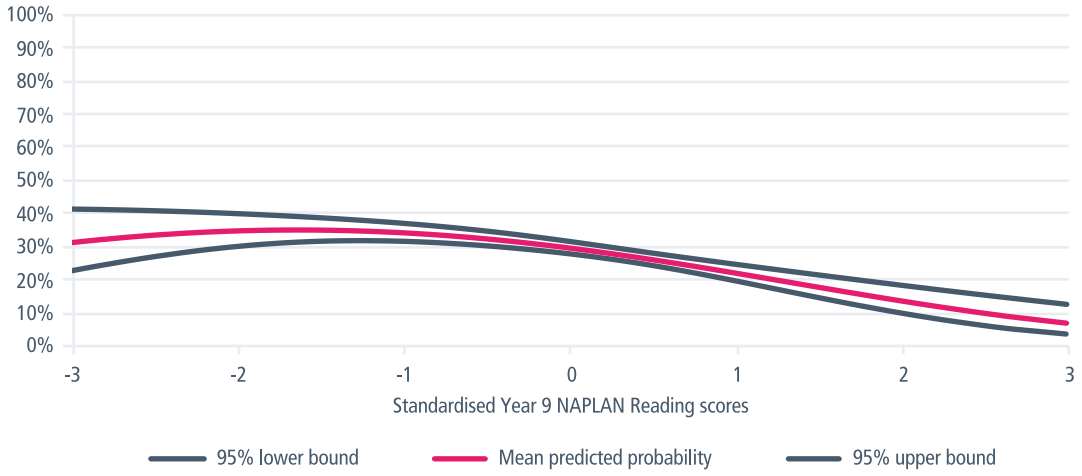
Predictive margins for each standardised ICSEA value



As shown in Figure 15, our results indicated that there was a quadratic relationship between Year 9 NAPLAN Reading scores and the log odds of student enrolment in VET. For the lower half of the Year 9 NAPLAN Reading scores, the relationship between Year 9 NAPLAN Reading scores and student enrolment was negligible (as Year 9 NAPLAN Reading scores increased, the expected enrolment rate did not change much). For the upper half of the Year 9 NAPLAN Reading scores, however, the relationship between Year 9 NAPLAN Reading scores and student enrolment was negative (as Year 9 NAPLAN Reading scores increased, the expected enrolment rate decreased).

Figure 15:

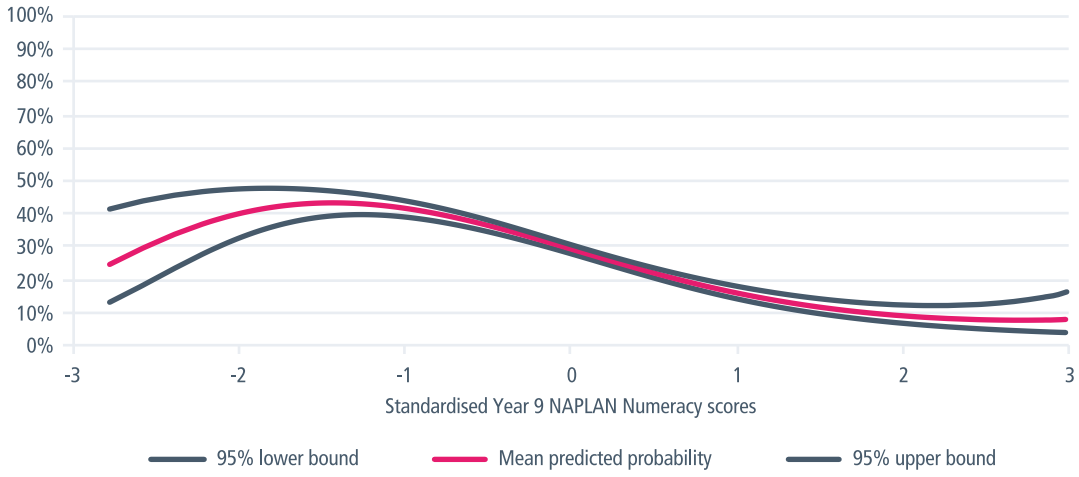
Predictive margins for each standardised Year 9 NAPLAN Reading score



As shown in Figure 16, our results indicated that there was a cubic relationship between Year 9 NAPLAN Numeracy scores and the log odds of student enrolment in VET. For Year 9 NAPLAN Numeracy scores that are less than 1.5 standard deviations below the mean, the relationship between Year 9 NAPLAN Numeracy scores and student enrolment was positive (as Year 9 NAPLAN Numeracy scores increased, the expected enrolment rate increased). However, for Year 9 NAPLAN Numeracy scores between 1.5 standard deviations below and 1.5 standard deviations above the mean, the relationship was negative (as Year 9 NAPLAN Numeracy scores increased, the expected enrolment rate decreased). Finally, for Year 9 NAPLAN Numeracy scores that are 1.5 standard deviations above the mean, the relationship was negligible (as Year 9 NAPLAN Numeracy scores increase, the expected enrolment rate did not change much).

Figure 16:

Predictive margins for each standardised Year 9 NAPLAN Numeracy score



Summary

The following results are presented in order from largest to smallest independent contribution. With regard to student enrolment in VET, our results indicated that:

- students with low NAPLAN Numeracy scores were substantially more likely to enrol than similar students with high scores
- students who attended remote or very remote schools were substantially more likely to enrol than similar students who attended metropolitan schools
- students who attended independent schools were substantially less likely to enrol than similar students who attended government schools
- students with low NAPLAN Reading scores were much more likely to substantially more likely to enrol than similar students with high scores
- students who took a Life Skills course were moderately more likely to substantially more likely to enrol than similar students who did not take a Life Skills course
- students who attended schools with low ICSEA scores were much more likely to substantially more likely to enrol than similar students who attended schools with high scores
- students who spoke only English at home were moderately more likely to much more likely to enrol than similar students who spoke a language other than English at home
- students with low SES scores were slightly more likely to much more likely to enrol than similar students with high scores
- students who attended Catholic schools were slightly less likely to much less likely to enrol than similar students who attended government schools
- students who attended provincial schools were slightly more likely to much more likely to enrol than similar students who attended metropolitan schools

- students who identified as an Aboriginal and/or Torres Strait Islander person were equally likely to moderately more likely to enrol than similar students who did not identify as an Aboriginal and/or Torres Strait Islander person
- students who were male were equally likely to slightly more likely to enrol than similar students who were female.

When we used a multivariable model, we found that most of the assessed characteristics independently predicted student enrolment in VET. That is, when we accounted for the relationships between the explanatory variables, we still found independent relationships between most of the assessed characteristics and student enrolment. This means that each characteristic contained unique information about why students enrolled in VET. For example, there appears to be something about attending a remote or very remote school that increased the likelihood that a student enrolled in VET. This had nothing to do with the fact that these students tended to have lower academic achievement and come from lower SES backgrounds.

While the range of information used in our analysis explained a substantial amount of the variation in VET enrolments (the area under the receiver operating characteristic curve for the multivariable model was .76), there remains considerable room for improvement should additional information become available. Future research should aim to measure student perceptions of VET and career aspirations before students start their selected courses. This information would provide a more nuanced understanding about why students enrol in VET and would allow a more robust assessment of the effect of taking these courses as part of senior secondary education.

While most of the findings from our multivariable model appear reasonable, the relationship between the NAPLAN Numeracy scores and student enrolment in VET warrants further investigation. Our results indicated that, after controlling for the effects of the other modelled covariates, the relationship between NAPLAN Numeracy scores and log odds of enrolment in VET was cubic. Specifically, we found that, as NAPLAN Numeracy scores increased from very low (around 3 standard deviations below the mean) to low (around 1.5 standard deviations below the mean), the probability of enrolment was expected to increase from around .25 to around .42. We also found similar results for SES (as SES scores increased from very low to low, the probability of enrolment increased from around .19 to around .29). While we acknowledge that the predictions from our model contain a large degree of uncertainty for scores in this range, this finding has not been reported in previous research. It may be that the approach used in previous research was not sensitive to differences in this range because they did not model the log odds of student enrolment in VET as a continuous function of academic achievement; rather they tend to group students (for example into academic quartiles) based on their academic achievement.

One possible explanation for this finding is that students with very low scores may have been more likely to leave school before they had the opportunity to enrol in VET, and that this may drive the effect at the lower end of the distribution. To investigate this possibility, we removed the students who left school in Year 10 and refit the multivariable logistic regression model. As this had little effect on the estimated relationships, the relationship between NAPLAN Numeracy scores and enrolment in VET warrants further investigation.

4. What are the post-school destinations of the secondary students who enrolled in vocational education and training and how do they compare to those of students who did not enrol?

Prior research has shown that secondary students who enrol in VET tend to have different post-school destinations than those who do not enrol. However, some of the observed differences in post-school destinations are likely driven by differences in the characteristics of the two groups of students (for example students who have lower NAPLAN scores are more likely to take VET, but they are also less likely to go to university after they leave school). To better isolate the impact of enrolment in VET on post-school destinations, analyses need to take into account between-group differences. In this section, we present the post-school destinations of the secondary students who enrolled in VET and compare them to those of similar students who did not enrol.

Methodology

We used PSM to better isolate the effect that enrolment in VET might have on post-school destinations. PSM is a technique where an individual who was exposed to some variable of interest (for example enrolment in VET while at school) is matched to an individual who was not exposed to the variable but who had a similar probability of exposure. The expectation is that individuals with similar probabilities of exposure are similar in most other aspects (for example similar levels of SES) such that any observed differences in their outcomes can be attributed to exposure to the variable of interest.

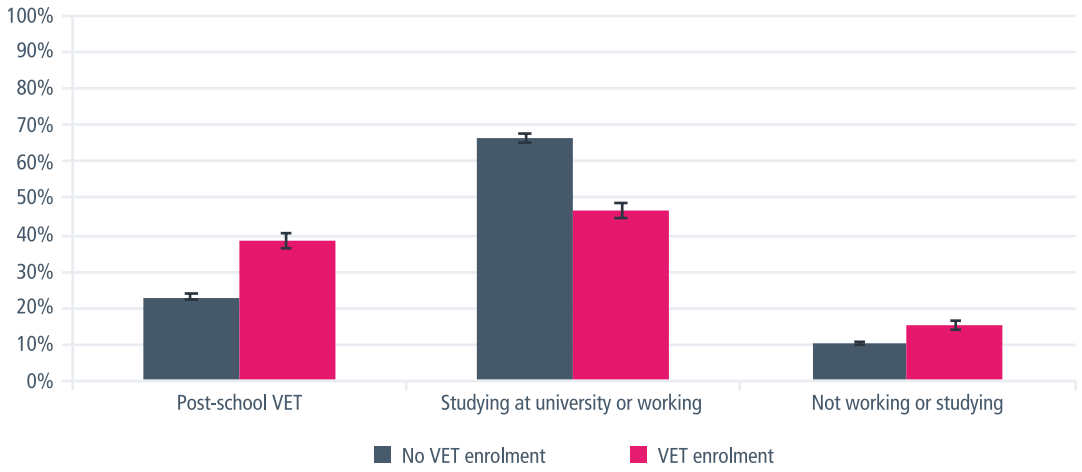
To carry out the matching procedure, we used the estimated parameters from the weighted multivariable logistic regression model described earlier in this report to calculate a propensity score for each student in our sample. We then used these propensity scores to match secondary students who did not enrol in VET to those who did enrol. We present more information regarding the PSM method in Appendix D.

Results

As shown in Figure 17, our results indicated that, compared to the (unmatched) secondary students who did not enrol in VET, those who did enrol were about 1.67 times more likely (95% CI [1.56, 1.79]) to be engaged in post-school VET (doing an apprenticeship, traineeship, VET Certificate I-III or VET Certificate IV+); about 1.43 times less likely (95% CI [1.37, 1.50]) to be studying at university or working; and about 1.46 times more likely (95% CI [1.29, 1.65]) to be not working or studying.

Figure 17:

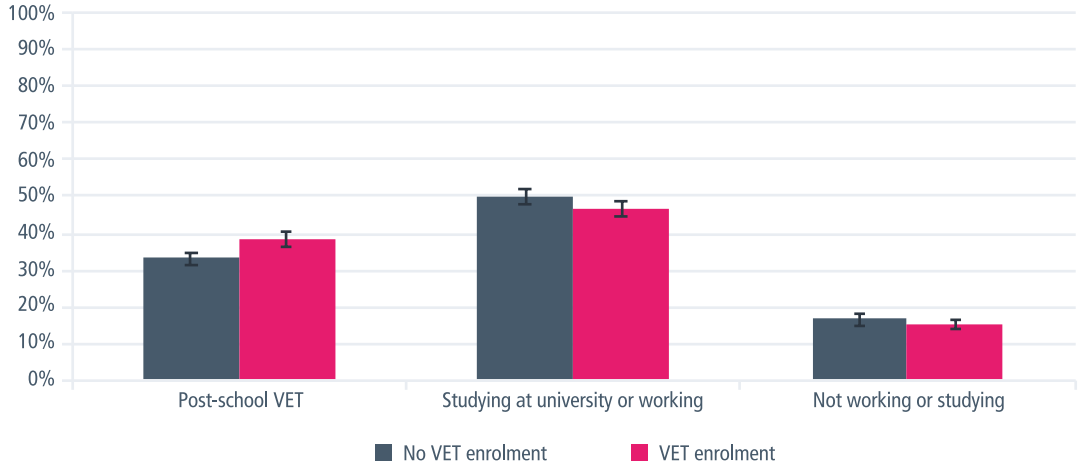
Estimated proportions of post-school destinations by VET enrolment status (unmatched)



However, when the differences between those who enrolled in VET and those who did not enrol were balanced using the propensity score method, the differences across the two groups were less pronounced. As shown in Figure 18, our results indicated that, compared to similar secondary students who did not enrol in VET, those who did enrol were about 1.14 times more likely (95% CI [1.06, 1.22]) to be engaged in post-school VET; about 1.04 times less likely (95% CI [0.99, 1.10]) to be studying at university or working; and about 1.17 times less likely (95% CI [1.03, 1.33]) to be not working or studying.

Figure 18:

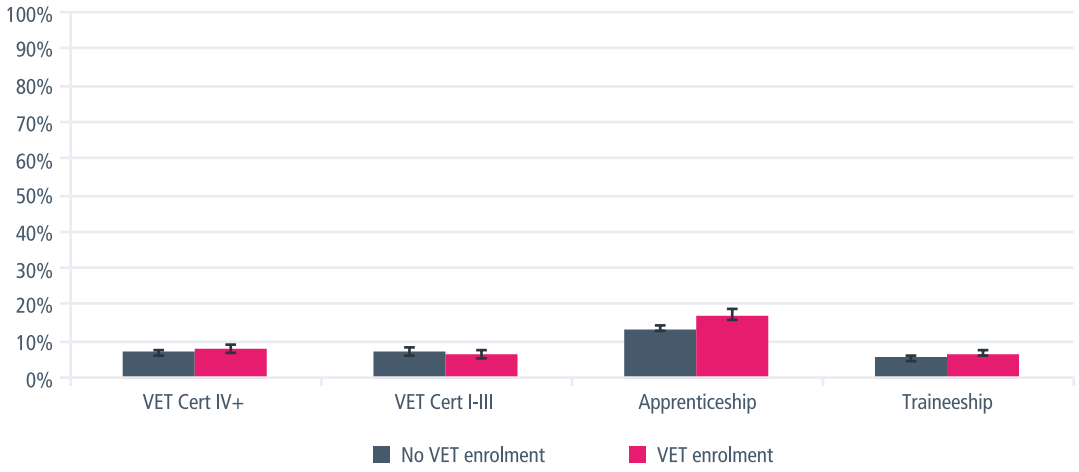
Estimated proportions of post-school destinations by VET enrolment status (matched)



We present a more detailed breakdown of the post-school destinations of the matched students in the post-school VET category in Figure 19. Our results indicated that, compared to similar secondary students who did not enrol in VET, those who did enrol were about 1.17 times more likely (95% CI [0.96, 1.42]) to be engaged in a Certificate IV+; about 1.17 times less likely (95% CI [0.97, 1.41]) to be engaged in a Certificate I-III; about 1.24 times more likely (95% CI [1.11, 1.39]) to be engaged in an apprenticeship; and about 1.21 times more likely (95% CI [0.98, 1.49]) to be engaged in a traineeship.

Figure 19:

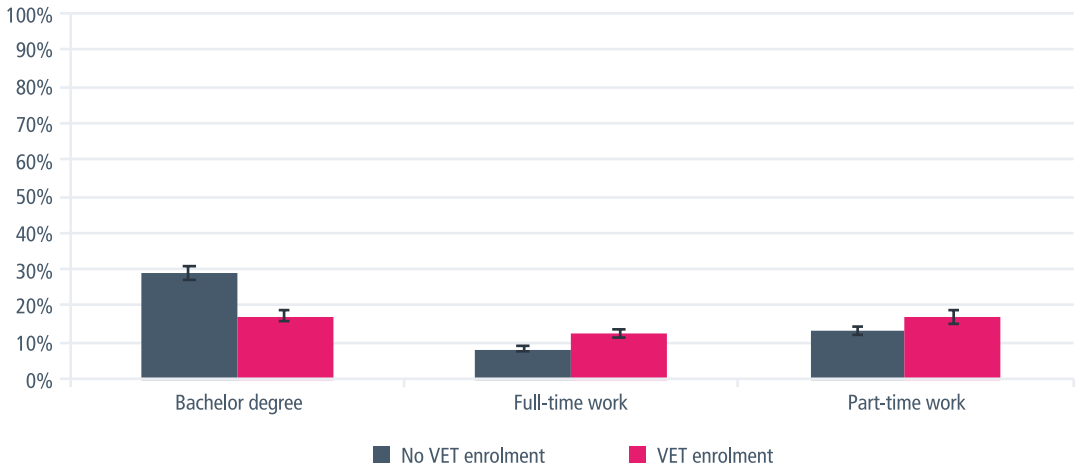
Estimated proportions of post-school destinations in the post-school VET category by VET enrolment status (matched)



We also present a more detailed breakdown of the post-school destinations of the matched students in the studying at university or working category in Figure 20. Our results indicated that, compared to similar secondary students who did not enrol in VET, those who did enrol were about 1.54 times less likely (95% CI [1.38, 1.72]) to be studying at university; about 1.50 times more likely (95% CI [1.28, 1.32]) to be working full-time; and about 1.28 times more likely (95% CI [1.12, 1.48]) to be working part-time.

Figure 20:

Estimated proportions of post-school destinations in the studying at university or working category by VET enrolment status (matched)



Summary

Our results indicated that, compared to the secondary students who did not enrol in VET, those who did enrol were:

- substantially more likely to be engaged in post-school VET
- substantially less likely to be studying at university or working
- moderately more to much more likely to be not working or studying.

While these results clearly show that post-school destinations are related to enrolment in VET, the analysis does not take into consideration other differences between the two groups of students (for example differences in SES). When we compared the secondary students who enrolled in VET to a group of students who had similar characteristics but did not enrol, we found that the differences in their post-school destinations were much smaller. Specifically, our results indicated that, compared to matched students who did not enrol in VET, those who did enrol were:

- slightly more to much more likely to be engaged in post-school VET
- equally likely to moderately less likely to be studying at university or working
- equally likely to moderately less likely to be not working or studying.

Our findings with respect to the chances that a young person will be not working or studying after they leave school are particularly encouraging. These results provide evidence that the provision of VET as part of senior secondary education may help students transition into work or study after they leave school.

These findings also suggest that secondary students who have an increased risk of not working or studying after they leave school may particularly benefit from taking VET programs as part of their senior secondary education. As our results show, students with very low NAPLAN Numeracy scores or very low SES scores are less likely to enrol in VET than similar students whose scores are in the low range. These students are also more likely to be not working or studying after they leave school, thus policy aimed at supporting these students to complete VET programs may be effective in reducing the proportion of school leavers who are not working or studying.

While it is encouraging that VET enrolment appears to decrease the chances that a young person will be not working or studying after they leave school, the findings with respect to post-school VET are more difficult to interpret. While our results suggest that the provision of VET appears to support a pathway of continued engagement with VET post-school, we argue that this outcome is not inherently positive or negative. Within the group of secondary students who enrolled in VET, some may find their career pathway satisfactory whereas others may not. To estimate the impact of VET enrolment on career (pathway) satisfaction, future research should seek to develop a clear operational definition of success.

While we have attempted to isolate the impact that VET enrolment has on post-school destinations, it is likely that our analysis does not include all the relevant information. For example, the decision to enrol in VET is likely influenced by student perceptions of VET and career aspirations (a secondary student who is more interested in studying at university may be less likely to enrol in VET than a similar student who is more interested in pursuing post-school VET). Unfortunately, our integrated dataset does not contain prospective measures of career aspirations; thus there may still be important differences between the group of secondary students who enrolled in VET and the group of similar students who did not.

The influence of these omitted variables can likely be seen in the comparison of the Bachelor degree destination in the matched sample. This comparison showed that the secondary students who enrolled in VET were substantially less likely to be undertaking a Bachelor degree than their matched peers who did not enrol in VET. We argue that most of this difference is likely due to individual differences in pre-existing aspirations to study at university and not the effect of enrolling in VET.

5. Which features of vocational education and training program delivery were associated with post-school destinations?

While every state and territory in Australia offers VET programs as part of senior secondary education, each state or territory does so differently. There are also differences within each state or territory with respect to how these programs are delivered. While future research may seek to identify the precise components of VET delivery that influence course effectiveness, our data currently contains information on three features of VET delivery within NSW, including:

1. whether the VET course was delivered by a school or an external RTO (for example TAFE)
2. whether a student undertook a work placement as part of their VET course
3. the level of VET qualification (certificate II or certificate III)[5].

Methodology

We investigated the fourth research question using a series of weighted logistic regression models. These models were used to estimate the bivariate relationships between each feature of VET program delivery and post-school destinations. While we initially tried to better isolate the effect of each feature using PSM, the conditions for such an analysis were not supported by the data. For example, when we categorised VET courses into broad fields of education[6], based on the Australian Standard Classification of Education (ASCED, 2001), we found that some courses, such as those in the Health and Education fields, were only offered through external RTOs while others, such as those in Architecture and Building and Food, Hospitality and Personal Services, were offered mainly through schools. This meant that it was impossible to disentangle the effects of field of education from the effects of RTO type. We therefore limited our analysis to simple descriptive comparisons.

We coded each variable of interest (RTO versus school based VET; work placement versus no work placement; certificate II versus certificate III) such that the secondary students who took VET course(s) with the feature of interest were placed into one group and those who took VET course(s) without the feature of interest were placed into another group. However, it is important to point out that some students (those who took more than one VET course) did not fit neatly into either group (the two groups are not mutually exclusive at the student level). For example, a student may take one VET course that requires a work placement and another that does not. Students who were not placed into a single group were excluded from the relevant analysis[7].

5 While secondary students can take certificate I and certificate IV courses, our data only contained information for 275 and 29 students who took these courses, respectively. Due to these small numbers, we do not present any information for these groups of students.

6 There are twelve broad fields of education: (1) natural and physical sciences; (2) information technology; (3) engineering and related technologies; (4) architecture and building; (5) agriculture, environmental and related studies; (6) health; (7) education; (8) management and commerce; (9) society and culture; (10) creative arts; (11) food, hospitality and personal services; and (12) mixed field programs.

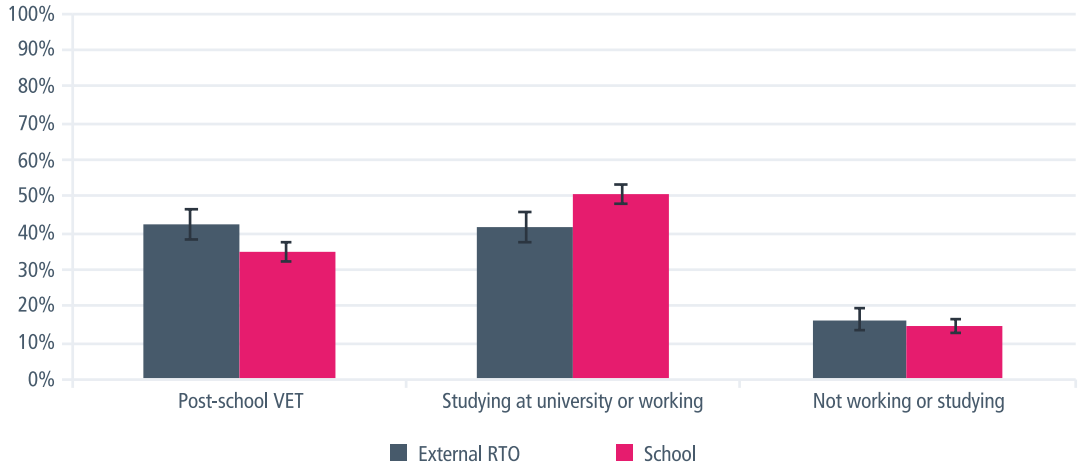
7 Of the 5,486 secondary students who took at least one VET course and were included in our original sample, 1,187 (22%) had conflicting RTO information, 318 (6%) had conflicting work placement information, and 1,411 (26%) had conflicting certificate information. These students were excluded for the relevant analysis (22% were excluded from the RTO analysis, 6% were excluded from the work placement analysis, and 26% were excluded from the certificate analysis.

Results

As shown in Figure 21, our results indicated that, compared to the students who had their course(s) delivered by RTOs, students who had their course(s) delivered by schools were about 1.22 times less likely (95% CI [1.08, 1.37]) to be engaged in post-school VET; about 1.21 times more likely (95% CI [1.08, 1.35]) to be studying at university or working; and about 1.09 times less likely (95% CI [0.87, 1.36]) to be not working or studying.

Figure 21:

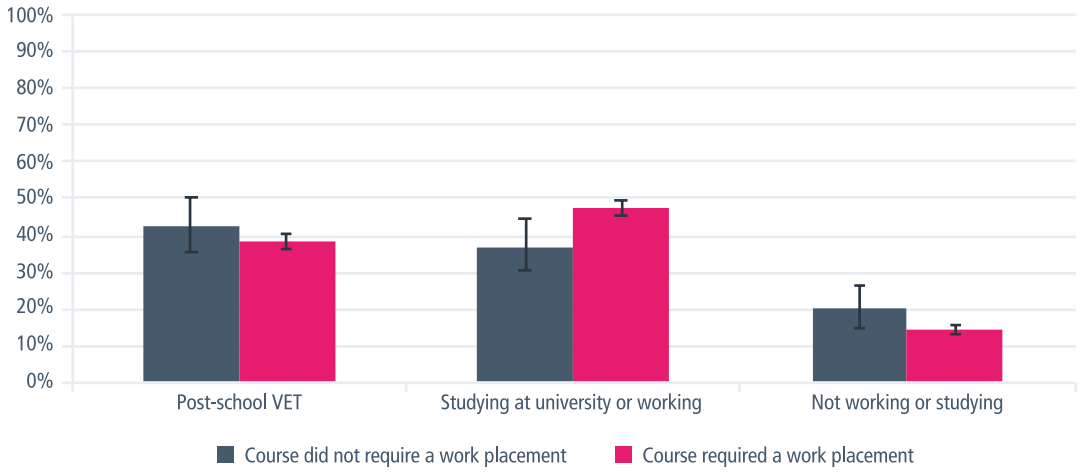
Estimated proportions of post-school destinations by RTO type



As shown in Figure 22, our results showed that, compared to the secondary students who took course(s) that did not require a work placement, those who took course(s) that did require a work placement were about 1.13 times less likely (95% CI [0.94, 1.35]) to be engaged in post-school VET; about 1.28 times more likely (95% CI [1.05, 1.56]) to be studying at university or working; and about 1.38 times less likely (95% CI [1.01, 1.90]) to be not working or studying.

Figure 22:

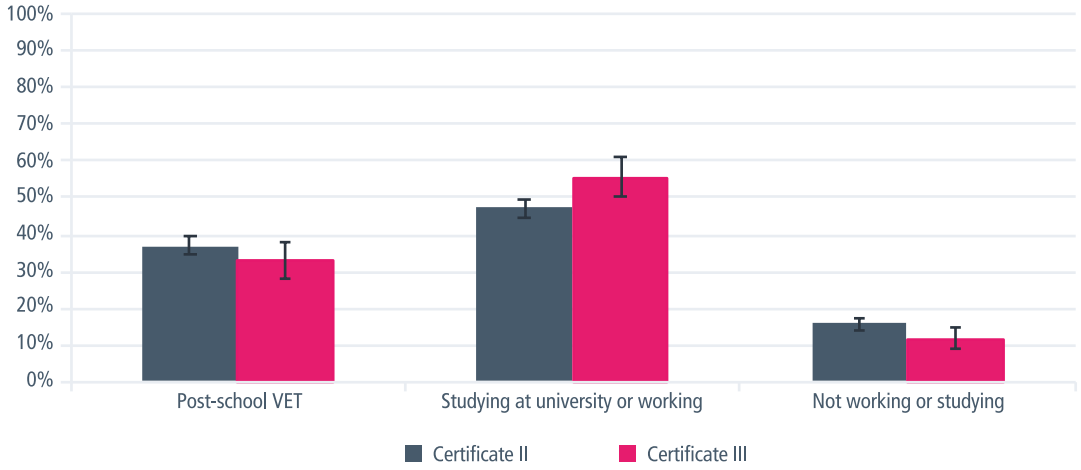
Estimated proportions of post-school destinations by enrolment in a course that required a work placement or not



As shown in Figure 23, our results indicated that, compared to the secondary students who enrolled in certificate II course(s), those who enrolled in certificate III course(s) were about 1.13 times less likely (95% CI [0.96, 1.32]) to be engaged in post-school VET; about 1.18 times more likely (95% CI [1.06, 1.32]) to be studying at university or working; and about 1.37 times less likely (95% CI [1.02, 1.85]) to be not working or studying.

Figure 23:

Estimated proportions of post-school destinations by Certificate II and III



Summary

Our results indicated that, compared to the secondary students who did their VET course(s) at external registered training organisations (for example TAFE), those who did their VET course(s) at school were:

- slightly less likely to substantially less likely to be engaged in post-school VET
- moderately more likely to substantially more likely to be studying at university or working
- slightly more likely to moderately less likely to be not working or studying.

Compared to the secondary students who did not do a work placement as part of their VET course(s), those who did a work placement were:

- slightly more likely to substantially less likely to be engaged in post-school VET
- slightly more likely to substantially more likely to be studying at university or working
- equally likely to substantially less likely to be not working or studying.

Compared to the secondary students who enrolled in certificate II VET program(s), those who enrolled in certificate III VET program(s) were:

- slightly more likely to much less likely to be engaged in post-school VET
- slightly more likely to substantially more likely to be studying at university or working
- equally likely to much less likely to be not working or studying.

While our results suggest that these three features of VET delivery may be associated with different post-school destinations, care needs to be taken when interpreting these results. It is likely that there are substantial unaccounted for differences between the types of students who do their VET programs at schools than at external RTOs, do work placements or not, and enrol in certificate II versus certificate III programs. These unaccounted for differences may be related to post-school destinations. In order to investigate the effects of these VET delivery features further, future research would need to take into account individual differences between students and between programs. Unfortunately, the integrated dataset we used for our analysis does not capture a large enough sample of students to make clear inferences about these types of differences (for example the effects of taking a certificate II versus certificate III program). This would require a large-scale dataset similar to the one used for our analysis, but capturing a greater number of individuals so that the assumptions underlying the analytical techniques are more likely to be satisfied.

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Appendix A – Additional information on complex data items

Post-school destinations

Any participant doing an apprenticeship, traineeship, VET certificate I-III or VET certificate IV+ was classified as belonging in the post-school VET category. Any participant doing a Bachelor degree, or working (part-time or full-time) was classified as belonging in the studying at university or working category. Any participant either looking for work or not working or studying was classified as belonging to the not working or studying category.

For more information on the classification of these mutually exclusive post-school destinations, see the destinations survey annual report (Myers et al., 2015).

Socioeconomic status scores

This data item is based on survey responses to questions about parental education and occupation. There are four measures that contribute to the final SES score:

1. parent 1's education status
2. parent 2's education status
3. parent 1's occupation
4. parent 2's occupation.

Education status and occupation are given numeric values between 0-100 (described in more detail below) then averaged to create the SES score for each individual, creating a continuous score that ranges from 0-100.

Numeric values for education status were calculated by assigning values to years of education (distinguishing between primary and secondary schooling, and post-school qualifications), then summing total values for primary and secondary schooling plus any additional values for post-school qualifications. Where multiple post-school qualifications were provided, the highest post-school qualification was used. Therefore the maximum score that could be received for education status was 17. Total values of education are then expressed as a percentage of the maximum value, resulting in a value ranging from 0-100. The values are as follows.

Primary and secondary schooling:

- 0 for no schooling
- 6 for primary schooling only
- 8 for started high school but left before Year 10
- 10 for finished Year 10 / school certificate / O levels
- 12 for finished Year 12 / HSC / A levels / IB

Post-school qualifications:

- 0 for no post-school qualifications
- 2 for any apprenticeship/VET/TAFE certificate, diploma or advanced diploma completed
- 3 for a university undergraduate degree / bachelor degree / honours degree / graduate diploma
- 5 for a post-graduate degree / masters / doctoral degree / PhD

The values for occupation status were calculated by converting occupation status using the Australian Socioeconomic Index 2006 (AUSEI06) scale. Conversion occurred at a 4-digit (unit group) level. The AUSEI06 scale is a continuous measure which ranges from 0-100. Lower scores indicate lower status and higher scores indicate higher status. The maximum score that could be received was 100.

Index of Community Socio-Educational Advantage values

The ICSEA value is the level of the school's educational advantage. ICSEA provides an indication of the socio-educational backgrounds of students. It is calculated based on four factors (two student factors and two school factors). The two student factors are parents' occupation and parents' education. The two school factors are geographical location and proportion of Aboriginal and/or Torres Strait Islander students.

ICSEA is a scaled score. The median score is set at 1000 with a standard deviation of 100. Schools with lower ICSEA values have lower levels of educational advantage, and schools with higher ICSEA values have higher levels of educational advantage (for more information, see Australian Curriculum, Assessment and Reporting Authority (2011)).

Appendix B – Correlation table showing relationships between characteristics predicting enrolment in vocational education and training

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Male	1													
2. Aboriginal and/ or Torres Strait Islander person	.002	1	--	--	--	--	--	--	--	--	--	--	--	--
3. Life skills course	.046*	.064*	1	--	--	--	--	--	--	--	--	--	--	--
4. Government	.021*	.131*	.089*	1	--	--	--	--	--	--	--	--	--	--
5. Catholic	-.020*	-.089*	-.056*	-.698*	1	--	--	--	--	--	--	--	--	--
6. Independent	-.006	-.072*	-.055*	-.531*	-.236*	1	--	--	--	--	--	--	--	--
7. SES	-.030*	-.120*	-.086*	-.218*	.065*	.218*	1	--	--	--	--	--	--	--
8. ICSEA	-.043*	-.204*	-.118*	-.474*	.175*	.437*	.458*	1	--	--	--	--	--	--
9. LBOTE	-.015	-.116*	-.004	.057*	-.029*	-.042*	-.020	.079*	1	--	--	--	--	--
10. Metro	-.013	-.150*	.000	-.092*	.041*	.076*	.138*	.366*	.260*	1	--	--	--	--
11. Provincial	.011	.140*	-.008	.088*	-.038*	-.074*	-.135*	-.355*	-.259*	-.993*	1	--	--	--
12. Remote and very remote	.013	.091*	.045*	.038*	-.026*	-.020*	-.032*	-.111*	-.025*	-.084*	-.026*	1	--	--
13. NAPLAN reading score	-.114*	-.140*	-.197*	-.164*	.054*	.158*	.386*	.442*	-.021*	.099*	-.096*	-.037*	1	--
14. NAPLAN numeracy score	.055*	-.158*	-.178*	-.114*	.005	.149*	.370*	.516*	.146*	.166*	-.162*	-.035*	.701*	1

Note: * represents statistically significant at $\alpha = .05$. Types of correlations – Pearson's correlation between two continuous variables; point-biserial correlation between a continuous and a dichotomous categorical variable; Crammer's V for relationship between two categorical variables (based on chi-square test).

Appendix C – Technical details regarding weighted logistic regression model and predictive margins

As stated in the body of this report, relationships between explanatory variables constrain the interpretation of bivariate comparisons. To better isolate the independent contribution of each characteristic, we fit a weighted logistic regression model to the data. All continuous inputs were standardised using their weighted means and standard deviations before they were entered into the model. All indicator variables were dummy coded. Once the initial model had been fit to the data, we created quadratic and cubic polynomial terms for each continuous input. We then sequentially entered each set of higher-order polynomials into the model, using Wald tests to assess the significance of each additional predictor. We used a test-wise alpha level of .05 to assess significance. The sequential testing showed that the cubic terms for SES, ICSEA and NAPLAN Reading scores were not statistically significant. All the other terms were retained in the model. The parameter estimates from the final model are presented in Table 3.

Table 4:

Parameter estimates from the final weighted logistic regression model

			95% confidence interval	
Predictor	**Estimate**	**Exp(β)**	**Lower bound**	**Upper bound**
Male	0.05	1.05	-0.06	0.16
Aboriginal and/or Torres Strait Islander person	0.08	1.08	-0.04	0.19
Life Skills course	0.50	1.65	0.17	0.84
Independent school	-0.71	0.49	-0.89	-0.54
Catholic school	-0.26	0.77	-0.39	-0.12
SES scores	-0.14	0.87	-0.21	-0.06
SES scores^2	-0.11	0.90	-0.16	-0.06
ICSEA values	-0.26	0.77	-0.36	-0.16
ICSEA values^2	-0.06	0.94	-0.12	0.00
LBOTE status	-0.40	0.67	-0.56	-0.25
Provincial	0.22	1.24	0.09	0.34
Remote	1.26	3.52	0.58	1.93
Year 9 reading scores	-0.31	0.74	-0.41	-0.21
Year 9 reading scores^2	-0.09	0.91	-0.15	-0.04
Year 9 numeracy scores	-0.72	0.49	-0.85	-0.59
Year 9 numeracy scores^2	-0.12	0.89	-0.19	-0.05
Year 9 numeracy scores^3	0.06	1.06	0.03	0.09
Year 9 NAPLAN reading participation	0.77	2.17	-0.88	2.43
Year 9 NAPLAN numeracy participation	-0.36	0.69	-1.65	0.92

In order to better understand the independent contribution of each characteristic, we used the estimated model parameters to compute predictive margins for specific values of each predictor. Predictive margins represent the estimated mean probability of the response variable when all observations in a defined population have a specific value of a given modelled covariate, leaving the values of the other modelled covariates as observed. For example, a single predictive margin for SES can be calculated using the following procedure:

1. fix each observation's SES score at a specific value
2. leave all other modelled covariates as observed
3. predict the probability of student enrolment in VET for each observation
4. average the predicted probabilities.

For the predictors that were intended to be mutually exclusive (for example, the indicator for independent schools and the indicator for Catholic schools), the predictive margin for one level of the input was calculated by setting the other levels of the input to zero. Furthermore, for the inputs that included polynomial terms (for example, NAPLAN scores), the predictive margins were calculated by setting the relevant covariate values to their respective powers (for example, for a NAPLAN score that was 2 standard deviations above the mean, the quadratic term was set to 2^2). While we acknowledge that these predictions will only be accurate under strict conditions (which will not hold in this instance), this method still allows us to capture insights into why students enrolled in VET.

Appendix D – Technical details regarding propensity score matching procedure

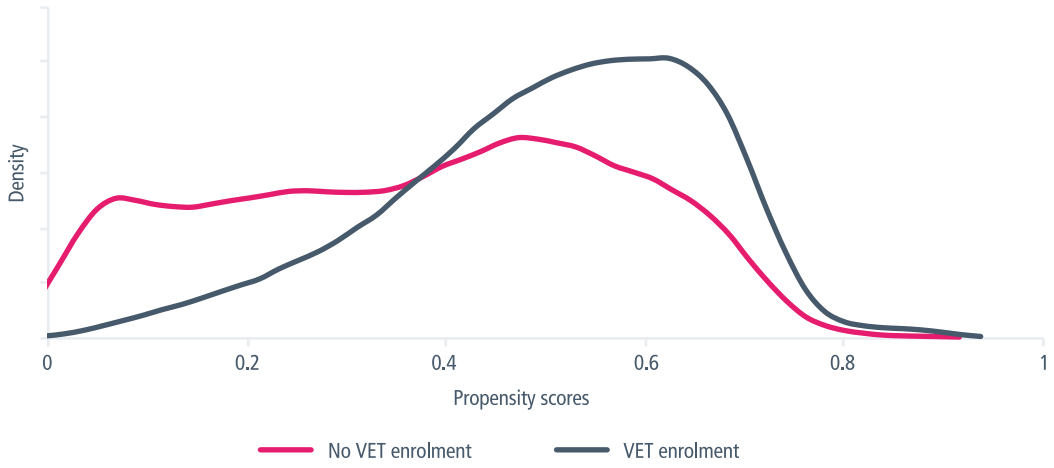
As the results from the bivariate and weighted multivariable logistic regression analyses showed that there were considerable differences between the secondary students who enrolled in VET and those who did not, with many of these differences potentially related to post-school destinations, simple comparisons of post-school destinations would not necessarily indicate an effect of student enrolment in VET. To better understand the potential effect of student enrolment in VET, we used PSM to reduce the effects due to confounding.

PSM is a technique where individuals who were exposed to some variable of interest (for example, enrolment in VET) are matched to individuals who were not exposed to the variable but have similar probabilities of exposure. The expectation is that individuals with similar probabilities of exposure are similar in most other aspects such that any observed differences in their outcomes can be attributed to exposure to the variable of interest.

We used the estimated parameters from the weighted multivariable logistic regression model (see Appendix C) to calculate propensity scores for all survey respondents. As shown in Figure 24, the survey respondents who enrolled in VET tended to have higher estimated propensity scores than those who did not enrol. Figure 24 also shows that there were an insufficient number of respondents who did not enrol in VET with high propensity scores to carry out unique 1:1 matching (that is matching without replacement). We therefore used n:1 nearest neighbour matching with replacement to match the weighted average of the closest respondents who did not enrol in VET to each respondent who did enrol (see Stuart 2010 for more information on different matching methods). The sampling frequencies for the respondents who did not enrol in VET ranged from 0 to 12. As the aim of the analysis was to investigate the effect of enrolment in VET among those that actually enrolled (known as the estimated treatment effect on the treated), respondents who did not enrol in VET were not matched to those that did (matching was unidirectional).

Figure 24:

Distribution of estimated propensity scores by VET enrolment status



One of the key assumptions underlying the PSM technique involves covariate balance. In brief, PSM only yields unbiased estimates of treatment effects when the groups of interest have equal levels of all confounding covariates. To investigate whether the matching procedure balanced the levels of the observed covariates, we calculated standardised bias measures for each covariate. For continuous covariates, we calculated the standardised bias measures as:

$$d = (\hat{\mu}_{VET} - \hat{\mu}_{no\,VET}) / \hat{\sigma}_{VET}$$

where $\hat{\mu}_{VET}$ represents the estimated population mean for the secondary students who enrolled in VET, $\hat{\mu}_{no\,VET}$ represents the estimated population mean for the students who did not enrol in VET, and $\hat{\sigma}_{VET}$ represents the estimated population standard deviation for the students who enrolled in VET. For dichotomous covariates, we calculated the standardised bias measures as:

$$d = (\hat{\pi}_{VET} - \hat{\pi}_{no\,VET}) / \sqrt{(\hat{\pi}_{VET}(1 - \hat{\pi}_{VET}))}$$

where $\hat{\pi}_{VET}$ represents the estimated population proportion for the secondary students who enrolled in VET and $\hat{\pi}_{no\,VET}$ represents the estimated population proportion for the students who did not enrol. It is convention to consider a covariate balanced if the standardised bias is between -0.25 and 0.25 (see Harder et al. 2010). The standardised bias measures for the matched and unmatched samples are presented in Figure 25. This figure shows that the matching procedure was generally successful in reducing the differences between the two groups of students.

Figure 25:

Standardised bias measures before and after matching

As the matching procedure was generally successful in reducing the differences between the two groups of students, the next step in the analysis involved comparing the post-school destinations in the matched sample. To further reduce the effects of confounding, we included the estimated propensity scores along with a binary VET indicator in a series of weighted logistic regression models (see Austin 2014 for details regarding double propensity score adjustments). The results from this analysis are presented in the main body of the report.

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