

*Full Length Research Paper*

# Student pathways in a New Zealand polytechnic: Key factors for completion

Boaz Shulruf<sup>1,2\*</sup>, Sarah Tumen<sup>1</sup> and John Hattie<sup>1</sup>

<sup>1</sup>Starpath Project, Faculty of Education, University of Auckland, New Zealand.

<sup>2</sup>Faculty of Medical and Health Sciences Centre for Medical and Health Sciences Education (CMHSE) University of Auckland, New Zealand.

Accepted 16 June, 2010

**This study aims to identify factors predicting students' pathways in a New Zealand polytechnic. Data on 1076 students who enrolled in 2002 in degree programmes in a large polytechnic in the Auckland region were used for this study. A series of regression models were established, the findings suggest that the more papers students take in the first year the more likely they are to complete their Bachelor degree qualifications within three years. Demographic characteristics did not have significant effect on the likelihood for completion. Grade Point Average GPA in the second year was a significant predictor for retention through to the third year but not for the likelihood of completion in the third year. It was suggested that the high level of student engagement with the polytechnic is a possible reason for the high completion rate, particularly among groups of students who are traditionally under-represented in higher education. A significant proportion of tertiary students (30% in 2002) in New Zealand study at polytechnics or institutes of technology (Ministry of Education, 2002a). Hence, a good understanding of student pathways within the polytechnic sector is critical for any intervention aimed at improving educational outcomes within this sector. The current study focuses on students enrolled in degree programmes at a large polytechnic in 2002 and follows their pathways and achievements throughout a period of three years (to the end of 2004). The purpose of this study is to scope the nature and value of data held by a large New Zealand Polytechnic (henceforth: NZP) to assist in evaluating the effectiveness of student pathways and achievements of different groups of students within degree programmes at the NZP.**

**Key words:** Undergraduate students, polytechnics, vocational training

## THEORETICAL FRAMEWORK

Early in the 1990s the New Zealand Government introduced a new policy for the tertiary education called "Learning for Life" (Lange and Goff, 1989). One of the most important features of this policy was the recommendation that colleges and polytechnics would offer degree programmes. It is noted that the new policy did not evolve in isolation from the rest of the OECD (Organisation for economic co-operation and development), as similar reforms took place in a number of European countries. All aimed to provide more people with high quality higher education to address the increasing demand for high skilled employees in global

markets (Pfeffer et al., 2000). The polytechnics responded to this policy change by offering degree programmes with some becoming, and others intending to become, more like universities; and indeed, one institution has since changed from polytechnic to university status. Over the 1990s the number and diversity of students in the tertiary sector increased significantly (Codling and Meek, 2003).

In 2002, 30% tertiary students in New Zealand studied in twenty polytechnics (MoE, 2002), and 41% in eight universities. By 2004, the proportions had shifted and 21 polytechnics attracted 46% of the students while only 30% studied at the eight universities. It appears however, that these changes predominantly occurred due to the rapid growth of the Wānanga, a type of institution aimed particularly at increasing the participation of Māori students in the tertiary education in New Zealand (Ministry

\*Corresponding author. E-mail: [b.shulruf@auckland.ac.nz](mailto:b.shulruf@auckland.ac.nz). Tel: 64-9-3737599.

Education, 2004a), which increased their student bodies from 1200 students in 1998 to 41,200 in 2003. By 2004, sixteen percent of all undergraduate degree students studied at polytechnics (Ministry of Education, 2004a), a situation that makes understanding the dynamics of student pathways and achievement in the polytechnic sector an important research area, particularly because of the differences in patterns of completion occurring in polytechnics and universities in New Zealand (Scott, 2004).

Scott's research concluded that a completion rate within six years from enrolment for students in degree programmes is highest within colleges of education (75%), followed by universities (58%) and polytechnics (53%) (Scott, 2004, 2005c).

Factors affecting student decisions regarding their post-secondary school destinations may provide some background for students' pathways within the polytechnic, as it is likely that similar factors affect students at different times throughout their education journey, particularly at the post secondary level (Scott, 2005c; Tumen et al., 2008). Analysis of school leaving destination choices at age 16 indicates that previous academic achievements, household income constraints and socio-economic background are influential in school retention choices, and exert influence through factors such as academic performance and school effects (Shulruf et al., 2008a). Moreover, it has been found that students' decisions about whether to go into the labour market or on to tertiary education are influenced by a range of factors such as: Socioeconomic background; Household income; School performance; the expected returns of these choices; Personal preferences and interest; Information available to the students through family and school and Peer networks (Maani, 2000).

Furthermore, there is on-going evidence that participation in university studies is found to be strongly associated with parental education, skills and income (Fergusson and Woodward, 2000). Over the past ten years in New Zealand the number of students participating in tertiary education, particularly those from low income families and from Māori and Pacific ethnicities has increased (McLaughlin, 2003). This increase has mostly occurred in non-degree programmes rather than in degree studies, in line with the trend identified within the OECD (Organisation for Economic Co-operation and Development) countries (Wagner, 1998). Scott (2003b) found that between 1994 and 2002 there was a steady growth in student numbers in degree-level education in New Zealand across all ethnic groups. However, since 1999 the growth in Māori students in non-degree studies far exceeded all other ethnic groups, without any effect on the Māori participation in degree programmes.

In a recent report Scott (2005a) looked at the time that students spend in tertiary education in New Zealand. Scott's findings indicate that on average students take 3.1 years of equivalent full-time study to graduate with a

Bachelor's degree. In addition, it was found that the lower the FTE (Full Time Equivalent) the longer it took for students to complete their studies (Scott, 2005c). Ussher (2006) also suggested that students who started their degree in the year after leaving school completed their studies in an average of 4.1 years. One of Scott's most important findings is that 42% of the students who had started a programme leading to a Bachelor's degree qualification did not acquire the qualification within six years of enrolment. It is noteworthy that this trend of low completion rate is not unique to New Zealand, with other countries reporting similar figures (Miller and Skidmore, 2005; Morgaman et al., 2002; Robinson, 2004).

Scott (2005c) also identified some of the characteristics of students who were more likely to complete their studies. He found that European and Asian students were 1.3 times more likely than Māori and Pacific students to complete their studies within a given term; and across genders, females were found to be 1.1 times more likely than males (adjusted for demographic and study related factors) to complete their studies in a given term. Interestingly, Scott found that school decile (the socioeconomic status of the catchment area of the school) did not have significant effect on the likelihood for completion (when adjusted for other factors example student demographics), despite the higher completion rate of students from higher decile schools. A number of studies have been carried out in New Zealand to identify factors that relate particularly to the participation and success of under-represented populations in the tertiary sector (for example see, Anderson et al., 2004; Bennett, 2002; King, 2004a, 2004b; Maani, 2000; Ministry of Education, 2002b, 2005; Shulruf et al., 2008; Smart, 2006; Sovka, 2002). These studies suggest that Māori and Pacific students are under-represented in the degree programmes within the tertiary education sector (King, 2004a, 2004b; Shulruf et al., 2008b); while Māori are over-represented in the non-degree programmes (Ministry of Education, 2002a, 2002b). As the proportion of Māori students aged between 18 - 25 in the national population is growing (Ministry of Education, 2004b) these trends have major social and economic effects as the public and the private (economic) return is positively associated with level of education (Maani, 1999, 2000).

In other words, in order to maintain the sustainability of New Zealand society, increasing the proportion of the traditionally under-represented groups in higher education (degree programmes) is crucial (Ringold, 2005). Preliminary findings from research on student pathways at one large New Zealand university (Tumen et al., 2008) indicate that once factors such as age, gender and learning style are controlled, ethnicity was not related to time to completion or withdrawal from an undergraduate degree programme. Tumen et al. (2008) found that high course-load in the first year, high GPA and a higher pass rate were associated with early completion.

## METHODS

Student data for those enrolled in degree programmes in 2002 were received from a large polytechnic within the Auckland region. The dataset included data on students' participation, achievements and completion (acquisition of qualification); as well as data on student ethnicity, gender, age, decile of last secondary school, final secondary school achievements/ qualification; and data on courses taken in the degree programmes and grades achieved. In order to measure study workload, 'intensity of study' was calculated as the number of papers taken per annum. The quality of study was measured by two variables, calculated for each year separately: Grade Point Average (GPA) and course success (pass) rate.

The definition of the cohort was crucial to the study. In order to minimise possible effects of previously accumulated, accountable credits (that is credits accumulated from previous studies that can be counted towards completion), students were included in the cohort only if they were enrolled in first year of a degree programme and had no previous record in such programmes within the institution. It is noted however, that data on previously acquired credits were only available from 2001 onwards and that data on credits acquired in other institutions were not available at all. Moreover, students who completed their degree studies within two years were excluded from the cohort. Since it is highly unlikely a degree programme can be completed within two years only, in the case of these students it was assumed that credits gained in previous studies had accounted for their degree completion.

In order to measure student pathways, each student was assigned to an outcome destination at the end of each year: leaving the programme (that is no records of studies at the following year); continued (that is, was an active student in the following year); and completed, that is (gained the qualification at that year or at the following year). Students who took a year break were considered as continued but at the break year they were taken out of sample and were placed back in when they became active again.

A series of regression models were established to identify the predicting factors for student pathways each year. Logistic regressions were established for years 2002 and 2003 as there were only two possible outcomes: leaving the programme or continuing; while for year 2004, the model comprised of multinomial regressions since students could leave the programme with no qualification, continue studying or complete the programme with qualifications (reference group: continued that is comparison was made between each of the groups who left the programme and the group who continued). Although the dataset included data on students from 2002 through to 2005, it proved impossible to establish a model for 2005 as no students from cohort 2002 had completed their studies by 2005. With the data from 2006 not being available in time for this analysis, it was also impossible to know who continued and who left the programme at this stage. These regressions provided the relative likelihood of each of the variables considered, to affect students outcomes (leave the programme, continue, complete) while other variables are controlled for.

Data concerning the decile of students' last secondary school were available, but only for school leavers. Since only 53% of the students in the 2002 cohort were New Zealand school leavers the decile variable was removed from the model.

## RESULTS

The study population comprised of 1076 students, 51% of them females. 34% of the population reported being Pākehā (New Zealand European), 37% stated Asian, 14% Pacific, 9% Māori and 6% other ethnicities. The average age was 29, ranging from 17 to 61 years.

The results (Table 1) indicate that 164 of the 1076 (15.2%) of the students who started their degree programme in 2002 completed their studies within the minimum time at the end of 2004. They also indicate that the demographic characteristics of students had little to no effect on the pathways they followed; and that no statistically significant differences in the likelihood for continuation or completion were revealed between students from different age groups, ethnicities and SES deciles. Gender, on the other hand, was found to be related to the likelihood for continuation or completion, but only in the second year (2003) when males were more likely than females to leave their programmes (Odds Ratio = 0.47, hereafter OR).

A clear pattern of study style was, however, found to be related to student achievements (retention and completion). For instance, students who studied intensively in the first year were more likely (OR = 1.38) to continue to the second year; and among these, intensive studies in the second year predicted a high probability of continuing to the third year (OR = 1.30). Further analysis of the third year suggests that intensive studies in the first year and less intensive studies in the third year predicted two opposite outcomes: either leaving the programme with a qualification or leaving with nothing (in comparison to the reference group that is students who continued). In this case, the level of study intensity in the second year (2003) did not appear to be related to student pathways.

As expected, a high pass rate in the first year highly predicted completion in the third year (OR = 11.9). Similarly, a student's third year pass rate was the most substantial determinant for completion or leaving with no qualification at the end of the third year (OR = 210 and OR = 0.08, respectively). The only measure of achievement that predicted pathways in the second year was the Grade Point Average (GPA): a higher second year GPA predicted continuation into the third year (OR = 16.23). No other significant effects of GPA on student pathways could be identified.

Students' persistence level varied across programmes. Students who studied towards a Bachelor of Health Sciences (Nursing) were the most likely group to continue to the second year (OR = 2.06, ref Bachelor of Business) whereas students in Engineering (that is Bachelor of Electronic Engineering and Bachelor of Engineering Technology programmes) were the most likely to leave the programme after the first year (OR = 0.28 and OR = 0.54, respectively).

It also appears that students studying Applied Communication were the most likely to complete their studies in the third year (OR = 9.04). No significant differences were found across programmes in the likelihood of leaving a programme after the third year. As previously mentioned, although data on 2005 studies were available, it was impossible to analyse student pathways through this year as the completion results and data regarding students' studies in 2006 were not

**Table 1.** Regression models (Bold p<0.05).

Academic year	2002	2003	2004	
Dependent variables	Cont./Left	Cont./Left	Comp./Cont	Cont./Left
Age over 25	1.09		1.64	0.83
Age 20-24	1.65		2.09	0.59
<b>Decile</b>				
SES			0.97	1.02
Gender*		0.47	0.99	0.73
Local		1.36	0.46	3.17
Ethnicity Māori**			0.89	2.04
Ethnicity Pacific**			0.82	0.36
Ethnicity Asian**			0.91	0.50
Ethnicity Other**			0.74	0.98
Intensity papers 2002	1.38	1.07	1.64	1.29
Intensity papers 2003		1.30	1.02	0.83
Intensity papers 2004			0.75	0.72
Success rate 2002	8.02		11.90	1.84
Success rate 2003			3.01	0.51
Success rate 2004			210.01	0.08
GPA 2002		0.91	0.66	0.40
GPA 2003		16.26	1.11	1.21
GPA 2004			1.03	1.67
Bachelor of applied communication***	1.44		9.04	2.61
Bachelor of electronic engineering***	0.28		0.09	3.48
Bachelor of engineering technology***	0.54		1.58	0.66
Bachelor of health science (Nursing)***	2.06		1.26	0.72
Bachelor of information systems***	0.77		0.81	3.16
-----				
Continued	627	506	243	243
Completed			164	
Left the programme	449	121		99

\* Reference: Femal, \*\* Reference Pākehā, \*\*\* Reference: Bachelor of Business, -----

available.

In summary, it is suggested that demographic factors have little to no effect on students pathways. Intensity of studies and pass rates may be better predictors of student pathways than any other variables. Students in Engineering programmes are at the highest risk of leaving their programmes without qualification, and students in Applied Communication are the most likely to graduate within three years.

## DISCUSSION

This study aimed to identify the factors that predict student pathways and their achievements, particularly across different groups of students within degree programmes at the NZP.

The findings show that students at this particular polytechnic perform better than the average New Zealand

bachelor's degree student: 15.2% graduated with a degree within three years of enrolment, compared to a 12.7% national rate (Scott, 2004). Yet, in comparison to the 26.6% completion rate within three years of enrolment recorded for New Zealand polytechnics (Scott, 2004, Figure 6.1), this graduation rate initially suggests that students in NZP did not reach the national average for polytechnics. However, taking into account the conservative cohort definition used in the current study, particularly the fact that students who completed within two years were excluded from the cohort (see methods above), and the fact that 19.8% of the students in Scott's study completed their degree at polytechnics within two years (Scott, 2004), it is reasonable to conclude that the difference between Scott's and the current study's findings result from differing sampling methods, rather than the actual completion rate. In the current study students who completed their study within the first two years were excluded from the cohort on the assumption

that completion within two years of study is likely to be the result of an accumulation of credits from previous studies and counted towards completion, rather than fast-track study. Thus, the appropriate comparison should be made between the proportions of completion in the third year of study only. This comparison indicates that the national completion rate was 6.8% in comparison to 15.2% in NZP.

It is also noted that in contradiction to previous studies (Benseman et al., 2006; McLaughlin, 2003; Scott, 2005b; Ussher, 2006), the current study suggests that students' demographic characteristics did not significantly affect their pathways. This contradiction can be related to difference in the statistical methods used in these studies. Most of the previous studies used descriptive data where only direct associations were measured between the participation and completion and demographic variables (with no control for other variables). The exception was Scott (2005c) study which used logistic regression whereby all independent variables were controlled. Nonetheless, Scott used a different set of variables as predictors and his model explained only 22% of the variance; in the current study, however, the models explain 33, 38 and 57% of the variance for student pathways, in each of their first three years of study.

It is therefore suggested that the higher completion rate in degree programmes within NZP may possibly relate to the specific circumstances or measures put in place to support the groups that traditionally tend to leave their studies early. Although specific data on support programmes were not available, previous reports suggest that in NZP specifically, there is a high level of students engagement with lecturers, facilitated by students' easy access to lecturers, the encouragement to ask questions, and the receipt of regular feedback from lecturers (Anderson et al., 2004; Benseman et al., 2006; Zepke et al., 2006). Furthermore, the student demographic composition in NZP is unique as it is the only polytechnic in the country to have a greater proportion of Pacific students enrolled than present in the community at large, and a proportion of Māori students which is only slightly lower than the national proportion (Middleton, 2003). It is therefore possible that, and in line with Tinto (1987) theory and Tinto and Love (1995) findings in the USA, that the high proportion of the traditionally under-represented population (Māori and Pacific) in NZP creates and provides the familiar environment (culturally) found to be an important factor affecting student retention in tertiary institutions (Benseman et al., 2006).

The second important finding revealed in this study was that a higher first year course-load (study intensity) was among the better predictors for completion. Although at first sight this relationship may seem to be obvious, that is the more papers one takes, the more likely one is to complete the course (Schartman and Yokoyama, 2004), more in-depth analysis provided a broader view. Although completion was associated with high intensity

study in the first year, it was also associated with low intensity in the third year (Table 1). This finding is of particular interest in relation to national data which indicate that students in bachelor's degree programmes tend to increase their course load over the first three years, and then reduce it in the fourth to the sixth years (Scott, 2005a). While this comparison should be taken with caution due to differences in cohort definition, in the two studies, it does suggest that assisting students in course load management may be beneficial. Furthermore, a high pass rate in the first year was found to be a very significant predictor of completion in the third year, whereas a high pass rate in the second year was not shown to have any effect (Table 1). These two findings (first year course load and first year pass rate) raise an important issue by indicating that the first year experience is critical for completion. It should be noted that course-load in the second year related only to retention in the transition from the second to third year; it did not relate to completion.

The question raised by these findings is why is a higher course-load and a high pass rate in the first year but not in the second a good predictors for completion? Within previous studies which indicate that first year students' experiences are the best predictors for completion, self perception in terms of academic achievement and engagement with peers and the institution were found to be the most important factors (Nelson, 1984; Schartman and Yokoyama, 2004; Tinto and Love, 1995). It has also been suggested that a high level of self efficacy (McKenzie and Schweitzer, 2001; Ross et al., 2002), academic self-esteem, aspiration for success in tertiary education, efficiency and study strategies (Boyd et al., 2001; Burton and Dowling, 2005; Overwalle, 1989; Wagner, 1998; Zeegers, 2004) play major roles in students' success in the higher education. Taking these into account, it is suggested here that course-load in the first year is possibly influenced by students' aspirations, efficacy and motivation to succeed in their studies. Students resolute to graduate with a degree qualification in three years enrolled in more first year courses than their peers with lower motivation, and were more determined to pass these courses. It is important to note that the GPA in the first year had no effect on completion in the third year, regardless of the high positive association between first-year pass rate and completion in the third year. Thus, it seems that study intensity and the number of papers passed (pass rate) in the first year is a better predictor for completion than how well those papers were (that is GPA).

Although it might be seen as somewhat speculative, it is suggested that NZP's policy to support students, particularly from under-represented groups, has been successful. Enhancing student engagement with the institute, addressing students' cultural needs and providing appropriate academic support programmes (Middleton, 2003) have had their effect. More students who

traditionally do not enrol or who are not retained in degree programmes have succeeded in their first year and passed their exams (albeit probably just passed) which in turn has operated as a booster for them to complete their degrees.

It is noted that students enrolled in the Bachelor of Health Sciences (Nursing) degree programme, followed by students studying for a Bachelor's degree in Applied Communication degree programme, were the most likely to continue from the first to the second year; whereas, students enrolled in Bachelor of Engineering degree(s) were the most likely to leave their programme after the first year.

While these findings are in line with Scott (2005c) who identified similar trends within the 1998 New Zealand cohort of students, it is also noted that most of these programmes were designed for completion within three years of full-time study, with the exception of the Bachelor's degree in Electronic Engineering (BEE) which was designed for four plus years. The longer course design for the BEE therefore explains the low completion rate of this programme in the third year (OR = 0.09); but no clear indication could be found in the data to explain the differences identified across programmes in the likelihood of retaining students into the second year. One possible explanation for the low probability of students continuing into the second year of the Bachelor's degree in Engineering Technology (BET) might be found in the socioeconomic status (SES) of the enrolled students. On average the SES of students enrolled in the BET programme was 4.6, in comparison to 5.3 for those in the BEE programme. As students' GPA in the first year was similar (1.27) across both programmes, it is suggested that economic factors may have affected students' decisions regarding the continuation of their studies.

Another possible explanation for the differences in the likelihood for continuing on to the second year may relate to gender. The findings suggest that females were more likely to continue to the second year than males regardless all other variables (see Table 1). It is possible that females (vast majority in nursing programme) are more likely to be secondary earners in their families than males (vast majority in Engineering), hence the economic burden of study may be slightly smaller. Since no data are available on this issue it is impossible to establish it with empirical evidence and further study is required to enlighten this particular issue.

Furthermore, evidence suggests that the students' course-load (study intensity) in the BEE programme was greater than their counterparts in the Bachelor of Engineering Technology course (5.9 and 4.2 papers per annum, respectively), which further supports the importance of appropriate course-load management for degree completion. It is also noted that up to a quarter of the student who had studied in BET and BEE left after the first year to complete their degree at the university, which may also explain the low likelihood for continuation to the second year.

Socioeconomic status (SES), however, is not a factor that can explain the differences in the relatively high likelihood of the Bachelor of Health Sciences (Nursing) and the Bachelor's degree in Applied Communication programmes to retain students to the second year. In this case it is likely that the gender was the major determinant.

It appears that students in programmes with a high proportion of females (Nursing 91%, Applied Communication 78%) are more likely to continue into the second year than students in programmes with lower proportions of females; for example, BEE - 8% female - and the Bachelor of Engineering Technology, 7%. It is noteworthy that gender, school decile and SES did not survive the stepwise of the logistic regression model of retention to the first year.

A possible reason for this is that females came from lower SES and school decile than males (4.8 versus 5.1 and 4.9 versus 6.32 respectively) but performed better (GPA: females 1.3 males 1.1; pass rate: females 0.72 males 0.63). Thus, it is suggested that some demographic characteristics (gender, SES) may relate to student outcomes in certain circumstances, for example in specific programmes were the participant population has a unique composition (Maani, 2000; Scott, 2003a). However, since the interactions between demographic factors and programmes' participation differ across programmes, it is suggested that demographic factors do not directly affect student performance; instead, the interactions between demographic characteristics and a programme's enrolment may operate as confounding factors causing their effects to be washed out from the comprehensive regression models.

In summary, it has been found that students' experiences in the first year are a major determinant for their pathways through their tertiary education and success in the first year is likely to increase the probability of degree completion. Most importantly, the findings indicate that the students who studied in NZP performed well above the average for other similar institutions in New Zealand. The reason for this is likely to lie in the way in which the polytechnic addresses its students' cultural and social needs, together with the high level of institution-student engagement.

Of concern is the high risk of leaving after the first year for students in some Engineering programmes. It is suggested that particular investigation should take place to identify other possible relevant factors, in addition to those suggested in this study that may affect student retention (example admission criteria, academic support programmes, curricula, teaching methods etc). Some socio-demographic factors are found to be the significant determinants however, although these are unlikely to be changed, the institute can review its practices which may ease the path for some students. The findings of the current study may therefore help to identify at risk student groups, but further research is needed to identify the best ways to make the change.

## REFERENCES

- Anderson H, Stephenson M, Millward P, Rio N (2004). Access and Engagement: A New Zealand Study. Auckland: Manukau Institute of Technology.
- Bennett S (2002). Cultural identity and academic achievement among Māori undergraduate university students. Paper presented at the National Māori Graduates of Psychology Symposium, Hamilton.
- Benseman J, Coxon E, Anderson H, Anae M (2006). Retaining non-traditional students: lessons learnt from Pasifika students in New Zealand. *Higher Educ. Res. Dev.*, 25(2): 147-162.
- Boyd S, Chalmers A, Kumekawa E (2001). Beyond School: Final year school students' experiences of the transition to tertiary study or employment. Wellington: NZCER.
- Burton S, Dowling D (2005). In search of the key factors that influence student success at university. Paper presented at the Higher education in a changing world, Sydney.
- Codling A, Meek LV (2003). The Impact of the State on Institutional Differentiation in New Zealand. *Higher Educ. Manage. Policy*, 15(2): 83-97.
- Fergusson D, Woodward L (2000). Family Socioeconomic Status at Birth and Rates of University Participation. *New Zealand J. Educ. Stud.*, 35(1): 25-36.
- King R (2004a). 2004 Tertiary Analysis: Business and Economics Faculty, Starpath Technical Report 2. Auckland: The University of Auckland.
- King R (2004b). 2004 Tertiary Analysis: Engineering Faculty Starpath Technical Report 3. Auckland: The University of Auckland.
- Lange D, Goff P (1989). Learning for Life. Education and Training Beyond the Age of Fifteen: Government Printer, Wellington.
- Maani SA (1999). Private and Public Returns to Investments in Secondary and Higher Education in New Zealand Over Time: 1981-1996. Wellington: Treasury New Zealand.
- Maani SA (2000). School Leaving, Labour Supply and Tertiary Education Choices of Young Adults: An Economic Analysis Utilising the 1977-1995 Christchurch Health and Development Surveys, Auckland: Department of Economics, The University of Auckland.
- McKenzie K, Schweitzer R (2001). Who Succeeds at University? Factors predicting academic performance in first year Australian university students. *Higher Educ. Res. Dev.*, 20(1): 21-33.
- McLaughlin M (2003). Tertiary Education Policy in New Zealand. Retrieved 20 April 2006, from <http://www.fulbright.org.nz/voices/axford/docs/mcLaughlin.pdf>
- Middleton S (2003). Connecting with community: A strategic approach to meeting the imperatives of a changing community. Paper presented at the The American Association of University Administrators National Assembly, San Francisco.
- Miller J, Skidmore M (2005). Higher Education Completion and Related Factors. Whitewater: University of Wisconsin – Whitewater.
- Ministry of Education. (2002a). New Zealand's Tertiary Education Sector: Profiles and Trends 2001.
- Ministry of Education. (2002b). Participation in Tertiary Education (August 2002): Ministry of Education, New Zealand.
- Ministry of Education. (2004a). Education Statistics of New Zealand for 2003. Wellington: The Data Management and Analysis Division.
- Ministry of Education. (2004b). Nga Haeata Matauranga: annual report on Maori education 2002/3 (No. D-MOE03). Wellington: Ministry of Education, New Zealand.
- Ministry of Education. (2005). Maori in Tertiary Education: A Picture of the Trends: Ministry of Education, New Zealand.
- MoE (2002). Profile and Trends: New Zealand's Tertiary Education Sector (Book).
- Morgaman P, Desai A, Leone D, McIntyre B, Moore E, Stuart J, et al (2002). Postsecondary Progression of 1993-94 Florida Public High School Graduates: 2002 Update (Research/Technical). Tallahassee: Florida State Council for Education Policy, Research and Improvement.
- Nelson RB (1984). Precollege Characteristics and Early College Experiences as Predictors of Freshmen Year Persistence. *J. College Student Pers.*, 25(1): 50-54.
- Overwalle F (1989). Success and failure of freshmen at university: a search for determinants. *Higher Educ.*, 18(3): 287-308.
- Pfeffer T, Unger M, Hölttä S, Malkki P, Boffo S, Finocchietti G (2000). Latecomers in vocational higher education: Austria, Finland, Italy. Vienna University of Flagenfurt
- Ringold D (2005). Accounting for Diversity: Policy Design and Māori Development in Aotearoa New Zealand. Retrieved 20 April 2006, from <http://www.fulbright.org.nz/voices/axford/ringold.html>
- Robinson R (2004). Pathways to completion: Patterns of progression through a university degree. *Higher Educ.*, 47(1): 1-20.
- Ross A, Archer L, Hutchings M, Gilchrist R, Thompson D, John C, et al (2002). Potential Mature Students Recruitment to HE. London: Department for Education and Skills.
- Schartman L, Yokoyama T (2004). Spotlight on OU Graduation Rate Up, Time to Degree Down. Rochester, Minnesota: Oaklan University.
- Scott D (2003a). Participation in Tertiary Education. Wellington: Ministry of Education.
- Scott D (2003b). Participation in Tertiary Education. Wellington: Ministry of Education.
- Scott D (2004). Pathways in Tertiary Education 1998-2002. Wellington: Ministry of Education.
- Scott D (2005a). How long do people spend in tertiary education? Wellington: Ministry of Education.
- Scott D (2005b). Retention, Completion and Progression in Tertiary Education in New Zealand. *J. Higher Educ. Policy Manage.*, 27(1): 3-17.
- Scott D (2005c). What factors make a difference to getting a degree in New Zealand? Wellington: Ministry of Education.
- Shulruf B, Hatti J, and Tumen S (2008). Individual and School Factors' Affecting Participation and Success in Higher Education. *Higher Educ.*, 56(5), 613-632.
- Shulruf B, Hatti J, and Tumen S. (2008). The Predictability of Enrolment and First Year University Results from Secondary School Perform. *Stud. Higher Educ.*, 33(6), 685-698.
- Shulruf B, Tolley H, Tumen S (2005). Students' Pathways and Achievements, Technical Report No. 4. Auckland: University of Auckland.
- Smart W (2006). Outcomes of the New Zealand tertiary education system : a synthesis of the evidence. Wellington: Ministry of Education.
- Sovka, R. (2002, 7-10 July 2002). Quality Outcomes through inclusion: Tertiary Decisionmaking and Ethnicity at a Regional New Zealand Polytechnic. Paper presented at the HERDSA 2002, Perth, Western Australia.
- Tinto V (1987). Leaving College: Rethinking the Causes and Cures of Student Attrition: University of Chicago Press, 5801 S. Ellis Avenue, Chicago, IL 60637 (\$19.95).
- Tinto V, Love AG (1995). A Longitudinal Study of Learning Communities at LaGuardia Community College. Washington: National Center on Postsecondary Teaching, Learning, and Assessment, University Park, PA.
- Tumen S, Shulruf B, Hattie J (2008). Student pathways at the University: patterns and predictors of completion. *Stud. Higher Educ.*, 33(3): 233-252.
- Ussher S (2006). From school, work or unemployment: A comparison of pathways in tertiary education. Wellington: Ministry of Education.
- Wagner A (1998). From Higher to Tertiary Education: Evolving Responses in OECD Countries to Large Volume Participation: The World Bank.
- Zeegers P (2004). Student learning in higher education: a path analysis of academic achievement in science. *Higher Educ. Res. Dev.*, 23(1): 35-56.
- Zepke N, Leach L, Prebble T (2006). Improving tertiary student outcomes in their first year of study. Wellington: College of Education, Massey University.