A statistical analysis of student backgrounds at a regional university

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Structured Abstract

BACKGROUND
Students entering higher-education are faced with many challenges; adapting to the tacit expectations, cultural norms and academic discourses of an institution are a significant component of this challenge. Students who do not come from a background where higher education is seen as the norm face an even greater sociocultural incongruence (Devlin, 2011). An emerging discourse (Zepke & Leach, 2005), which suggests that in order to support such students through their studies an empathetic institutional culture is needed, is influencing reviews of institutional contexts and support mechanisms for diverse student cohorts.
There is some evidence to suggest that more students from non-traditional higher education backgrounds (particularly low SES) tend to enrol in engineering than in other professional courses such as medicine and law (King, Dowling, & Godfrey, 2011). Furthermore, students from non-traditional backgrounds are found in greatest concentrations at regional universities (James, 2008), suggesting that a cohort of engineering students at a regional university is likely to be diverse in their backgrounds, or at least have a distinct profile from that of more traditional metropolitan university.

PURPOSE
This study set out to identify the demographic, educational and geographic backgrounds of an engineering cohort located at a regional Australian university. It is intended to identify the profile of this particular cohort and situate it in the context of the wider Australian higher education landscape.

DESIGN/METHOD
All students actively enrolled in the institution's engineering and surveying programs were invited to participate in an online survey in late 2013. The survey returned 568 valid responses, representing 15% of the total cohort, pertaining to demographic, educational and geographic student backgrounds. The data is representative of the various programs and modes of study and progression through the programs across the cohort was subjected to a descriptive statistical analysis.

RESULTS
An accurate profile of the cohort studying engineering at this university has been developed and situated in the context of the national priority of widening access to higher education (Bradley, Noonan, Nugent, & Scales, 2008), higher education equity participation trends (James, 2008) together with recommendations to diversify engineering participation (King, 2008). The data shows that the students concerned have multiple indicators of disadvantage and comprise a heterogeneous cohort.

CONCLUSIONS
Despite the diverse nature of this cohort their retention and progression rates are amongst the best in Australian Engineering programs. By a more fine grained analysis of their backgrounds a greater understanding of this student body can be developed, creating a platform for further work on the identification of institutional contexts that enable the success of these students.

KEYWORDS
Diversity, Equity

Introduction

Widening participation in higher education is seen as fundamental to building the knowledge based economies of developed nations in the twenty first century (Johnston, 2010). Programs aimed at increasing access to and equitable participation in higher education are being pursued in many developed countries, including the UK (Corver, 2005), Europe (Council of Europe Committee of Ministers, 1998) and Australia (Bradley et al., 2008). These programs are being driven by economic imperatives, technological change and the challenge of "the knowledge economy" on a national level and individual responsibility and self-improvement and employability on an individual level (Osborne & Gallacher, 2004).

In Australia the 'higher education equity framework', has been in place since the 1990s. It links the participation in higher education by identified equity groups with university funding. These equity groups are those within the Australian community which have traditionally been under-represented in higher education. They include people from low socio-economic status (SES) backgrounds, people from rural or remote areas, people with a disability, people from non-English speaking backgrounds (NESB), women in some non-traditional areas of study and Indigenous people (James, Baldwin, Coates, Krause, & McInnis, 2004). A specific target of 20% by 2020 has been set for participation rates of people from low SES backgrounds in higher education (Bradley et al., 2008).

This broadening of access to higher education has led to more diverse cohorts with widely varying backgrounds being enrolled in higher education (Bowser, Danaher, & Somasundaram, 2006; Krause, 2005). Students in the higher education classroom now represent a wide variation in ethnicity, socio-economic background, age, political and religious beliefs and academic preparation. These changing patterns of enrolment have led to the phenomenon of 'non-traditional' students enrolling in higher education. The term 'non-traditional' is generally used to mean students from any social grouping that is under-represented in higher education (Benseman, Coxon, Anderson, & Anae, 2006; Bowie & Hancock, 2000) More specific means of identifying non-traditional students have included age, demographic background and factors such as delayed enrolment, part time study, part time work, financial independence, dependents other than a spouse and students who lack a high school diploma (Gilardi & Guglielmetti, 2011). These types of indicators usually point to students who come from a disadvantaged background, and in Australia there is some evidence that in some universities there is a higher participation rate in engineering by these minorities than in other professional degrees, such as medicine and law (King 2011).

Increasing attention is being given not only to the recruitment of traditionally underrepresented groups of higher education students but to their retention and progression through their studies (Benseman et al., 2006; Crosling, Heagney, & Thomas, 2009). Many such studies focus on students from low socio-economic backgrounds because, as Heagney (2004) commented: "Low SES is a primary determinant of disadvantage and is present in differing combinations in nearly all manifestations of disadvantage". She also pointed out that some students are members of multiple equity groups (also noted by James et al. (2004)) and so experience multiple disadvantage.

Personal, social and economic factors associated with the retention and progression of students have been identified but institutional approaches to supporting these groups are also a significant factor in their persistence (Benseman et al., 2006). Much of the literature around the first year experience revolves about ways to improve student experience. A recent longitudinal study of first year higher education experiences (James, Krause, & Jennings, 2010) suggested that institutions explore "more sophisticated strategies for making student responsibilities in the higher education partnership more explicit". This approach suggests that by clearly articulating or demonstrating student responsibilities then institutions can enable all students to succeed. However it also points to an emerging discourse,

identified by Zepke and Leach (2005), whereby, instead of expecting students to adapt, the institutional cultures might be adapted to fit the needs of a diverse cohort.

Students entering higher-education are faced with many challenges; adapting to the tacit expectations, cultural norms and academic discourses of an institution are a significant component of this challenge. In order to perform successfully students must have socio-cultural capabilities which are relevant to the context of university study (Lawrence 2005). They must understand how to interact 'appropriately' to the culture of academia, that is the dominant ways of thinking and acting (Read, Archer, & Leathwood, 2003). Students who do not come from a background where higher education is seen as the norm face an even greater sociocultural incongruence than those from a more traditional background (Devlin, 2011).

Little progress has been made in identifying students 'at risk' (James et al., 2010) despite numerous studies on student participation and retention . It is also widely acknowledged that there is not enough known about the causes of non-completion amongst under-represented groups (Thomas & Quinn, 2007 pg. 5). This study set out to identify the demographic, educational and geographic backgrounds of an engineering cohort located at a regional Australian university. It is intended to identify the profile of this particular cohort and situate it in the context of the wider Australian higher education landscape. The students concerned have multiple indicators of disadvantage and comprise a heterogeneous cohort. By a more fine grained analysis of their backgrounds a greater understanding of this student body can be developed, creating a platform for further work on the identification of institutional contexts that enable the success of these students.

Methodology

Most government statistical reporting on the results of widening participation is based on identifiers of 'disadvantage' such as socioeconomic status (SES) and rural or regional origin, together with broad demographic indicators such as gender, disability and English speaking background.

The exact definition used for 'low SES status' varies both within Australia and between countries (King et al., 2011; Thomas & Quinn, 2007). It is generally based on a student's postcode which is ranked according to census data. There is some evidence that identifying students by their geographical location can be misleading. Forsyth and Furlong (2003) found it is often the relatively-advantaged students from a geographic area who access higher education (for example the child of a professional living in a 'working class' area), which would skew the statistics on retention of that category. There have been many suggestions and discussions about how to identify and define this group better (Bradley et al., 2008; Devlin & O'Shea, 2011; James et al., 2004; Thomas & Quinn, 2007) . Thomas and Quinn (2007) suggest that, based on research considering the two indicators, first generation entry into higher education might be more determining of inequality than socio-economic status.

This study set out to study an engineering cohort to directly identify indicators of non-traditional backgrounds such as 'first in family' (to attend university) status, parental education and occupation, level of paid employment, age and existence of dependents. All of these factors identify traditionally underrepresented groups in engineering education and data on the prevalence of these factors are not directly obtainable from institutional records. So a survey was used to gather these details for the engineering student cohort.

Method

The entire cohort of students actively enrolled in this institution's engineering and surveying programs was invited to participate in an online survey in late 2013. The survey was hosted within the university's learning management system so that respondents were identifiable by student number and could be cross matched with data contained on the institution's

database. Data was de-identified prior to analysis and subsequent reporting to ensure confidentiality. The study was conducted with institutional ethics committee approval.

The survey was designed in consideration of its objectives, which was to provide a more finely-grained 'picture' of this engineering student cohort than was available through existing student data. Evaluation and testing of the survey accessibility and question interpretation was conducted with a small pilot group prior to rollout and participant invitation. The survey was widely promoted and used reminders and follow up of incomplete submissions to maximise the response rate.

The survey returned 568 valid responses, representing 15% of the total active engineering student cohort. However, the real test of a survey sample's validity is its representativeness, not just the raw response rates, so the data was checked for representativeness before being subjected to a descriptive statistical analysis supported by the SPSS software.

Results and discussion

Representativeness of respondents

A comparison of attributes known for both the full active student cohort and the survey respondents was conducted to ensure the representativeness and thus the validity of the sample.

Table 1: Analysis of whether the response rate for the survey is representative of the total student cohort based on various attributes. The 95% Confidence Interval represents the range of response rates indicated by the current response rate; a representative sample for a particular attribute is achieved if the fraction of the Total Cohort falls within this range.

Attributes	Total Cohort (N=3815) %	Survey Respondents (n=568) %	95% Confidence Interval %	Repre-sentative
Distance Students	76.7	78.0	74.6 - 81.4	✓
Females (all programs)	9.3	14.8	11.9 – 17.7	
Female BEng	3.1	7.9	5.7 – 10.1	
Aboriginal & TSIsl	0.7	1.6	0.6 – 2.6	✓
Program				
BEng (incl. dual deg.)	30.9	41.2	37.1 - 45.2	
Other Engineering programs	39.6	37.7	33.7 – 41.7	✓
Engineering allied programs	25.1	15.0	12.0 – 17.9	
Post Grad. programs	8.6	6.2	4.2 – 8.1	
Engineering Discipline				
Civil, Agricultural & Environmental	33.6	34.3	30.4 – 38.2	✓
Mechanical/Mechatronic	17.0	19.9	16.6 – 23.2	✓
Electrical/Electronic/Software	23.4	27.3	23.6 – 31.0	
Allied Disciplines &	26.0	18.5	15.3 – 21.7	

unspecified				

Attributes available for the comparison of both groups included academic profile information, gender and membership of indigenous groups. The comparison of these attributes, using a large sample confidence interval for a population proportion, is presented in Table 1 and demonstrates that the respondents were broadly representative of the total cohort.

Female students and students studying the Bachelor of Engineering degree were slightly overrepresented in the survey, while post-graduate students and those studying allied programs such as surveying and construction were underrepresented. This is not overly concerning as the wider study which this survey supports is focussed on Bachelor of Engineering students in particular and in some analyses will isolate this section of the respondents for further analyses.

National and Institutional cohort comparisons

National published data (Department of Education, 2014) relating to equity groups includes university participation rates for low SES, regional, remote and indigenous groups. This data is based on Australian domestic students, excluding international students. The SES ranking, rural and remote indicator data is derived from student postcodes of their permanent home residence. As expected from a regional university that specialises in distance education even this broad-brush data indicates that the student cohort contains a larger proportion of non-traditional students than most other universities. Table 2, shows the participation rates (students in the equity group/all domestic onshore students) of particular equity groups.

Table 2: Comparison of broad demographic indicators; Participation rates of identified equity groups, 2007-2012 published data. (Department of Education, 2014)

Demographic Indicator	National Average	USQ Average
Low SES, by post code	15.4	32.2
Regional students,	18.0	50.6
Remote Students	1.05	2.76
Indigenous Students	1.33	2.06

Mode of enrolment

USQ has a long history of distance education and is one of the leading providers of distance engineering programs. This is clearly reflected in the comparison of Australian national data on external, part time and multi-modal enrolment modes shown in Table 3.

Table 3: A comparison of national and institutional enrolment modes

	National HE Average (2003-2008)	USQ Engineering Cohort (2013)
Percent External	13.7	76.5
Percent Multi-Modal	6.2	5.9

Percent Part Time	33.2	72.7

From a comparison of USQ data and national averages it appears that students attending USQ have more diverse backgrounds than those at most other universities. Data associated with specific indicators of disadvantage, gathered from the survey of engineering students, is presented below.

Age profile of USQ Engineering students

One of the key differentiating characteristics of USQQ's engineering cohort is the age profile of the students. Approximately 20 per cent of commencing undergraduates in Australia are aged over 25 (James, 2008). However, over 50 percent of the student survey respondents were aged over 25. (Figure 1)

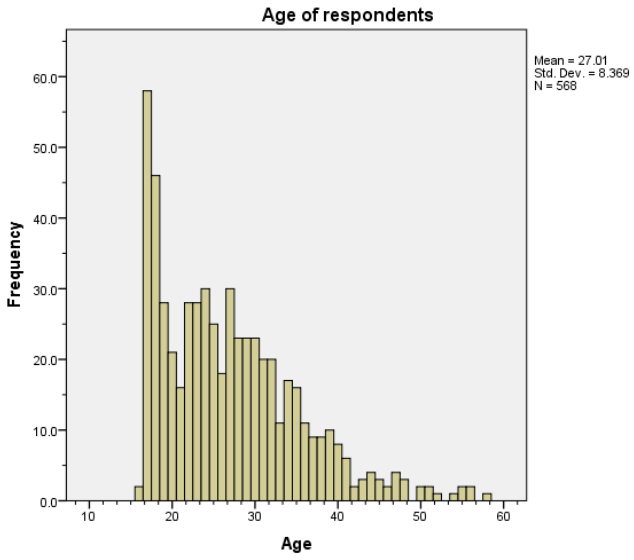

Figure 1: Ages of survey respondents

While the largest single age group was 17-year-olds (10.2 per cent of sample) 48.1 per cent of students are aged between 25 and 40 years (Table 4).

Table 4: Age Brackets of Student Respondents

Age Bracket (n=568)	Number	Percent
Under 25 years old	257	45.2
25-40 years old	273	48.1
Over 40 years old	38	6.7

Due to their flexible delivery modes, the engineering programs offered at this institution are attractive to students who are already working in the industry and want to enhance their career. This is reflected in the age profile of the students and the large number of students who are mid-career. While 'school leavers' represent the largest single age groups the majority of students are in the mid-career age bracket of 25-40 years old. This is demonstrated in Figure 2 which shows that the majority of these students are studying

externally and in Figure 3 which demonstrates that most external students are also in full time employment.

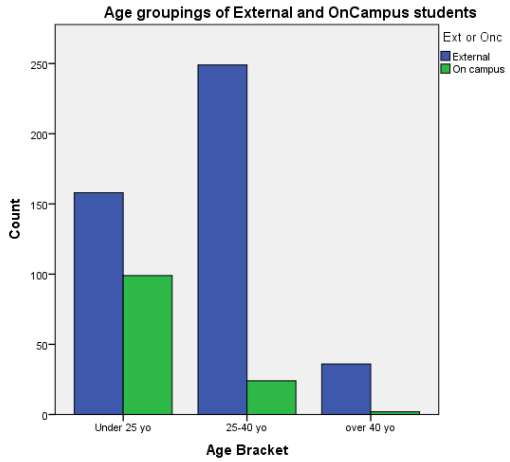

Figure 2: Age groupings of external and on-campus students

Employment

McMillan (2005) found that students who work more than 20 hours per week were significantly more likely to discontinue their studies than students who did not work or who worked fewer hours. This relationship remained statistically significant even after controlling for other socio-demographic factors.

At this institution the vast majority of students (68%), most of whom study externally, are in full time paid employment (more than 25 hours per week), as shown in Figure 3, theoretically putting them in a high risk category in terms of their retention.

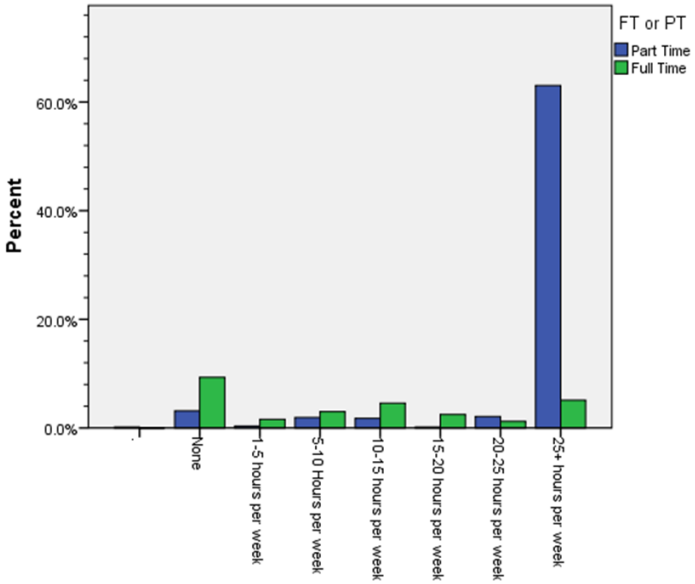

Figure 3: Hours of paid employment during semester, n=568

Parental Education levels and first generation students

The level of parental education (particularly the father's) has been shown to be significant both in the uptake of university studies and the likelihood of completion (McMillan, 2005). This indicator has been suggested as a more fine-grained means of identifying 'low SES' students than the postcode indicator used for many studies (James 2008). Parental

educational levels are also closely related to whether a student is a ‘first generation’ student, or first in their family to attend university. This institution has a high level of such students, 73 per cent of students’ fathers and 73 per cent of students’ mothers have not completed a university level program.

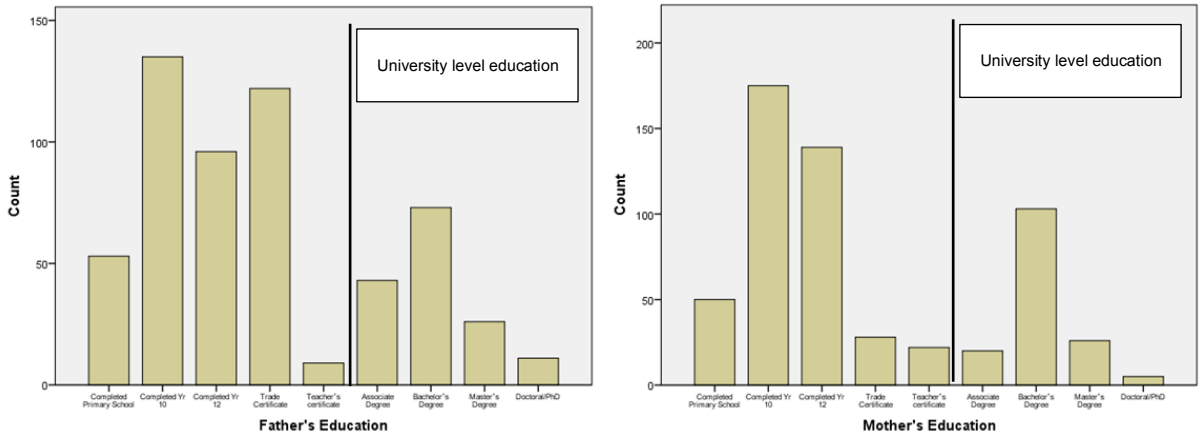

Figure 4: Parental Education Levels

Parental education levels are related to the figures for first generation students (students who are the first in their family to attend university). Figure 5 shows that a significant proportion of this cohort are the first in their family to attend university or the first after a sibling. Thomas and Quinn (2007) argue that this indicator is the most significant in identifying cohorts of non-traditional students who are entering university as part of the widening of participation in higher education. These are the students who experience the greatest socio-cultural incongruence on entering university as they do not have the cultural and social capital available to them that explicates the inherent expectations of academia.

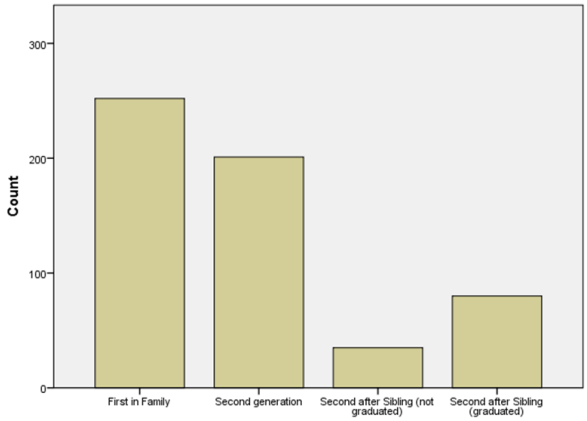

Figure 5: First / Second generation university attendance, n=568

Conclusion

The data collected in this survey confirms that the engineering cohort at this institution includes many under-represented groups. The cohort is heterogeneous and displays multiple indicators generally associated with ‘disadvantage’ in higher education. Despite its diversity previous studies (Gibbings, Godfrey, King, & Wandel, 2010) have shown that the retention and progression rates for students at this institution are amongst the best in Australian engineering programs.

The current discourse around widening participation in higher education and the issue of socio-cultural congruence within institutions suggests that more work needs to be done to understand the factors that support academic success for disadvantaged students. In

particular, a greater understanding of initiatives and institutional cultures which support good retention amongst diverse engineering student cohorts needs to be developed. This paper presents data which allows a more fine grained analysis of student backgrounds, creating a platform for further work on the identification of institutional contexts that enhance the interface between student and institution and so support and enable the success of these students.

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