

**AN ANALYSIS OF SOCIO-CULTURAL CONGRUENCE AND
ITS IMPACT ON DIVERSE STUDENT COHORTS IN AN
ENGINEERING CONTEXT**

**Josephine Maria Devine
BE Hons(Civil), Grad Dip (Tech Mgt)**

**Submitted in fulfilment of the requirements of the degree of
Doctor of Philosophy**

2016

Abstract

Increasing numbers of ‘non-traditional’ students are enrolling in engineering. They include students from low socio economic status backgrounds or a rural upbringing, those who are mature age or first in their family to attend university, and those studying part-time and from a distance. They have varying levels of academic preparation and study skills, often coupled with significant additional personal and work commitments and pressures to be balanced with their studies.

It is often assumed that if students have the ability, motivation and determination then they should be able to succeed at university regardless of their demographic backgrounds. However emerging data suggest that students must also master the academic culture; the norms, discourses and tacit expectations of academia.

Academic success at university depends on the student understanding these unspoken requirements and being able to respond to them appropriately. Unlike most traditional students, many non-traditional students do not have the socio-cultural background to navigate their way through their studies adequately, and so they struggle.

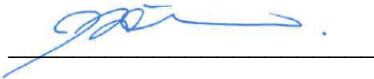
This social-constructivist research investigated the experiences of successful non-traditional engineering students. The dual aim of this research was to identify dispositions that enable these students to understand quickly and respond appropriately to academic culture in order to succeed in their studies and to identify institutional contexts which enable these dispositions to be successfully leveraged for academic success.

A conceptual framework developed by French sociologist Pierre Bourdieu, using his concepts of habitus, field and capital, was applied within a case study methodology. A series of interviews triangulated with observations and survey data was employed in the investigation of the localised case. Nationally published qualitative and quantitative data were also collected and analysed in order to situate the case in the context of higher education in Australia. The resulting qualitative data was subjected to a thematic analysis using the constant comparative method and descriptive statistics were used for the analysis of the quantitative data.

Improving our understanding of the key issues that influence positive and negative outcomes at university will inform the development of appropriate systems, programs and pedagogies to support more diverse, non-traditional student cohorts. The research concluded that consistent, high quality teaching and student support embedded throughout the curriculum of an engineering program is essential to optimising student academic performance. An institutional culture that is supportive of learning and teaching by disciplinary experts who have a student focus is essential to the implementation of effective student support strategies within the curriculum.

Certification of Thesis

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this thesis are entirely my own effort, except where otherwise indicated and acknowledged. I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

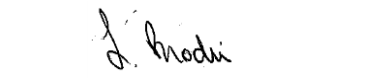


Signature of Candidate

___7 January 2016___

Date

ENDORSEMENT



Signature of Supervisor/s

___7 January 2016___

___07/01/16___

___7/1/16___

Date

Acknowledgements

This thesis is dedicated to those remarkable students who first inspired the research, some of whom have subsequently contributed anonymously as interview participants.

I am deeply indebted to my principal supervisor, Professor Frank Bullen, for his inspiring leadership and fostering of engineering education research at USQ. His insistence that I begin this research journey as soon as I indicated an interest and his ongoing support and encouragement through the many detours this project has taken, has directly resulted in its final completion.

I also thank my associate supervisor and friend Associate Professor Lyn Brodie, who has been instrumental in my progress, providing unfailing belief in me and endless streams of coffee and red wine in order to lubricate the process. I am indebted to Dr Lesley Jolly, our Athena, who shared her knowledge so generously and patiently; without her the sociological conceptual framework used in this research would not have been possible. I thank Dr Andrew Wandel for stepping in willingly to help a colleague and for making me feel that it was ok not to know the answer immediately.

My deep respect and appreciation goes to Marita Basson, my “PhD buddy” who travelled this road beside me, generously sharing her thoughts, insights, information sources and encouragement. Many other colleagues have encouraged and supported me, especially Prof David Dowling, who initially encouraged me to consider a PhD and then continued to flood me with interesting literature on a regular basis, Prof Ron Ayers, my academic mentor and Weena Lokuge, who shared a mutually supportive co-teaching relationship with me. My thanks go to Sandra Cochrane, who not only sent me serendipitous literature to read on many occasions but also proofread this thesis before its submission.

My parents, Margaret Devine (PhT) and Dr Bevan Devine (PhD), the original non-traditional students, have been a constant source of inspiration and support to me. They didn’t blink when their only daughter announced she was going to study engineering and it was only years later that I learned what a shock that was.

My appreciation goes to my three beautiful children who have grown up these past few years with a harried, distracted mother. I particularly thank Erin, whose enthusiastic inquisition about the completion of each chapter motivated me to get them finished. Finally, my thanks go to my husband, Joseph, who trod this path before me and showed me that it can be done.

TABLE OF CONTENTS

List of Figures	xi
List of Tables	xiii
Abbreviations	xvi
1 Introduction	1
1.1 Background to the research	1
1.2 Research scope and questions	3
1.2.1 <i>Key research question</i>	4
1.3 Importance of the research	4
1.4 Methodology	5
1.5 Outline of the thesis.....	6
2 Literature Review	9
2.1 Introduction	9
2.2 Class in Australia and its effects on educational attainment.....	11
2.3 Widening participation	12
2.3.1 <i>Elite, mass and universal education</i>	13
2.4 Non-Traditional students	16
2.4.1 <i>First in family</i>	18
2.4.2 <i>Rural and remote students</i>	18
2.5 Diversity in engineering	19
2.5.1 <i>Alternative entry pathways to engineering</i>	20
2.6 Student learning.....	21
2.6.1 <i>Student engagement, learning and culture</i>	22
2.6.2 <i>The first year experience</i>	23
2.7 Student retention within higher education.....	24
2.8 Social and cultural capital	25

2.9	Student achievement and institution.....	28
2.10	Conclusion.....	29
3	Conceptual Framework.....	31
3.1	Habitus, capital and field.....	31
3.1.1	<i>Capital</i>	32
3.1.2	<i>Habitus</i>	33
3.1.3	<i>Field</i>	37
3.1.4	<i>Theory of practice</i>	39
3.2	Bourdieu’s theories and educational systems.....	40
3.3	Conclusion.....	43
4	Methodology.....	45
4.1	Epistemological and paradigmatic stance.....	48
4.2	Methodological framework: Case study.....	49
4.2.1	<i>Case study design</i>	50
4.2.2	<i>Research design quality and validity</i>	52
4.2.3	<i>Reflexivity</i>	57
4.3	Data collection methods.....	58
4.3.1	<i>Confirmation of critical case: Demographics</i>	59
4.3.2	<i>Student Survey</i>	60
4.3.3	<i>Interviews</i>	61
4.3.4	<i>Institutional publications</i>	65
4.3.5	<i>Cross-institutional diversity workshop</i>	65
4.4	Data analysis process.....	66
4.4.1	<i>Data transcription and coding</i>	68
4.5	Ethical considerations.....	68
4.6	Conclusion.....	69
5	The Australian Higher Education Landscape.....	71

5.1	Approach	72
5.1.1	<i>Data gathering</i>	72
5.2	Higher Education in Australia, an overview	74
5.2.1	<i>Formal Australian university groupings</i>	77
5.3	University classifications	82
5.3.1	<i>Extending formal groups to university typing</i>	82
5.3.2	<i>Further classification</i>	83
5.4	Exploring differing institutional identities	85
5.4.1	<i>Go8 identity</i>	86
5.4.2	<i>The IRU identity</i>	88
5.4.3	<i>The ATN identity</i>	89
5.4.4	<i>The New Generation Universities identity</i>	89
5.4.5	<i>The Regional universities identity</i>	91
5.5	Public positioning with respect to diversity	92
5.5.1	<i>Overview</i>	92
5.6	Structured workshop: staff perceptions of diversity	97
5.6.1	<i>Go8 workshop group</i>	98
5.6.2	<i>Regional and ATN-like workshop groups</i>	100
5.6.3	<i>New Zealand workshop group</i>	101
5.6.4	<i>Workshop summary</i>	101
5.7	Conclusions	103
6	Student Demographics at USQ	107
6.1	Approach to investigating student demographics	108
6.1.1	<i>Data collection</i>	108
6.1.2	<i>Nationally published institutional data</i>	109
6.1.3	<i>Equity indicators used by the Department of Education</i>	110
6.1.4	<i>Survey of engineering student backgrounds</i>	112

6.2	Results: student demographics of the HE landscape.....	113
6.2.1	<i>Low-SES students</i>	117
6.2.2	<i>Regional and remote</i>	121
6.2.3	<i>Non English speaking background (NESB)</i>	124
6.2.4	<i>Women studying in non-traditional areas</i>	127
6.2.5	<i>Students with a disability</i>	130
6.2.6	<i>Indigenous students</i>	133
6.3	USQ’s student profile in the context of the HE landscape.....	136
6.3.1	<i>USQ and other regional universities</i>	138
6.4	USQ Engineering student profile survey.....	141
6.4.1	<i>Age profile of USQ engineering students</i>	142
6.4.2	<i>Employment</i>	144
6.4.3	<i>Parental education levels and first-generation students</i>	145
6.5	Analysis of USQ engineering student academic achievement.....	148
6.6	Conclusion.....	153
7	Faculty Culture	155
7.1	Background	155
7.2	Approach to exploring Faculty culture.....	157
7.2.1	<i>Data collection</i>	158
7.2.2	<i>The cultural survey</i>	158
7.3	McNay’s model of academic organisational culture.....	160
7.3.1	<i>Theoretical framework, the McNay typology of university cultures..</i>	161
7.4	Faculty culture within McNay’s framework	163
7.5	Findings: Faculty culture.....	167
7.5.1	<i>Social cohesion and practice within the wider institution</i>	167
7.5.2	<i>Industry focus</i>	169
7.5.3	<i>Engineers as academics</i>	170

7.5.4	<i>Disciplinary boundaries</i>	170
7.5.5	<i>Academic standards</i>	171
7.5.6	<i>Expectations of students</i>	171
7.5.7	<i>Mathematical competency</i>	172
7.6	Conclusion.....	173
8	Student Culture and Habitus	175
8.1	Approach to exploring student culture and habitus.....	176
8.1.1	<i>Data collection</i>	177
8.1.2	<i>Participants</i>	178
8.1.3	<i>Method of analysis</i>	180
8.2	Discussion of results.....	181
8.2.1	<i>Engineering – the profession</i>	182
8.2.2	<i>Choice and experience of institution</i>	186
8.2.3	<i>Student engagement</i>	188
8.2.4	<i>Aspects of self</i>	196
8.3	Findings	207
8.4	Conclusion.....	209
9	Conclusions	213
9.1	Key Recommendations.....	213
9.1.1	<i>Curriculum alignment</i>	213
9.1.2	<i>Institutional culture and teaching capital</i>	214
9.2	Recommendations for practice	215
9.2.1	<i>Quality curriculum delivery</i>	215
9.2.2	<i>Transparent administration practices</i>	216
9.2.3	<i>Delivering creative and altruistic value</i>	216
9.2.4	<i>Flexible delivery</i>	217
9.2.5	<i>Scaffolding a successful approach to study</i>	217

9.2.6	<i>Development of independent information seeking</i>	218
9.2.7	<i>Accessible academic staff</i>	218
9.2.8	<i>Provide opportunities for validation</i>	219
9.3	Implications for theory	220
9.4	Further research.....	220
	<i>Additional cases</i>	221
	<i>Shifting the structure of the field</i>	221
	<i>Fostering successful student behaviours</i>	221
	<i>Developing a framework for socio-cultural analysis of institutions</i>	221
9.5	Summary	222
References		223

APPENDICES

Appendix A: Publications Arising from this Research

Appendix B: Ethics Consent Documents

Appendix C: Protocol for Student Diversity Workshop

Appendix D: Faculty Culture Survey Questions

Appendix E: Interview Protocols

LIST OF FIGURES

Figure 4-1 Describing Habitus, Capital and Field	48
Figure 4-2 Lichtman’s Three C’s of data analysis – Distillation of raw data down to key concepts (Lichtman, 2013, p. 252)	67
Figure 5-1 Destination of OP 1-3 students (or equivalent rank) commencing university in Queensland, 2013 (data sourced from DoE).....	76
Figure 5-2 A proposed model: policy / practice quadrants	102
Figure 6-1 Proportions of Low-SES enrolments for differing university types, 2013 (Median and Interquartile ranges depicted)	118
Figure 6-2 Mean proportion of Low-SES students by type of university (95% Confidence Intervals)	119
Figure 6-3 Proportions of Regional and Remote students by differing university Types, 2013 (Median and Interquartile ranges depicted)	121
Figure 6-4 Mean proportion of regional & remote students by type of university (95% Confidence Intervals)	122
Figure 6-5 Proportions of NESB students by differing university Types, 2013 (Median and Interquartile ranges depicted)	124
Figure 6-6 Mean proportion of NESB students by type of university (95% Confidence Intervals)	125
Figure 6-7 Proportions of Women studying in non-traditional areas, by differing university Types, 2013 (Median and Interquartile ranges depicted).....	127
Figure 6-8 Mean proportion of Women studying non-traditional areas, by type of university (95% Confidence Intervals)	128
Figure 6-9 Proportions of students with t registered disability, by differing university Types, 2013 (Median and Interquartile ranges depicted)	130

Figure 6-10 Mean proportion of Disability students by type of university (95% Confidence Intervals).....	131
Figure 6-11 Proportions of Indigenous students, by differing university Types, 2013 (Median and Interquartile ranges depicted)	133
Figure 6-12 Mean proportion of Indigenous students by type of university (95% Confidence Intervals).....	134
Figure 6-13 Comparison of equity student participation rates at regional universities, 2013.....	139
Figure 6-14 Comparison of equity student participation rates at USQ and Go8 universities, 2013	140
Figure 6-15 Ages of survey respondents.....	143
Figure 6-16 Age groupings of external and on-campus students.....	144
Figure 6-17 Hours of paid employment during semester, n=568	145
Figure 6-18 Parental Education Levels.....	146
Figure 6-19 First/second generation university attendance within engineering, n=568	147
Figure 6-20: Error bar chats comparing GPA means for different demographic factors.....	151
Figure 7-1 Organisational cultural types (McNay, 1995).....	161

LIST OF TABLES

Table 2-1 Brennan’s (2004, p24) summary of Trow’s conceptions of elite, mass and universal higher education	14
Table 4-1 Data types and units of analysis (adapted from example in Yin 2014, p. 54)	52
Table 5-1 Groups of university types, as proposed by Moodie (2014).....	83
Table 5-2 Four tiers of university classification (from Moodie, 2009, Four Tiers)...	85
Table 5-3 Sample group of universities chosen for analysis.....	86
Table 5-4 Consortium School Outreach initiatives (data sourced from the Widening Participation Consortium)	94
Table 5-5 Indigenous Engagement (data sourced from the Widening Participation Consortium)	95
Table 5-6 Summary of findings in terms of relative value placed on institutional capital (based on discourses found in document and workshop analysis).....	105
Table 6-1 Percentage of domestic students in equity categories (data from DoE 2014), highlighted numbers are discussed above.....	115
Table 6-2 Descriptive statistics: Proportion of Low-SES students by university typing, 2013	117
Table 6-3 ANOVA: Proportions of Low-SES students at different university types	120
Table 6-4 Descriptive statistics: Proportion of Regional and Remote students by university typing, 2013	121
Table 6-5 ANOVA: Proportions of regional & remote students at different university types	123

Table 6-6 Descriptive statistics: Proportion of NESB students by university typing, 2013.....	124
Table 6-7 ANOVA: Proportions of NESB students at different university types ...	126
Table 6-8 Descriptive statistics: Proportion of Women studying in non-traditional areas, by university typing, 2013	127
Table 6-9 ANOVA: Proportions of Women studying non-traditional areas at different university types	129
Table 6-10 Descriptive statistics: Proportion students with a Disability, by university type, 2013.....	130
Table 6-11 ANOVA: Proportions of Disability students at different university types	132
Table 6-12 Descriptive statistics: Proportion of Indigenous students, by university type, 2013.....	133
Table 6-13 ANOVA: Proportions of Indigenous students at different university types	135
Table 6-14 Comparison of broad demographic indicators; Participation rates of identified equity groups, 2013 published data. (Department of Education, 2014)..	136
Table 6-15 Participation Rates for Higher Education Providers, 2007 to 2012 (DoE, 2014)	136
Table 6-16: A comparison of national and USQ institutional enrolment modes.....	137
Table 6-17 Analysis of whether the survey respondents are representative of the total student cohort.....	142
Table 6-18 Age Brackets of Student Respondents.....	143
Table 6-19 Results of independent t-tests to investigate the differences in mean GPA for different demographic groups	150

Table 7-1 Summary characteristics of four university models (McNay, 1995), extended by van der Velden and incorporating survey results	164
Table 8-1 Demographic metadata for high achieving Bachelor of Engineering interview participants.....	179
Table 8-2 Final Grades available in engineering academic courses	200

ABBREVIATIONS

ANOVA	Analysis of Variance
ATN	Australian Technology Network
DoE	Department of Education (Australia)
EA	Engineers Australia (formerly The Institution of Engineers Australia, IEAust)
EWB	Engineers Without Borders
FoES	Faculty of Engineering and Surveying
Go8	Group of Eight
GPA	Grade Point Average
HE	Higher Education
HEI	Higher Education Institution
HEPP	Higher Education Participation and Partnerships
HEPPP	Higher Education Participation and Partnerships Programme
IQR	Inter-quartile Range
IRU	Innovative Research Universities
LMS	Learning Management System
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
NESB	Non English Speaking Background
NGU	New Generation University
OLT	Office of Learning and Teaching
RUN	Regional Universities Network
SEIFA	Socio-Economic Indexes for Areas
SES	Socio-Economic Status
TSIsl	Torres Strait Islander
USQ	University of Southern Queensland
VET	Vocational Education and Training

1 INTRODUCTION

Social justice in education implies that all students, with the desire and the capacity for higher education, are not only given the opportunity to participate but to also to succeed. While a large body of work has been conducted on why students fail to complete their university studies, this research investigates why students succeed. In this thesis the socio-cultural congruence between student and institution is explored as a facilitator of success for diverse student cohorts undertaking engineering degrees.

The economic and social benefits of tertiary education, on both an individual and national level, are widely acknowledged by education researchers and government policy makers (OECD, 2008). On this basis, the governments of many western countries are promoting and encouraging greater participation in higher education across the population. While providing opportunity and access to higher education is the first part of an equitable educational system, it must be complimented by genuine opportunities for academic success. This research study investigates the dimensions of success in engineering education for students from social groups that are traditionally under-represented in higher education, denoted as ‘non-traditional’ students for the purpose of this study.

1.1 Background to the research

The influence of the Australian Government on higher education and associated policies to promote widening participation has a long history (Gale & Parker, 2013; Gale & Tranter, 2011). The current Australian ‘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 have been identified as those within the Australian community that 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). The most recent report into higher education commissioned by the Australian Government (Bradley, Noonan, Nugent, & Scales,

2008), made recommendations for the expansion of the higher education sector. The recommendations included a specific target for higher education participation by people from Low-SES backgrounds of 20% by 2020.

A significant portion of the Australian economy continues to be driven by the resources sector. The recent resources sector construction boom created a high demand for engineers that exceeded graduate supply (R. King, 2008; R. King, Dowling, & Godfrey, 2011) and drove growth in domestic engineering student intakes. This growth in domestic engineering qualification completions continues despite the current downturn in demand for engineers (Kaspura, 2014). One of the recommendations of a report (R. King, 2008) on the supply and quality of engineering graduates in Australia was that shortages of engineering graduates be addressed by increasing student diversity in engineering education programs. These imperatives have assisted in the development of alternative entry pathways to engineering education in Australia (R. King et al., 2011) and innovative curriculum delivery mechanisms, particularly online and part-time modes of study.

As a result of these policies and innovations, increasing numbers of non-traditional students have been enrolling in engineering. They have various levels of academic preparation and study skills, tend to be less well informed about what to expect (James, Krause, & Jennings, 2010) and often have significant additional work and family commitments to be balanced with their studies. Many of these students report more difficulty comprehending material and adjusting to the teaching styles of university than more conventional students do (James et al., 2010).

It is often assumed that if students have the ability, motivation and determination then they should be able to succeed at university regardless of their demographic backgrounds. Nevertheless, the experience of university studies and academic culture varies greatly for students of different backgrounds (James et al., 2010; Read, Archer, & Leathwood, 2003). Lawrence (2005) suggests that in order to succeed academically students must master the academic culture: the norms, discourses and tacit expectations of academia. Many non-traditional students do not have the socio-cultural background to navigate their way through their studies in this respect (Lawrence, 2005), and so they struggle.

This study focusses on non-traditional students who are successful at university. French sociologist Pierre Bourdieu's triad of concepts; 'habitus', 'field' and 'capital' (Bourdieu, 1984) is employed as a conceptual framework to investigate the underlying dispositions that cause students to behave successfully in the engineering education environment. Bourdieu developed his concepts in the late 20th century and applied them in his investigations into the role of social class on individual aspirations and behaviour. Bourdieu's concept of habitus and its relationship to his concepts of 'field', 'cultural capital' and 'dispositions' form a theoretical framework and the basis of a methodology which enable the rigorous investigation of human actions and interactions (Reay, 2004). As yet, Bourdieu's concepts have not been widely applied as an investigative framework within engineering education research.

Bourdieu's conceptual triad presents a lens through which to view the motivations behind individual student decisions to study engineering and their subsequent behaviour in the engineering education environment. His theories also have direct application to the investigation of the underlying sociological factors in student performance. Their application should lead to a deeper understanding of the institutional policies and practices that affect student success.

1.2 Research scope and questions

This research project investigated the habitus of non-traditional students successfully studying engineering. The aim was to identify student dispositions and institutional contexts that enable non-traditional engineering students to succeed in their studies, in order to make recommendations as to best support diverse cohorts of engineering students. The final scope was informed by a pilot project investigating the success of non-traditional students conducted in 2012 (Devine, 2016).

A case study approach was adopted using the University of Southern Queensland, a regional Australian university, within the context of the Australian field of engineering education. The case was approached from multiple directions in order to firstly describe the broad field of higher education in Australia, confirm the chosen case as a critical case and finally to investigate the nexus of specific institutional culture and student habitus.

1.2.1 Key research question

The research question posed was:

“What dispositions and institutional contexts enable non-traditional students to succeed in their engineering studies?”

The research focus was deconstructed into the following themes in relation to non-traditional engineering students:

- What is the significance of student / institutional alignment in terms of student habitus and institutional position in the field?
- To what extent is habitus transformation important to student success?
- What is the connection to background/home culture for successful students? (And what is its significance to their success?)
- What value do successful students acquire from their study?

1.3 Importance of the research

The literature review undertaken by the writer identified that very little research has been conducted to investigate engineering student success from a socio-cultural perspective. Understanding student success also has significant implications for practice across the higher education sector. The governmental widening participation agenda implies that diverse cohorts of students, currently found predominantly in smaller and less “prestigious” universities, will begin enrolling in larger universities. Supporting the success of these students is attracting greater attention due to the government funding tied to progression and retention. The research outcomes reported in this thesis help address both of these issues.

The writing of Vincent Tinto (2005), below, is appropriate here.

“Though we have learned much over the past thirty years on why students leave colleges, we have not yet fully explored why students stay and succeed. More important, we have yet to develop an effective model of institutional action that provides institutions guidelines for the development of

policies, programs, and practices to enhance student success” Tinto (2005)

This study addresses the first part of Tinto’s call for action, with the intent that enhanced understanding of student success, particularly in diverse cohorts, will inform institutional efforts to develop the policies, programs and practices aimed at widening that success.

Pierre Bourdieu’s conceptual framework is an important and established theory for investigating issues of student diversity in higher education but it has not been widely used in the sphere of engineering education research. This framework also has the potential to underpin and further explain other work on student success based for example on motivation theories. The outcome of this work will contribute to theory building with respect to the experiences of students generally and non-traditional students in particular.

By understanding the elements of student habitus that underpin success for non-traditional students and the significance of the effect of institutional values and practices on that success, efforts to improve retention and progression of a broader range of non-traditional students can be directed in an effective manner.

1.4 Methodology

This research uses the Faculty of Engineering and Surveying at USQ as a case study as it has a diverse engineering cohort which is ideally suited to the research question. The student cohort at USQ was subjected to a qualitative study using inductive methods to explore student experience and identify factors which support student success. A socio-cultural study was undertaken utilising Pierre Bourdieu’s concepts of habitus, field and capital as a conceptual framework for the research.

Key participants were drawn from a target sample of non-traditional Bachelor of Engineering students, defined as students who have multiple indicators of educational disadvantage, for example low socio-economic status, mature age, first in family, rural background, external and part-time study modes. The exploration of their educational experiences was deepened through the investigation of their

particular educational environment, drawing on additional data sources such as institutional documentation, staff interviews and observation.

1.5 Outline of the thesis

Chapter Two begins by describing the literature concerning the drive to widen participation in higher education and the resulting work on student diversity in both higher education and engineering education. The literature review then briefly addresses the large bodies of work on student progression and retention and investigations of student learning and achievement. The chapter concludes by looking at socio-cultural aspects of student achievement. The emergent concept of socio-cultural congruence was identified as a rich area of inquiry within which to pursue this research.

Chapter Three describes Bourdieu's triad of concepts, 'habitus', 'field' and 'capital', which are used as a conceptual framework for this research, and discusses their application in educational research. The chapter concludes with a discussion of the application of Bourdieu's conceptual tools to the present research inquiry.

Chapter Four, Methodology, explains the use of Bourdieu's concepts as a methodology and justifies the use of case study as a methodological framework in the context of Bourdieu's concepts. The use of multiple data collection methods and data sources to collect four distinct sets of data are discussed. The methods used and the strategies enacted to ensure rigour through consideration of validity, reliability and generalisability are explained. Issues relating to the choice of data sources, the data analysis and ethical considerations are also dealt with.

Due to the complexity of the methodological approach the following four chapters are each used to describe the findings of different aspects of the investigation. They include a more detailed description of methods used for the collection of individual datasets, the contribution to answering the research question, data analysis and findings. The first of these, Chapter Five, presents an overview of the field of Higher Education in Australia, describing various positions taken by different institutions in terms of the capital that they employ. Variations in perceptions of student diversity by institutional type are also explored. Findings on the types of capital valued and

operationalised, and the mapping of different institutions within this field are presented.

Chapter Six presents a statistical analysis of the demographics of higher education students in Australia in different types of universities and particularly at the case study institution, USQ. The second part of this chapter focusses specifically on the demographics of the engineering student cohort that constitutes the case for this study. The demographic indicators of students who are generally under-represented in higher education are quantified for this cohort and it is demonstrated that many of the cohort possess multiple indicators of what is commonly used to identify educational disadvantage.

Having detailed the context of the study (Bourdieu's field) in the previous two chapters, Chapter Seven turns to the operation of the field in the specific case of USQ. An investigation of the academic culture within the Faculty of Engineering and Surveying is presented. Findings in terms of the values, culture and capital employed at the position in the field occupied by USQ are discussed.

Chapter Eight presents the key data and findings pertaining to engineering students who succeed academically within the case of USQ. The analysis of the student educational journeys using Bourdieu's framework draws on the findings of the previous chapters to explicate the social structure operating in this case. Factors that support and hinder student success, in terms of both student and institution are identified and discussed.

Chapter Nine discusses the implications for theory and practice. The chapter concludes the study in terms of the research question and makes recommendations for facilitating student success in the context of engineering education. The applicability of the findings to wider institutional and disciplinary contexts are explained. Finally some possibilities for future work to expand on the research findings are discussed.

2 LITERATURE REVIEW

The literature review outlines some of the key international research undertaken in the broad area of student participation and achievement in higher education. Reference is made to engineering education work and disciplinary examples are provided where appropriate.

This chapter presents an overview of current literature concerning student diversity and the drive to widen participation in higher education by currently under-represented social groups. Specific attention is paid to the effect of social status, demographic indicators of educationally disadvantaged groups and the work that has been done concerning the educational journeys and outcomes of students from these groups. Student diversity within engineering education is explored along with cultural aspects of the engineering context which have been found to have substantial effects on the success of some under-represented groups, most significantly women in engineering.

The second part of the literature review briefly addresses the large bodies of work on student progression and retention and investigations of student learning and achievement. The chapter concludes by looking at the socio-cultural aspects of student achievement, and the influence of interaction between the student socio-cultural competencies and institutional culture on the student success. The emergent concept of socio-cultural congruence was identified as a rich area of inquiry within which to pursue this research.

2.1 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). Many countries around the world, including Australia and the United Kingdom, have stated goals of increasing both access to and participation in higher education (OECD, 2012a). The recent global financial crisis has highlighted the economic importance of these goals for both individuals and national economies (OECD, 2012b). As national economies increasingly shift from a mass production base to a knowledge based economy employment in science and technology

occupations is expected to increase further (OECD, 2012c). However, despite increasing access to higher education and accompanying increases in student diversity internationally (OECD, 2013), social inequalities associated with access to higher education persist and are greatly influenced by students' background (OECD, 2015).

In Australia specific targets have been set for participation rates in higher education (Bradley et al., 2008) and the rate of tertiary enrolment has been steadily increasing (OECD, 2014). There is a focus on increasing access for disadvantaged groups within the community and this was addressed by the key recommendations of a wide-ranging report into the higher education sector in Australia conducted in 2008 (Bradley et al., 2008). Government funding policy reforms were introduced in 2012 with the intention of expanding higher education participation in line with the report's recommendations. This policy reform appears to be broadly effective but the effect on enrolments by under-represented groups in higher education is not yet clear (C. King & James, 2014).

A significant portion of the Australian economy continues to be driven by the resources sector. The recent resources sector construction boom created a high demand for engineers that exceeded graduate supply (R. King, 2008; R. King et al., 2011) and drove growth in domestic engineering student intakes. This growth in domestic engineering qualification completions continues despite the current downturn in demand for engineers (Kaspura, 2014). One of the recommendations of a report (R. King, 2008) on the supply and quality of engineering graduates in Australia was that shortages of engineering graduates be addressed by increasing student diversity in engineering education programs. These imperatives have encouraged the development of alternative entry pathways to engineering education (R. King et al., 2011) and innovative curriculum delivery mechanisms in Australia. Of particular importance are online and part-time modes of study. However, widening access to engineering programs may be counterproductive if mechanisms for supporting the progression and completion of studies for the increasingly diverse cohort are not put in place.

2.2 Class in Australia and its effects on educational attainment

Australians have a national pride in the idea that they live in an egalitarian society, where everyone has a “fair go”. There is a belief that we live in a largely classless society and that anyone can succeed if they have the determination to put in the hard work. Educational sociologists refer to this as a perceived meritocratic educational system (for example Sullivan, 2001) and argue that social background does affect cultural capital, which has a direct bearing of educational attainment. Large scale educational research (James, 2002) confirms that educational outcomes are affected by social backgrounds. However, there is some evidence to suggest that socio-economic background alone cannot completely account for educational achievement and that the school environment also has an effect (Marks, 2009).

The Gonski review of education (Gonski et al., 2011) in Australia specifically targeted issues of equity within Australian education by recommending a needs-based funding model for schools. The review explicitly stated that funding reforms should ensure that:

- Differences in educational outcomes are not the result of differences in wealth, income, power or possessions
- All students have access to a high standard of education regardless of their background or circumstances (Gonski et al., 2011).

Most groups in Australian society have access to the material symbols of financial affluence such as technology and luxury goods, and this contributes to the perception that class is irrelevant or does not exist for the majority of Australians (Scanlon, 2014). However, class is not purely a matter of access to monetary wealth. Bourdieu proposes that a person’s class is reflected in their aesthetics (Bourdieu, 1984). It manifests in a person’s style of dress, speech, cultural preferences and even their comportment.

Popular discourse, as explained by Scanlon (2014), points to an awareness of class within Australia, even if it is not called “class”, this it is reflected in much of Australia’s contemporary culture. He argues that contemporary entertainment (such

as television programs ‘The Castle’, ‘Kath & Kim’, ‘Upper Middle Bogan’ and ‘Ja’mie: Private school girl’) which are premised on the social realities of class, resonate with Australian audiences in a manner that suggests familiarity through everyday lived experience.

There is a popular perception that social success is a matter of making good choices (Nelson, 2014; Scanlon, 2014), and that application and aptitude lead to attainment. This is the embodiment of a meritocratic concept of education, which legitimates educational success as a function of the application of cognitive ability only. This idea leads to a deficit model for students who do not achieve academically; they are seen as responsible for their own failure (Spohrer 2011). The poor educational results of disadvantaged groups (Australian Curriculum Assessment and Reporting Authority, 2013) are popularly seen as the result of poor choices (Riddle, 2014).

Whilst large scale studies identify differences in educational achievement based on social background, as identified by socio-economic status (SES), it is generally recognised that SES does not fully identify the variations in contemporary culture within Australian society. SES status is largely based on an individual’s residential post code and this does not adequately capture the cultural variations which often co-exist within a particular postcode.

2.3 Widening participation

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 Review of Australian Higher Education (Bradley et al. 2008) established some ambitious national goals for moving the country’s higher education system towards a greater accessibility (James, 2008a). The key challenge offered by this report was the expansion of access to higher education amongst currently under-represented groups, as well as the achievement of equitable participation. The

review's recommendations are strongly linked to equity and specifically address the current underrepresentation in Australian higher education of Low-SES and indigenous groups. Australian Government funding policies for higher education have subsequently been reformed (commencing in 2012) with the intention of expanding higher education participation. The effectiveness of these reforms is still unclear (C. King & James, 2014).

The Australian Government's goal of the achievement of equitable participation implies an imperative that goes beyond simply enabling access (enrolment) to ensuring that participation is equitable; i.e. that academic success is achievable for all.

2.3.1 Elite, mass and universal education

Trow (1973) was amongst the first educators to describe the shift of higher education from being a service to an elite group of academically high achieving socio economically advantaged school leavers to one of mass and universal education. Trow (1973) described a shift in both the purpose and nature of higher education as well as an expansion of the accessibility of higher education to all sectors of society. He described three phases of higher education system evolution characterised by ever widening participation rates, and labelling them elite, mass and universal higher education. His ideas are made readily accessible by Brennan's (2004) summary, shown in Table 2-1 below. Trow (1973) predicted that eventually universal higher education systems would be characterised by:

- More open entry requirements
- A focus on "added value" rather than absolute standards
- High levels of delayed entry (as opposed to direct progression from school to university)
- More modularised curricula
- More movement in and out of the higher education system across individual's lifetimes.

Table 2-1 Brennan's (2004, p24) summary of Trow's conceptions of elite, mass and universal higher education

	Elite (0-15%)	Mass (16-50%)	Universal (over 50%)
<i>i) Attitudes to access</i>	A privilege of birth or talent or both	A right for those with certain qualifications	An obligation for the middle and upper classes
<i>ii) Functions of higher education</i>	Shaping mind and character of ruling class; preparation for elite roles	Transmission of skills; preparation for broader range of technical and economic elite roles	Adaptation of 'whole population' to rapid social and technological change
<i>iii) Curriculum and forms of instruction</i>	Highly structured in terms of academic or professional conceptions of knowledge	Modular, flexible and semi-structured sequence of courses	Boundaries and sequences break down; distinctions between learning and life break down
<i>iv) The student 'career'</i>	"sponsored" after secondary school; works uninterruptedly until gains degree	Increasing numbers delay entry; more drop out	Much postponement of entry, softening of boundaries between formal education and other aspects of life; term-time working
<i>v) Institutional characteristics</i>	Homogenous with high and common standards; Small residential communities; Clear and impermeable boundaries	Comprehensive with more diverse standards; 'Cities of intellect' – mixed residential/commuting; Boundaries fuzzy and permeable	Great diversity with no common standards; Aggregates of people enrolled but rarely or never on campus; Boundaries weak or non-existent
<i>vi) Locus of power and decision making</i>	The Athenaeum' – small elite group, shared values and assumptions	Ordinary political processes of interest groups and party programmes	(The Daily Mail) 'Mass publics' question special privileges and immunities of academe
<i>vii) Academic standards</i>	Broadly shared and relatively high (in meritocratic phase)	Variable; system/institution 'become holding companies for quite different kinds of academic enterprises'	Criterion shifts from 'standards' to 'value added'
<i>viii) Access and selection</i>	Meritocratic achievement based on school performance	Meritocratic plus 'compensatory programmes' to achieve equality of opportunity	'open', emphasis on 'equality of group achievement' (class, ethnic)
<i>ix) Forms of academic administration</i>	Part-time academics who are 'amateurs at administration'; elected/appointed for limited periods	Former academics now full-time administrators plus large and growing bureaucracy	More specialist full-time professionals. Managerial techniques imported from outside academe
<i>x) Internal governance</i>	Senior professors	Professors and junior staff with increasing influence from students	Breakdown of consensus making institutional governance insoluble; decision-making flows into hands of political authority

Australia is in the process of moving from a mass education system to a more universal one (C. King & James, 2014). The problem of not just increasing but *widening* participation in higher education seems an intractable one, however over

the past twenty years genuine efforts have been made to increase (James, 2008a, p 50). In his analysis of the Bradley Review, James (2008) points out that:

“The achievement of universal participation involves enrolling people in higher education who presently might not consider going to university. These are people who do not believe they can afford the cost or the opportunity cost, who might not see any value in going to university and who might not believe they are “bright” enough to go to university – a belief possibly reinforced by their experience of schooling.”

The proportion of Low-SES students varies considerably between Australian universities. Some universities are far more successful in enrolling Low-SES students due to their contexts, student demand and policies and procedures for selection/recruitment (James 2008).

The OECD Program for International Student Assessment (Organisation for Economic Co-operation and Development (OECD), 2014) provides standardised testing of Australian school children and the most recent data show that the academic achievements of Low-SES children is substantially lower than students with parents in professional occupations. Individuals from Low-SES backgrounds are more likely to perceive attainment of a university place as unachievable, have less confidence in the personal and career relevance of higher education, and may be more likely to experience alienation from the cultures of universities (James, 2001, 2002).

These social and educational factors may make the problem of equitable access and subsequent participation seem intractable, or beyond the influence of the higher education sector. A growing discourse however, suggests that universities could play a greater role by adapting to current educational paradigms (James, 2008a; Zepke & Leach, 2005). Many aspects of the cultures of Australian universities have undergone minimal change and retain characteristics from an elite era, not acknowledging contemporary patterns of student engagement and work-study imperatives. Attitudes to higher education in both the sector and wider community remain “frozen” between mass and universal conceptions (James, 2008a, p. 53). The role and value of higher education continue to be seen as the nurturing of “talent” and “potential”, both of

which tend to be defined by schooling outcomes that are known to vary with social background (Australian Curriculum Assessment and Reporting Authority, 2013).

2.4 Non-Traditional students

Since the mid-twentieth century most developed countries have experienced an expansion of higher education opportunities (Meyer 1992), whereby universities are no longer the preserve of an elite few but are available for mass education (Trow, 1973).

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 lack of a high school diploma (Gilardi & Guglielmetti, 2011). These types of indicators usually point to students who come from a disadvantaged background. 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).

The widening participation trend has been accompanied by a focus, both in Australia and internationally, on the progression and retention of non-traditional students (G. Crosling, Heagney, & Thomas, 2009), resulting in a large body of research work in this area. 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.

Widening participation has been linked to declining student progression and retention rates (Groves, Bowd, & Smith, 2010; Pokorny & Pokorny, 2005) with non-traditional students, in particular the socially and economically disadvantaged, thought to be more likely not to complete their studies (Ellis & Allan, 2010). Institutions which recruit the highest proportion of students from lower socio-economic groups have been found to also have the highest non-completion rates (Quinn et al., 2005). This pattern is not necessarily consistent though as part-time study mode can distort reported retention rates (Gibbings, Godfrey, King, & Wandel, 2010) and transfers between programs and institutions can also distort reported figures (R. King et al., 2011). Overall, the pattern of lower achievement by Low-SES students in higher education is seen to remain stubbornly different to that of students from a more affluent middle class background (Bowser et al., 2006; Reay, 2006).

Notwithstanding these results, other major international and Australian studies (Marks, 2007; QUT Equity Services, 2011; L. Thomas & Quinn, 2007) have found that students categorised as Low-SES do not necessarily have a higher propensity to ‘fail’ academically. Marks found that although participation rates might be lower, “once students from a lower socioeconomic background enter university, their background does not negatively affect their chances of completing the course” (2007). This was also a finding of in an international study, which included Australia, by Thomas and Quinn (2007).

The exact definition used for ‘Low-SES status’ varies both within Australia and internationally (R. King et al., 2011; L. Thomas & Quinn, 2007). It is generally based on a student’s address (postcode or similar) which is categorised according to census data. There is some evidence that identifying students by their geographical location can be misleading since, as 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 access and retention of that category. This effect is

enhanced in socially heterogeneous postcodes, where it is unlikely that access to education is randomly distributed across the population (James, 2008b). 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; L. 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.

2.4.1 First in family

The concept of 'first in family' (or 'first generation') students describes students who have no parent or guardian who has earned a university degree. This is generally acknowledged to be an indicator of potential difficulty within higher education (Pascarella, Pierson, Wolniak, & Terenzini, 2004; Pike & Kuh, 2005; Soria & Stebleton, 2012; L. Thomas & Quinn, 2007) and is being increasingly considered in Australian studies of student experience (see for example Devlin, 2011; James et al., 2010). A disproportionately low number of first-in-family students succeed in college in the United States (Warburton, Bugarin, & Nunez, 2001) and tend to achieve lower overall grades than their peers with parents who had both graduated from college. In Australia James et al. (2010) found that although first-in-family students are more likely to manage their workload consistently throughout the semester, they are also more likely to report feeling overwhelmed by their workload.

There is a significant overlap between students who are the first in their family to attend university and other possible indicators of disadvantage such as Low-SES (L. Thomas & Quinn, 2007), rural or remote background and mature age (James et al., 2010).

2.4.2 Rural and remote students

The participation of rural Australians in universities and the engagement of universities with rural and isolated Australia continue to be significant policy issues for Australia (James et al., 2010, p. 66). The gulf between rural and urban student performance has long been recognised (see for example Felder, Mohr, Dietz, & Baker-Ward, 1998). Rural students, particularly males, are still under-represented in

Australian higher education (James et al., 2004), with some research suggesting that aspirations concerning university are lower among rural students (Heagney, 2004).

Access to university for rural students has been found to be a barrier to participation, with a desire by rural residents to have rurally located universities (Drummond, Halsey, & van Breda, 2011, p. 3). This is probably reflective of the significant financial, personal and social impacts experienced by students who leave home to attend university (Alloway, Gilbert, Gilbert, & Muspratt, 2004).

Rural students are more likely to report difficulties adjusting to the style of university teaching, to have more difficulties comprehending material, and to feel more overwhelmed than are urban students (James et al., 2010). However, retention rates for rural students are comparable to those of the total cohort of Australian students although remote students also have a relatively high risk of attrition (Bowser et al., 2006).

Students from rural and remote backgrounds are highly likely to also have a Low-SES designation and lower parental education levels than urban students. This makes rural and remote students a relatively large group with potentially multiple indicators of disadvantage. Literature about these students specifically is limited and they are a group of significant potential interest in the study of non-traditional students in Australia.

2.5 Diversity in engineering

Much of the work done on under-represented groups within engineering has been undertaken with reference to women (Jesiek & Beddoes, 2013). They continue to be under-represented in engineering academia and industry despite years of studies and programs promoting engineering as a career for women. This group, as with all under-represented groups, represents a pool of talent that is largely unexploited, both in terms of potential employees and new perspectives on engineering problems (Malicky, 2003, p. 1).

Many studies have shown that the environment within science, maths and engineering can be quite hostile to women (Malicky, 2003), and tends to have a subtly discriminatory culture (Haines, Wallace, & Cannon, 2001; Tonso, 1996).

Malicky's literature review (2003) on the issue of women in engineering identifies the need to better understand the experiences of women in engineering within the engineering culture, including dimensions of the social, cultural, academic, interpersonal, and intrapersonal. These issues are likely to be of equal importance for other under-represented groups.

Leslie et al. (1998) identify that self concepts, formed in early childhood, socialising, and self-efficacies regarding maths and science, formed in adolescence and heavily influenced by family and peers, are critical to female students' high school preparation and aspirations in regards to science maths and engineering careers. These same socialising forces are at play within any social group and could explain aspirational and academic preparation levels for many under-represented groups in engineering.

A significant factor in women's decisions not to pursue engineering as a career is the culture, described by Malicky (2003) as the "Chilly Climate". Besides evidence of discrimination against females, there is a culture of competition and high expectations coupled with relatively low levels of support.

2.5.1 Alternative entry pathways to engineering

The largest area of growth in higher education commencements in Australia is through alternative entry pathways (Brodie & Porter, 2009). These have been developed in engineering with the intent of increasing participation by under-represented groups (R. King et al., 2011). Para-professional courses and Vocational Education and Training (VET) awards that articulate into Bachelor of Engineering degrees are emerging as an important and growing alternative entry pathway for engineering students (R. King et al., 2011). Dowling (2010) found that 51% of students studying para-professional engineering courses aspire to complete a Bachelor of Engineering.

The over-representation of Low-SES students in VET programs (Foley, 2007) suggests that many of the students entering through this pathway are likely to be from the disadvantaged groups previously discussed. They are likely to have the same concerns as other disadvantaged students coupled with a non-traditional academic preparation. There has been concern that a lack of progression for non-

traditional students could be attributed to a lack of learning skills and inadequate prior academic preparation (Forsyth & Furlong, 2003; Krause, 2005; Wingate, 2006). This concern is reflected in the finding by King et al. (2001) that of all engineering degree commencements, students who had articulated from a VET degree had less than a 20% chance of graduating, identifying this small but important group of non-traditional students as high risk.

Numerous support programs have been implemented in order to cater for the learning needs of student cohorts with diverse academic preparation (Wingate, 2006). However, even amongst institutions that offer comprehensive student support services, 'working class' students continue to exit their studies (L. Thomas & Quinn, 2007). A study by Roberts (2011) on the retention of non-traditional students suggested that it was not so much the type of prior academic preparation but the differing stocks of social and cultural readiness that had a greater influence on student preparedness for university study.

2.6 Student learning

Ramsden (2003, p. 82) argues that learning can be conceptualised as a change in the way in which people understand the world around them. Early key research concerning changes in thinking and intellectual development was undertaken by William Perry (1970), who wrote that students develop increasingly sophisticated ways of thinking as they progress through higher education. They initially conceptualise knowledge as a series of neatly packaged facts to be remembered and recalled appropriately. After passing through a stage of confusion about the nature of knowledge and belief, students reaching the highest level interpret evidence based on their own personal values, while acknowledging that different interpretations of reality exist.

Unfortunately the research indicates (Ramsden, 2003, p 31) that, although students acquire vast amounts of information, many of them seem to be unable to retain it. Many students acquire the 'jargon' of their discipline but still operate with erroneous conceptions and do not appear to make good use of the information they do remember.

2.6.1 Student engagement, learning and culture

The quality of student learning is recognised as being intimately related to the quality of student engagement in the learning task (Ramsden, 2003). Internationally there has been an increasing focus on institutional performance in regards to student engagement and learning outcomes. These performance indicators are being directly linked to higher education funding, and relative institutional rankings are publicised through the results of nationally administered student satisfaction surveys, which have been introduced in the US (NSSE, 1998), the UK (Richardson, Slater, & Wilson, 2007) and Australia (Coates, 2010).

Successful progression and retention have been linked to student engagement and a large body of literature concerning effective student engagement has developed.

“Student engagement is concerned with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution” (Trowler, 2010).

Coates states that learning and, in turn, academic success “is influenced by how an individual participates in educationally purposeful activities” (Coates, 2005, p. 26). However, there are different aspects to be considered. The student must participate in purposeful activities and they must understand the requirements and culture of the program and institution in order to do this but, from an institutional perspective, academics must have resources, knowledge and interest in order to actually design and implement these ‘educationally purposeful activities’ suitable to the cohort of students their institution attracts.

Qualitative research and survey instruments are used increasingly by institutions to try to understand student engagement and hence improve engagement and ultimately grades and retention. The National Survey of Student Engagement (NSSE) has identified five criteria by which student engagement can be measured (Coates, 2005). These are:

- level of academic challenge
- active and collaborative learning
- student–faculty interaction
- enriching educational experiences
- supportive campus environment.

Of these criteria faculty interaction, educational experiences and campus environment are strongly influenced by the institutional ethos and culture. From a sociological perspective, the success of a student’s education is bound up with their integration into the academic culture (Bourdieu, 1977). It is thus appropriate to explore that environmental culture.

2.6.2 The first year experience

Initial experiences of university offers challenges to both students and the university. This area of research has been given significant attention, as evidenced by specialist international conferences (for example the ‘First Year in Higher Education’ conference). Much of the research, focussed around the full-time on-campus cohort, has limited application to students from minority groups who are studying part-time off-campus. Johnston (2010) summarises the overall situation well, however the added nuances of a diverse student cohort and flexible study modes require attention:

“the actual student experience retains many features which would be recognizable to graduates from the start of the twentieth century. Entering first year is one of the most powerful elements of the university experience, representing the beginning of a key period of change in an individual’s social life and intellectual development. This period of transformation is often conveyed through notions of ‘freshers’ being inducted into the norms and practices of the university’s undergraduate culture.” (Johnston, 2010, p. 2)

Tinto (2012) argues that innovations to increase student progression and completion must be directed towards classroom attributes that enhance the likelihood of success and that this is especially important to first year students.

The first year in higher education is seen as critical to a student's likelihood of success (Johnston, 2010; Tinto, 2012). However the majority of higher education providers have not yet been able to develop strategies that equitably embrace full-time, on-campus students and those non-traditional students studying in a non-traditional manner.

2.7 Student retention within higher education

While enrolments in higher education have increased substantially in recent years, successful completion rates have not matched this growth despite considerable investment in research and programs to increase retention (Osborne & Gallacher, 2004, p. 10; Tinto, 2006, 2012). Retention, and by extension facilitating student success, remains an issue of concern for institutions across the world (G. Crosling et al., 2009).

Spady (1970, 1971) and Tinto (1975) were amongst the first researchers in the area of student retention to consider a student's interaction with their higher education environment as important to their retention and academic success (Tinto, 2006). The seminal work on student integration by Tinto (1975) discussed the need for students to fit in to the higher education environment, both in terms of their academic and social interrelationships. He proposed that students who were able to integrate into the university system and felt comfortable in that environment were enabled to persist with higher education.

Pierre Bourdieu suggested that the social background of a student affected their ability to integrate into the higher education system, which in turn favours those students who have the manners, approaches and world view that is consonant with that of the institution at which they study. This compatibility with their environment enabled students to feel at home, "as a fish in water", as Bourdieu famously stated (Bourdieu & Wacquant, 1992, p. 127).

Tinto's (1975) concept of integration has been further developed to encompass the current concept of student engagement (Tinto, 2006). Student engagement, and the consequent desirable outcomes of productive learning and retention, is dependent on a student's total experience of university (Scott, 2006) and so has both academic and social dimensions.

Academic engagement is reflected by students' attending classes, their active involvement with staff and fellow students and with learning resources (Scott, 2006; Tinto, 1975). So, an educational environment that involves students and provides feedback on their study efforts means that they are more likely to study successfully (G. M. Crosling, Thomas, & Heagney, 2008; Tinto, 2006). Student academic success is a significant factor in persistence (G. M. Crosling et al., 2008; Tinto, 2006).

Social engagement occurs through students developing networks and relationships with fellow students (Tinto, 1975). In previous times students were likely to connect with their fellow students simply due to shared and similar backgrounds and experiences, leading to the natural development of social networks and relationships (G. M. Crosling et al., 2008). With the advent of greater diversity in student cohorts, accompanied by changing patterns in university attendance (e.g. part-time, online) the development of a social network within the educational environment becomes more challenging.

Both social and academic integration into a higher education institution have a positive impact on students' sense of belonging (Reay, Davies, David, & Ball, 2001), on their academic achievement, and ultimately on their retention within that environment (L. Thomas, 2002). Academic performance of non-traditional students is directly related to how marginalised they feel within the institution (Osborne & Gallacher, 2004).

2.8 Social and cultural capital

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 et al., 2003). Lawrence (2005) uses the example of students seeking help and points out that the specific verbal and non-verbal ways of asking for help will vary between sub-cultures within Australian society, and that seeking help may not be 'valued' in some self-reliant sub-cultures. This can cause difficulty, as described by Gee (1999):

“The ways of communicating within an academic setting are not easily grasped and are often difficult for students whose backgrounds differ from, or even conflict with, the ways of writing, knowing and valuing favoured within a university context.”

The ability to understand and master the higher education culture includes understanding what Collier and Morgan (2008) described as the “implicit expectations” and “tacit understandings” of the university study experience. Understanding and responding appropriately to this culture is essential to success at university. Many non-traditional students are not even aware of these unspoken requirements, let alone know how to understand and respond appropriately (Devlin, 2011).

A useful framework for understanding the student experience of higher education is through the related concepts of cultural and social capital (Bourdieu, 1986; Coleman, 1988). It is the differing amounts and types of social and cultural capital which students bring to university, rather than the type of academic preparation that has the greatest influence on student preparedness for university study (Roberts 2011).

Pierre Bourdieu (1986) identified three forms of capital; economic, cultural and social. Each of these types of capital may be converted, with time and effort, into the other forms of capital (Bourdieu 1986).

The most familiar form of capital, economic capital, can be directly converted into money and is usually recognised in the mercantile sense as material assets. Cultural and social capital are usually represented as less material manifestations of capital, although Bourdieu argues that economic capital may present itself as cultural or social capital and vice versa (Bourdieu, 1986, p. 242). He discusses cultural capital as being embodied in the form of “long lasting dispositions of the mind and body” (Bourdieu, 1986, p. 243) and objectified in the form of cultural goods (books, artwork, instruments, machines, etc).

Social capital can be described as being composed of social connections or relations (what the lay person might refer to as ‘who you know’), which can facilitate the exchange of information or communication of ideas (Coleman 1988). The three most

notable writers on social capital (Stone, 2001) are Bourdieu (1986), Coleman (1988), and Putnam (1993). Bourdieu and Coleman both used the concept of social capital within their investigations of varying levels of educational achievement, Putnam's focus was on democracy. Each of these writers understood social capital to be a resource that can be called upon or leveraged for personal or social benefit.

The social networks which comprise a person's social relationships are characterised by norms of trust and reciprocity (Stone, 2001) The dimension of trust can be further divided into the trust between individuals and trust of a formal system such as the judicial or political systems (Ferlander, 2004; Stone, 2001).

The nature of people's relationships varies. Granovetter (1973) distinguishes between strong and weak ties within relationships. The strength of ties can be conceptualised as the emotional distance within the relationship, that is strong ties exist between people who are emotionally close, such as family, whereas weaker ties would be exemplified by more emotionally distant relationships, such as acquaintances. The social resources available from these differing types of relationship also differ; strong ties tend to provide emotional support while weak ties offer access to more diverse information (Ferlander, 2004). A related, although distinct concept is that of bridging and bonding social capital (Ferlander, 2004), where bonding networks refer to people similar to oneself and provide security while bridging networks concern people different to oneself, and tend to create innovation.

Bourdieu used the concept of cultural capital when he was seeking to explain the divergent academic achievements of children from differing social classes (Bourdieu, 1986, p. 243). He proposed that the differing distributions of cultural capital, in particular between children, affected the differing levels of scholastic success. This is at odds with the commonly held view that scholastic achievement is a result of purely natural aptitude, motivation and application, often described as a meritocratic system.

Understanding and responding appropriately to academic culture is dependent on a student's stock of cultural capital, and to a lesser extent social capital. The effect of differing levels of social and cultural capital evident in non-traditional students who struggle at school and university has been well documented (Berger, 2000; Nash,

2002; Reay, 2002, 2006; L. Thomas, 2002). Collier and Morgan (2008) distinguish between a student's academic skills and actual capacity on one hand and the cultural capital and demonstrated skills on the other hand. If students are lacking the appropriate cultural capital they will have difficulty understanding the implicit expectations of higher education and how they are expected to demonstrate their capacity. Collier and Morgan (2008) also point out that demonstrated capacity is what is examined and assessed at university.

Tinto (2012) states that "Students quickly pick up what is expected of them and adjust their behaviours accordingly" and thus, part of providing an effective classroom is to have high expectations. However in order for a student to pick up those very expectations, they must have the necessary cultural capital.

2.9 Student achievement and institution

One effect of widening participation has been an increasing focus on how institutions should accommodate the diverse needs of students. Much of the literature around the first year experience revolves around ways to improve student experience and academic outcomes. A recent longitudinal study of first year higher education experiences (James et al., 2010, p. 7) suggested that institutions explore "more sophisticated strategies for making student responsibilities in the higher education partnership more explicit". Although this might lead to the proposition that if institutions would just make the requirements clear then all students would be able to succeed, it does suggest 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.

The factors affecting student success are to some extent variable for different institutions (Berger, 2000). Tinto (1975) recognised in his theory of integration that a good fit between the institution and student enabled academic success. Although Tinto's model was developed with a very traditional cohort in mind the importance of 'fit' in terms of matching of institutional expectations to the cultural capital available to students could be an important part of accommodating non-traditional students.

Berger (2000) developed four propositions concerning student persistence in higher education based on the concepts of congruence between the level of student capital and the organisational capital held by the institutions at which they study. Non-traditional students tend to be found in regional and less 'prestigious' universities (Forsyth & Furlong, 2003; James et al., 2004; R. King et al., 2011; Reay, Crozier, & Clayton, 2009)

2.10 Conclusion

While there is a strong focus on encouraging diversity and increasing access and participation in higher education, large scale studies indicate that students from some sectors of society may be disadvantaged in the pursuit of educational qualifications. This has led to the concept of 'equity groups' or disadvantaged groups of students. However, the mechanisms for identifying non-traditional students who may be at risk are crude due to the large scale nature of such inquiries. They tend to be identified by SES status, which in turn is dependent on their residential address. These studies do not address the question of why such students may encounter additional difficulties in tertiary studies and labelling of them as 'at risk' due to their post code leads to deficit conceptions of students.

The research shows that 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 too little known about the causes of non-completion amongst under-represented groups (L. Thomas & Quinn, 2007, p. 5).

Several characteristics of non-traditional students, which are more defining of non-traditional students than postcode based SES status, have been identified in the literature. These characteristics, such as 'first in family' part time study, employment, age and having dependents, more uniquely identify students who have a different educational experiences and challenges than a traditional student. The emergent concept of cultural congruence with the institution of study offers an opportunity to inquire into why these students may either struggle or succeed at their studies, without the need for a deficit conceptualisation of students.

Much of the research associated with non-traditional students has focussed on the identification of attributes or indicators that identify students as ‘at risk’. A promising area that is less well understood (Tinto, 2005) is the question of what enables students to stay and even succeed in higher education.

“Though we have learned much over the past thirty years on why students leave colleges, we have not yet fully explored why students stay and succeed. More important, we have yet to develop an effective model of institutional action that provides institutions guidelines for the development of policies, programs, and practices to enhance student success” (Tinto, 2005)

The emerging focus on institutional culture, and cultural fit between student and institution, as a facilitator of student success offers a rich area of research which has not been fully explored, particularly in engineering education research. Bourdieu’s concepts of habitus, field and capital have been identified as an ideal framework for the investigation of student success and the development of a deeper understanding of the world of higher education as experienced by non-traditional students.

3 CONCEPTUAL FRAMEWORK

The emergence of socio-cultural congruence as a dimension of student achievement that is particularly important for non-traditional students has driven the choice of a sociological approach to this investigation. The work of French sociologist Pierre Bourdieu was chosen as the framework to theorise the phenomenon of successful non-traditional students. The ‘thinking tools’ (Wacquant, 1989, p. 50) of habitus, field and capital that he developed to conceptualise socio-cultural relations provide the basis for the methodology and subsequent analysis of this research project.

Bourdieu’s work was acclaimed by Rogers Brubaker (1985) as one of the most significant attempts to adapt sociological theory to the empirical study of contemporary society. Bourdieu drew on the fields of philosophy, social anthropology and sociology (Reay, Arnot, David, Evans, & James, 2004) to develop his own sociological concepts. He used these concepts to study the stratification of contemporary society and its implications for individual achievement and behaviour. Much of his work involved the study of social inequality and the ways in which it is perpetuated (DiMaggio, 1979; Reay et al., 2004; Webb, Schirato, & Danaher, 2002), mostly without conscious recognition and to some degree through education. Bourdieu’s concepts of habitus, field and capital can be applied as a sociological framework for investigating student success.

The concepts developed by Bourdieu and utilised in this research study are discussed in this chapter, together with the applications of these concepts to the sociology of education research. Finally, the relevance of this framework to the present study is highlighted.

3.1 Habitus, capital and field

One of the central concerns of Bourdieu’s work was to explain why people behave in certain ways. He observed that social action appears to be regulated, to the extent that recurring behavioural patterns can be observed and measured (Swartz, 1997, p. 95), without being directed by conscious obedience to rules, norms or direction (Bourdieu, 1990a, p. 65). Social structures are created and maintained by actions that are apparently undertaken subconsciously and which serve to reproduce those

same social structures. The concepts developed by Bourdieu attempt to explain the dichotomy of regularities and patterns in social action, or behaviour, and their continued practice by reasoning agents.

Bourdieu's model "affirms the primacy of relations" (Bourdieu & Wacquant, 1992, p. 15). It breaks from other sociological inquiries that prioritise either the individual or society and draws on multiple of structuralist traditions to conceive society as connections and relationships, rather than as the sum of individuals. His concepts of habitus and field, discussed below, are designated by "bundles of relations" (Bourdieu & Wacquant, 1992, p. 16). This approach enables the notion of society to be replaced by a series of relatively autonomous "spheres of play" (p. 17), within which struggle for advantage occurs.

The concept of social 'rules' of behaviour is replaced by the idea of strategy and the concept that all action is oriented towards advancing an actor's interests (Swartz, 1997, p. 99). This suggests that actors are not rule-followers or obeyors of a set of norms but strategic improvisers who respond according to their dispositions to the constraints and opportunities offered by various situations (Swartz, 1997, p. 100).

To conceptualise social activity Bourdieu developed three intertwined concepts which he called habitus, field and capital to be used not only as constructs for examining social practices but also as concepts to guide empirical work (Reay, 2004).

3.1.1 Capital

The concept of capital has arguably been the most widely used of Bourdieu's concepts. Bourdieu's concept of capital extends beyond economic capital to also encompass social and cultural capital. Each of these types of capital has a social value and can be 'inherited' (through the circumstances of one's early upbringing) or accumulated, exchanged and leveraged much like economic capital (DiMaggio, 1979).

Economic capital is the form of capital widely recognised outside sociology. It is the basis of economic activity and is readily convertible to goods, services and other forms of capital. Social capital essentially consists of the network of social

connections, and associated obligations, that a person possesses. The value of social capital has been illustrated in general parlance by the term ‘it’s not what you know it’s who you know’. Social capital also encompasses, institutionalised ‘symbolic capital’ which results from the conferring of a social title or position which carried with it recognition of power (for example judge in the legal system). Cultural capital may be thought of as cultural competencies. It may be *embodied* in the form of, for example, tastes or preferences, and cognitive, motivational and perceptual dispositions; it may be objectified, in the form of cultural goods (artwork, books, instruments, machines) or *institutionalised* in the form of qualifications (Bourdieu, 1986).

Cultural capital is the form most often associated with education research inquiry. Bourdieu initially conceived the idea of cultural capital in his investigations into unequal scholastic achievement. He realised that achievement was not dependent only on ‘natural aptitude’ or economic input but was affected by children’s social origins (Bourdieu, 1986, p. 243).

Through an investment in formal education, an individual can acquire a return in terms of cultural capital. This return is embodied as a distinctive habitus, discussed shortly, and the endowment of social attributes, which confer a certain social standing (Moore, 2004). The exact nature of the return is governed by the type (measured by ‘quality’ and length of education) of formal education undertaken. According to Bourdieu (1997), ‘institutionalised cultural capital’ refers to educational credentials and the credentialing system. To develop institutional capital a student must embody the appropriate cultural capital and successfully convert it, via the educational system, into enhanced educational credentials.

3.1.2 *Habitus*

The second of Bourdieu’s key concepts, habitus, concerns the personal attributes of an individual. Habitus is a “set of historical relations”, or a system of perception, apperception and action ‘deposited’ within an individual throughout their personal history (Bourdieu & Wacquant, 1992, p. 16). It is structured by one’s social origins and subsequent life experiences and results in perceptual and behavioural dispositions. Habitus is embodied in an individual’s use of language, non-verbal

communication, tastes, values, perceptions and modes of reasoning (Swartz, 1997, p. 108). It is also cognitive and includes a sense of one's (and other's), place and role in the world (Hillier & Rooksby, 2005).

Bourdieu emphasised the influence of habitus on an individual's social actions by use of the term 'dispositions' as a reminder that habitus refers to a "peculiar philosophy of action, or better, of practice" (Bourdieu, 2005, p. 44).

Bourdieu (2005) described habitus as:

*"a system of dispositions, that is of permanent manners of being, seeing, acting and thinking, or a system of **long lasting** (rather than permanent) schemes or schemata or structures of perception, conception and action"* (Bourdieu, 2005, p. 43, original emphasis)

That is to say, habitus is a collection of, mostly subconscious, dispositions to act in repetitive, patterned ways. It is structured by one's social origins and subsequent life experiences which result in perceptual and behavioural dispositions. Habitus is strategy generating, it not only drives practices in familiar social contexts but enables individuals to cope with unforeseen and novel situations (Bourdieu & Wacquant, 1992, p. 16).

It is important to note that dispositions are durable, being formed through social conditioning from a young age, but are not permanent. Bourdieu counters accusations of habitus being a deterministic concept by pointing out the habitus is constantly subjected to new experiences and is affected by them, and so constitutes an "*open system of dispositions*" (Bourdieu & Wacquant, 1992, p. 133, original emphasis). Although he also explains that, through priority of originary experiences, habitus is a relatively closed system of dispositions. It is formed through social experience and individuals are statistically more likely to encounter similar social circumstances to the ones under which habitus was initially formed, reinforcing or confirming existing dispositions. In addition, "all external stimuli and conditioning experiences are ... perceived through categories already constructed by prior experiences" (Bourdieu & Wacquant, 1992, p. 133). New experiences are mediated by existing dispositions, rendering original dispositions relatively irreversible. The

effect of apperception tends to chronologically prioritise the structures of habitus, with earlier dispositions structuring later experiences.

Despite the relative inflexibility of habitus once initially formed, it is not predictive of practice for every situation. It subconsciously informs the possibilities and probabilities of action in a specific situation through the effect of perception and apperception created through prior experience. However, individuals operate at a conscious level as well and may reflexively and rationally choose a particular course of action, although this choice is informed by their dispositions.

Nevertheless, Bourdieu (2005) also opposed the notion that people always act as rational agents who have the capacity to consciously calculate the most effective strategy by which to optimise their position in a given situation. Rather, he suggests that a person's habitus includes a subconscious inclination towards a way of behaving when an individual encounters a particular situation or field. They will tend to behave in ways that are familiar and that make sense to them, even when these are not practices that conform to the norms and expectations of the field.

The notion of habitus accounts for the duality of agent's strategies. Social agents are neither inanimate beings, acted upon by external forces and driven by their subconscious dispositions. Nor are they completely rational beings able to consistently recognise and discount the effect of their structuring dispositions (Bourdieu & Wacquant, 1992, p. 136). Bourdieu explains that, in this way, habitus can explain the fact that without being rational people usually behave reasonably (p. 129), they are inclined to behave in manners appropriate to their situation, since their perception of the world, and what should be said or done, has been constructed by earlier socialisation. Bourdieu mused that "[i]t is because agents never know completely what they are doing that what they do has more sense than they know" (Wacquant, 1989, p. 69).

Individuals from a particular social group will usually have many aspects of their habitus in common; they will have many life experiences in common, and this will have developed similar values and outlooks on life. Very often a particular social group can be easily identified by their mode of dress, manners, speech patterns and

habitual activities. Nevertheless individual habitus is unique due to the singularity of an individual's trajectory through social space:

The principle of differences between individual habitus lies in the singularity of their social trajectories, to which there correspond series of chronologically ordered determinations that are mutually irreducible to one another. The habitus which, at every moment, structures new experiences in accordance with the structures produced by past experiences, which are modified by the new experiences within the limits defined by their power of selection, brings about a unique integration, dominated by the earliest experiences, of the experiences statistically common to members of the same class. (Bourdieu, 1990b, p. 60)

A person's dispositions will include beliefs about their chances of success in a given endeavour. Bourdieu talks of an ongoing dialectic between subjective hopes and objective opportunities and that this may lead to a variety of outcomes. He postulates that one's aspirations, and subsequent actions, may be adjusted to the perceived probability of success but may also 'revolt' against the automatic reproduction of objective opportunities (Bourdieu & Wacquant, 1992, p. 130, n. 84). He refers to this idea as the "causality of the probable" (DiMaggio, 1979). People will generally adjust their expectations of what they are likely to achieve in terms of the practical limitations imposed by their educational background, social connections, social position and so on (Webb et al., 2002, p. 23). As Bourdieu put it "the subjective hope of profit tends to be adjusted to the objective probability of profit" (Bourdieu, 2000, p. 216).

Despite the tendency of habitus to seek out familiar, and objectively probable, social experiences, and to reproduce the patterns of practice generated through prior experiences, social trajectories do lead to new and unfamiliar social experiences. Practices are affected by both the cognitive and motivating structures of the habitus together with the potentialities of the situation (Bourdieu & Wacquant, 1992, p. 56). When habitus encounters a new social environment there will be a "dialectical confrontation", whereby habitus is adapted by and to the new social environment and

conversely the social environment is (subtly) altered by the habitus of the new-comer” (Bourdieu, 2005, p. 47).

Habitus is both structured, through the influence of social origins on perceptual and behavioural dispositions, and in turn structures actions (practices) which tend to perpetuate or reinforce social conditions.

3.1.3 Field

Bourdieu stresses that his concept of habitus should not be considered in isolation, but used in relation to his concept of field (Bourdieu, 2005). A field refers to a particular sphere of social activity and the norms or social rules that govern relations within that sphere. Common examples include family, the primary socialising field, school, higher education, religion, politics, the arts and economics. Bourdieu emphasises that fields should not be thought of in terms of formally constructed organisations but as relatively autonomous “set[s] of objective historical relations between positions anchored in certain forms of power (capital)” (Bourdieu & Wacquant, 1992, pp. 16, 97) A field is characterised by the forms of capital recognised and valued in the field, the logic of action within the field, its history and the agents within it (Bourdieu in Wacquant, 1989, p. 39). Each of these four characteristics is briefly discussed.

Bourdieu likens fields to a game “played” by agents within a field. The agents struggle, or compete, over the particular species of capital (the ‘stakes’) that is effective in that field. A field is a ‘space of play (Bourdieu & Wacquant, 1992, p. 19) but is ‘simultaneously a space of conflict and competition’ (p. 17, original emphasis).

The objective within this competitive game is for each individual to optimise their accumulation or retention of the capital that is recognised and valued in that field. The struggle over capital and resulting relations of force between agents (analogous to the effects of a gravitational or magnetic force field) forms the structure of a particular field, and the point at which their effects end define the limits of the field (Wacquant, 1989, p. 39). It should be noted that the limits of a field, rarely correspond to formal organisational boundaries, although they are always affected by institutionalised barriers to entry.

The forces which are active in this struggle define the specific capital of the field. “A capital does not exist and function except in relation to a field” (Bourdieu & Wacquant, 1992, p. 101) and capital has no value except in relation to a field. This can be readily understood if one considers a capital such as mathematical competency, which is valuable in a field of engineering but carries little or no value in an artistic field, so would constitute no value at all for its bearer in that sphere. The value of such a competency is dependent on the existence of a field in which it can be employed (p. 98).

When actors enter a particular field they are tacitly agreeing that the capital prevalent in that field is worth pursuing and so the game is worth playing. They are drawn in and agree to play by virtue of their belief (doxa) in the game and its stakes (Bourdieu & Wacquant, 1992, p. 98). Within the game the various species of capital may be employed both strategically in the struggle and also be the stakes which are pursued.

Although a field is a location of, sometimes fierce, competition, specific forms of struggle are legitimised in a field, while others are excluded.

Each field prescribes its particular values and possesses its regulative principles. These principles delimit a socially structured space in which agents struggle ... to either change or preserve its boundaries and form.” (Bourdieu & Wacquant, 1992, p. 17)

The game is played according to implicit, unspoken rules, or regulatory principles, (Bourdieu & Wacquant, 1992, p. 98) of the game. Particular procedures, such as ‘professional practices’ in a professional field, are accepted, while others, such as physical violence, are excluded as unacceptable. By entering into a field these tacit rules are accepted by the actor. Although Bourdieu points out (Bourdieu & Wacquant, 1992, p. 99) that an agent may play the game specifically in order to transform the rules of the game, for instance working to discredit certain forms of capital while valorising others which he possesses.

Capital in the field is usually unequally distributed and so results in dominant and subordinate positions within the field. The position occupied by an agent depends on

the volume and species of capital they possess. Agents with large stocks of the ‘right’ capital (that type which yields access to the profits at stake in the field) will hold dominant positions relative to those agents with less. The differences in position will be determined, not only by the total volume of capital each agent has accrued, but also by the species that they hold and its relative value within the field. The differences in positions within a field (the gaps, spaces and asymmetries between positions) and ‘the relations of force between players that define the structure of the field’ (Bourdieu & Wacquant, 1992, p. 99).

The structure of a field is the product of previous struggles to maintain or transform the structure as well as the tensions and forces within a field presently acting towards subsequent transformations (Wacquant, 1989, p. 37). The social history of contest within the field tends to shift, distort or transform the structure of the field and thus influence the logic of the game at any particular moment. The field becomes inscribed with the history of these struggles which in turn affects an agent’s disposition towards the game.

All fields fall within an overarching ‘field of power’; Bourdieu’s term for social space, or kind of ‘meta-field’ which encompasses all other social fields. The field of power is structured by two competing principles in the social hierarchy; the distribution of economic capital and the distribution of cultural capital. Fields intersect and exist at different levels within the field of power; smaller fields (eg family) exist and are nested within larger fields (eg school).

3.1.4 Theory of practice

Bourdieu’s theory conceptualises practices, or the actions, of agents, as the interactive consequence of habitus and capital with the dynamics of a field. Action should not be seen as the result of either habitus, formed through past experiences, or of the logic of the particular field. Rather, it is through the intersection of dispositions and the dynamics and structure of a field that action is produced (Bourdieu & Wacquant, 1992, p. 135). Likewise, practices do not occur simply as a result of the capital held by and pursued by agents, but are mediated by habitus.

Bourdieu provided an equation as a model which reinforces this idea that it is the interaction of all three concepts that results in practice (Bourdieu, 1984, p. 101):

$$[(\text{habitus})(\text{capital})] + \text{field} = \text{practice}$$

This formula makes it clear that practices occur as the result of a combination of habitus, capital and field, although it has been criticised for confusing the exact relationship between these three elements (Swartz, 1997, p. 141). The author's interpretation of Bourdieu's intention is that the formula expresses the combination of habitus and capital which, when brought to a particular field (with all its logic), results in practice. This is further supported by the conceptualisation of dispositions as both the inclination to operationalise capital and embodied cultural capital when they are applied within a field where they are valued (Edgerton & Roberts, 2014).

The focus of this thesis is the practices, driven by habitus, capital and field, that result in the acquisition of capital in the engineering education field. Thus it is informative to now consider the applications of Bourdieu's concepts to educational research.

3.2 Bourdieu's theories and educational systems

Bourdieu used the concepts of habitus, capital and field to explain persistent intergenerational social inequality. He saw the formal education system as a key setting through which cultural stratification and social inequality is perpetuated (Bourdieu, 1977). By allowing "inherited cultural differences to shape academic achievement and occupational attainment" (Swartz, 1997, p. 190), the education system provides the principal mechanism for controlling the allocation of status and privilege in contemporary society.

Bourdieu sees education as a form of cultural capital, which can be acquired through time, effort and money and that can be exchanged for a prestigious and profitable career (Swartz, 1997). Cultural capital can be acquired through education, but is more easily done so by students already possessing large amounts of cultural capital through inherited cultural wealth and/or social position (DiMaggio, 1979, 1982). The classification systems adopted by higher education (admissions and assessment criteria) favour students who already possess the cultural capital that enables them to decode the tacit expectations of the institution. In this way the uneven distribution of cultural capital is reinforced (Naidoo, 2004). As discussed previously, students who

are the first in their family to enter university often have not previously acquired the requisite capital for this task (Collier & Morgan, 2008).

Bourdieu proposes that the educational decisions made by students, about where to study, what to study and how to approach their studies are the result of their dispositions, which are a part of their habitus (Swartz, 1997). A child's expectations of education and career (their subjective hopes generated by social experience combined with the objective possibilities of social circumstance) are largely determined by familial attitudes and early educational influences during the formation of their habitus.

The topic of student achievement or success can also be addressed using Bourdieu's concepts. He proposes that whether students stay in school or drop out is largely determined by "the causality of the probable", or their perceptions of the probability of success for students of their background (DiMaggio, 1979, p. 1465). This is reflected in studies using motivation theories showing the importance of student expectations on academic performance (see for example Marra, Rodgers, Shen, & Bogue, 2012; Matusovich, Streveler, Loshbaugh, Miller, & Olds, 2008). The concept of self-efficacy, which is based on Bandura's (1982) social cognitive theory is a person's judgement of their own ability to perform a task within a specific domain (B. D. Jones, Paretti, Hein, & Knott, 2010). This psychology concept has clear links to Bourdieu's sociological explanation of the "causality of the probable". Expectancy-value theory (Wigfield & Eccles, 2000) says that student performance is influenced by both their expectancies for success and their values, where expectancies relate to the student's achievement in a task and values influence their choice of activities (B. D. Jones et al., 2010). Bourdieu's habitus encompasses individual values and behavioural dispositions, and furthermore explains their origin.

Bourdieu's habitus can also enlighten the, often negative, experiences of non-traditional students entering university. The transformation of habitus (Bourdieu 2005) that occurs when a student enters the unfamiliar field of higher education can have significant implications for the student. Previous research (see for example Reay, 2002) has pointed to the conflict and inner-turmoil which can be created when a student wishes to 'better themselves' through education or move out of the socio-economic sphere in which they have grown up. The transformation of student

habitus that occurs on entering the unfamiliar field of higher education can have significant implications for the student. The transformation can be accompanied by disquiet, ambivalence, insecurity, and uncertainty (Reay, 2005). A study by Jetten et al (2008) found that many students from a working class background studying at elite universities encountered dilemmas such as maintaining connections to their social background, including family, friends and the wider community. A disconnect in this sense was also observed in the study by Thomas (2002), who found that students who had left home to attend university subsequently found difficulties in relating to their peers and family who they had 'left behind'.

Friedmann (2005) described a "wholesale escaping of habitus" in relation to upward social mobility, whereby in the process of changing social status (e. g. through higher education) people move on and reject the habitus of the world in which they grew up. This may be one model of successful adaptation of habitus to a new field, another might be the development of an individual's habitus to allow movement between two worlds as described in Reay's (2009) study of successful students at an elite university. The students in that study were described as "keeping a definite hold on the former aspects of self even as they gained new ones through education". Paul Sweetman (2003) suggests that a reflexive habitus that is able to refashion itself to enable this movement between fields may be present in an increasing number of contemporary individuals.

Widespread cultural and social change in Western society has led to a diminishing importance of high-brow culture as a status signifier. Increasingly, cultural versatility is becoming important (Edgerton & Roberts, 2014). Erickson (1996) contends that social advantage is increasingly provided through facility with multiple cultural genres, or possession of a diverse cultural repertoire. Social advantage is gained by a repertoire of varied tastes, rather than high status tastes and a skill in understanding the relevance in different cultural spheres. This cultural flexibility offers social advantages such as increased opportunities for employment and promotion in many occupations (Edgerton & Roberts, 2014).

3.3 Conclusion

The social background of a student affects their ability to integrate into the higher education system, which in turn favours those students who have the conduct, approaches and world view that is consistent with that of the institution at which they study. This compatibility of habitus and field enables students to feel at home, ‘as a fish in water’, as Bourdieu famously stated (Bourdieu & Wacquant, 1992, p. 127). Students who, on the other hand, come from a background which causes habitus to be in conflict with the field of higher education, not having the dispositions necessary to produce field-legitimate practices (in terms of their conduct, attitudes and approaches to study) are less likely to thrive and achieve academically in the higher education environment (Bourdieu, 1977). As most students who accessed higher education in previous generations had middle class backgrounds and family experience of higher education, they would be more likely to have understandings of higher education that corresponded with those of the institution (Bourdieu 1988) than the non-traditional students of this study.

Socio-cultural congruence, or the congruence of habitus and field, is important to engineering student academic achievement. The present inquiry into the practices that generate this success is undertaken in the context of the field of engineering education, which operates within the larger field of higher education, and so applies many of the same ‘rules of the game’. Its aim is to understand and illuminate aspects of both field and individual habitus which, through their congruence, support success-generating practices by students from diverse social backgrounds.

In relation to the analysis of practice, Swartz (1997) observed:

“The analysis of practices involves the construction of the fields where they occur and the habitus of the agents brought to those fields.” (Swartz, 1997, p. 142).

The research methodology discussed in the next chapter was developed to elucidate the practices of successful students, by firstly constructing the field of engineering education and then by investigating student dispositions in that context.

4 METHODOLOGY

This chapter outlines the methodological approach taken to gather and analyse data for this research. The development of the research design, in consideration of the conceptual framework described in the previous chapter, is outlined. The complexity associated with the investigation of human behaviour in a particular setting necessitates a multi-faceted approach, which is adopted within a case study framework as described in the subsequent sections of this chapter.

According to Bourdieu, a person's habitus is largely subconscious, and is formed through early childhood experiences (Bourdieu, 1984). Although it includes and influences a person's actions and beliefs in a particular situation, it is not easily described or even acknowledged by an individual. Uncovering a student's habitus requires an inquiry into their largely sub-conscious beliefs and values triangulated with observations of their actual behaviour. It is not a question that can be asked directly or data that can be directly observed or measured against any standard (Swartz, 1997, p. 290). Clues to a student's habitus must be found in the expression of their beliefs, values and viewpoints and in the way that they operationalize their cultural capital. In the case of this research it is situated in the field of engineering education.

Bourdieu's triad of concepts cannot be discussed in isolation from each other. In order to uncover aspects of habitus and its effect on behaviour in a particular field, one must also consider the capital that is operationalised and accumulated within that field. The focus of this investigation is the habitus of successful engineering students and identification of the dispositions that support their success. This study and the findings will be somewhat dependent on the field within which the student is operating. The student's success in accumulating institutional capital will be dependent not only on the types of capital operationalised by the student, but on the capital that is valued and rewarded within the field.

The capital that is valued and pursued within a particular field is identified by competition and the struggle to acquire it. Institutional capital was defined by Bourdieu (1997) as the formal tokens which are awarded to individuals by the institution. At a university, these are best represented by formal awards such as

marks for individual assessment items, which in turn are converted to grades for different subjects. The accumulation of sufficient passing grades in a program will ultimately result in the award of a degree by the institution to an individual. These formal symbols of institutional capital could be compared to the currency that represents the value of individual performance (for example in an assessment task).

A field is defined by the capital that is valued in that field (Bourdieu, 1986). The 'rules of the game' within that field, or at a particular point in the field, determine the types of capital which can be successfully leveraged in the pursuit of additional capital. In the broad field of higher education, the types of institutional capital that are valued and pursued are identified in the currency of marks, grades and ultimately qualifications in the form of the award of a degree. The struggle to accumulate these types of capital will involve the leveraging of a student's existing store of capital such as study skills, time on task and dedication. The success, in terms of resulting institutional capital, of the leveraging of particular types of capital will be dependent on whether that type of capital is afforded value within the particular field. For example, a student's knowledge and appreciation of music would be rewarded within a Performing Arts program but may be of little, or limited, value in an Engineering program.

The capital that an individual chooses to leverage in a particular field will be influenced by the dispositions which are part of their habitus. In an unfamiliar field the behaviours exhibited by an individual will be almost wholly determined by their habitus. Whether they aggressively pursue authority figures for assistance, or turn to peers within the field, or take a very low profile approach to understanding the requirements of the field will be determined by personality aspects of their habitus. The capital that is operationalised within the field in the pursuit of institutional capital will be determined by the capital at the individual's disposal but also by their understanding of what capital may be useful to them (their understanding, flawed or otherwise, of the 'rules of the game'). Students entering university will use a variety of strategies to pursue institutional capital. Bourdieu's concepts suggest that those students who come from a 'traditional' higher education student background will be equipped with approaches to study and knowledge, which is valued and rewarded within the institution. Those less traditional students, who have little exposure to

higher education through their familial backgrounds or enter through an alternative academic pathway, may not arrive equipped with the types of capital that is usually operationalised by students within universities.

The hypothesis of this study is that successful non-traditional students may have differing types of capital, and dispositions which enable them to operationalise it successfully. However, the success of any alternative student study strategies would be dependent on the cultural environment of the university. The cultural environment will affect the types of capital which are recognised and the strategies that are considered acceptable and supported at that point in the field. A particular institution may be more tolerant of information seeking by individual students (e.g. by persistent questioning of staff) than other institutions. This may be more supportive of a non-traditional student who does not intrinsically possess the knowledge to find and access academic information.

An investigation of successful student habituses must therefore also consider the location within the field at which the students are studying. The field in which they are studying must also be described in terms of the values, culture and attitudes manifest at that point in the field and understood in terms of the interaction which occurs between student habitus and educational field during a student's educational journey. Bourdieu's triad of concepts and the interaction between them which is the subject of this study are depicted in Figure 4-1, which also illustrates some of the types of data that can be used to investigate each of the three theoretical aspects. The collection and analysis of data pertaining to each of the different concepts must be conducted with reference to the other two. A particular data source can be used to uncover aspects of more than one of the concepts of habitus, capital and field under consideration. In order to investigate the phenomenon of successful non-traditional students, with reference to Bourdieu's conceptual framework, an investigation of student habitus, capital and field must be conducted in the context of the particular institution at which a student is studying. A case study approach was chosen as the appropriate methodological framework for this investigation.

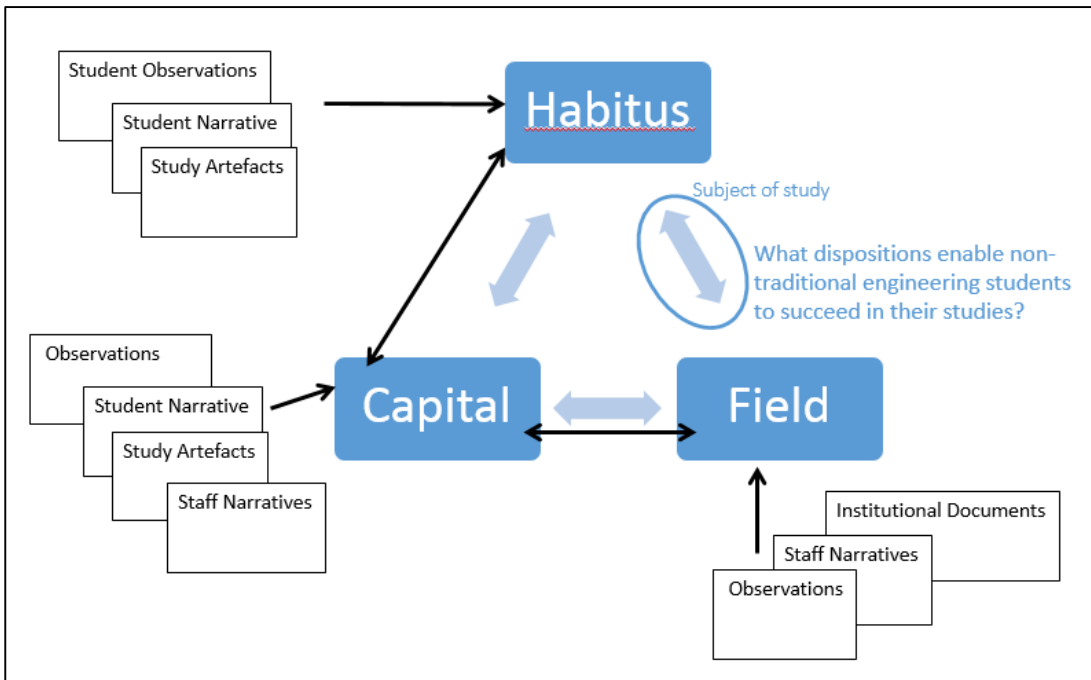


Figure 4-1 Describing Habitus, Capital and Field

4.1 Epistemological and paradigmatic stance

Engineers, together with natural scientists, have traditionally taken a positivist or empiricist stance in their approach to research. From this epistemological perspective ‘good’ knowledge or research is commonly thought to be that which can be quantified, is generalisable, repeatable, predictable, or enabling of prediction, and which can be ‘proven’. This stance is very useful and appropriate for a great number of research investigations but it is not always appropriate. Knowledge concerning people, particularly their actions and behaviours, is much less easily described by laws or generalisable principles. It is more appropriate to adopt a more constructivist or interpretivist stance for investigations concerning social phenomena and, in particular, education and educational outcomes. For this reason the research looks to the discipline of sociology for not only the conceptual framework but also the methodological framework and paradigmatic lens through which to view this investigation.

This research adopts a social constructivist stance, whereby meaning is interpreted through data collected in collaboration with participants. Their narratives and the

expressions of their educational journeys and influences are used to generate the insights and interpretations which constitute the findings of this study.

Bourdieu acknowledged the importance of both objective and subjective stances in the social sciences, together with the counter-productive division between these perspectives.

Of all the oppositions that artificially divide social science, the most fundamental, the most ruinous, is the one that is set up between subjectivism and objectivism. The very fact that this division constantly reappears in virtually the same form would suffice to indicate that the modes of knowledge which it distinguishes are equally indispensable to the science of the social world. (Bourdieu, 1990b, p.25)

One of the most important intentions of his work was to overcome this dualism (Bourdieu, 1989), and he termed his methods ‘structural constructionism’ (Bourdieu, 1989, p. 14). Bourdieu attempted to integrate both subjective and objective forms of knowledge into an epistemological stance from which sociological inquiry could be conducted. This integration created a third form of knowledge that he termed a “general science of practices” (Swartz, 1997, p.56).

4.2 Methodological framework: Case study

In order to examine and better understand the phenomenon of academically successful non-traditional students within the context of their program of study and institution of enrolment, a case study approach was adopted. The boundaries between the phenomenon of student academic success and the context within which this occurs are not clearly evident.

As indicated in Figure 4-1, multiple sources of data were identified as required for a detailed discovery and description of the aspects of habitus, field and capital relevant to the student educational journeys. A case study of students studying and succeeding within an particular institutional context, designed and executed with reference to the overarching conceptual framework provided by Bourdieu’s concepts, was identified as an appropriate approach. The case study framework allowed for the collection of

data from multiple sources, which could then be used to triangulate the study's findings. This scope and approach to the investigation meets Yin's (2014, p. 16) definition of a case study. Johansson's (2003) distillation of ideas from prominent case study researchers into a common definition of what constitutes a case study concluded that the study should have a 'case' as the object of the study and that features of the case should be:

“a complex functioning unit, investigated in its natural context with a multitude of methods, and be contemporary”
(Johansson, 2003)

The proposed investigation met all of these criteria, in that investigation of the complex interactions occurring when student habitus meets educational field must be investigated in the contemporary context of their program of study at a higher education institution.

A key feature of case studies is the attempt to combine different methods in order to triangulate the case and illuminate it from different angles (Johansson, 2003). This approach is particularly well suited to the complex interactions proposed by the conceptual framework within which the research questions for this study were to be investigated.

4.2.1 Case study design

A single case study is one where the study is organised around a single case. The case may be chosen because it is a critical, common, unusual, revelatory or longitudinal case (Yin, 2014, p. 51). The case selected for this study represents an unusual case, which can be considered to deviate from norms (Yin, 2014, p. 52) in respect to the occurrence of the phenomena being studied.

The University of Southern Queensland (USQ), Faculty of Engineering and Surveying (FoES), was selected as the single case for this study as it represents an unusual and ideal case. The student cohort demographics are demonstrably different to many other Australian universities (Devine & Wandel, 2014), while the retention and progression of the engineering cohort is comparable to, or better than, many other Australian engineering faculties (Gibbings et al., 2010). A high proportion of

non-traditional students are enrolled in engineering at USQ and study in non-traditional modes such as by distance and part-time. USQ has a long history of offering alternative study modes and its regional location is a factor in attracting non-traditional students.

The selection of this single case allowed for the development and application of an investigation using Bourdieu's concepts applied to the engineering education of non-traditional students in Australia. This application had not previously been attempted and a focus on a single information-rich case is appropriate as it allows for the development and extension of a theory of socio-cultural congruence using Bourdieu's concepts (Yin, 2014, p. 51). The selection of a critical or unusual case (Yin, 2014), within which the phenomenon of non-traditional student success was readily available, provided an opportunity to illustrate and illuminate (Stake, 1995, p. 3) this phenomenon. The choice of case was guided by Stake's (1995) concept of an instrumental case study; one which is chosen for its value in increasing understanding of the issues, or research questions, of the study. Understanding of the research questions were of dominant importance over the case itself (Stake, 1995, p. 16).

Within the single case selected, multiple embedded units of analysis (Yin, 2014) were utilised in order to explore the phenomenon using Bourdieu's concepts. The complexity and mutual dependence of habitus, field and capital have been discussed above. To fully document these concepts with regard to this study, the context (field of higher education in Australia, and the field of engineering education in particular) must be described. The types and distribution of capital within the case itself (USQ FoES), and the resulting accumulation and award strategies that result, and can be seen as the attitudes, values and culture within the case, need to be explored. Finally, the dispositions of successful students within this field must be documented for analysis. A further unit of analysis identified is the demographic profiles of students in higher education and at the case study institution itself in order to confirm its suitability as a critical case in terms of having a student demographic profile with a high proportion of non-traditional students.

As indicated in Table 4-1, multiple data sources can be used to explore each of Bourdieu's concepts. The proposed types of data from various sources, and the unit

of analysis to which they contributed, are summarised in Table 4-1 below. This matrix shows the types of data sources accessed during the study, the unit of analysis to which they contributed and the types of data that were extracted from the sources. Each of these units of analysis is discussed and presented as individual chapters (5-8) within this thesis.

Table 4-1 Data types and units of analysis (adapted from example in Yin 2014, p. 54)

Unit of analysis:	Data sources:		
	Public domain	Institutional	Individual
	Institutional publications Government HE statistics reporting Official websites X-institutional workshop	Student records LMS records Policies and procedures	Student interviews Staff interviews
Field of higher education in Australia	Values Achievements Attitudes to student diversity and access Differentiation across the sector		
FoES student cohort	Demographic profile	Student demographic profile Progression and retention rates	
Specific field location (USQ FoES)	By Inference: Institutional culture	Student management procedures By Inference: Institutional culture	Institutional culture Values Expectations
Engineering students		Demographic categorisation Academic performance Student/staff interactions By inference: attitudes and behaviours	Behaviours Attitudes Perceptions Values Background

4.2.2 Research design quality and validity

The four tests that have generally been used to judge the quality of empirical social research are construct validity, internal validity, external validity and reliability. In a predominantly qualitative study such as this one, it is good practice to specifically articulate the ways in which these aspects of research quality will be addressed.

The maintenance of research rigour within a case study is planned to occur throughout the conduct of the investigation, not only during the study design phase (Yin, 2014, p. 46). This means that the validity, reliability and generalisability are dependent on processes and checks implemented during research design, data collection, and data analysis phases. The processes used to ensure rigour in the conduct of this study are discussed below.

Construct validity

Validity in qualitative research refers to the extent to which the final narrative accurately reflects the social reality of the informants (Creswell & Miller, 2000) and refers to the quality of the inferences drawn from the data by the researcher. Concerns are often raised by quantitatively trained researchers regarding the use of “subjective judgement” (Yin, 2014, p. 46) or inference, as opposed to the use of empirical measurements, in the production of qualitative findings. These concerns may be addressed using a variety of strategies to ensure the validity of the study. The strategies chosen for ensuring validity within this study are consistent with the constructivist position adopted (Guba & Lincoln, 1994), as discussed above in Section 4.1. The strategies also tend towards a systematic approach as favoured within a post-positivist paradigm (Creswell & Miller, 2000). Recognising the contextualised perspectives of social reality that are acknowledged in the constructivist paradigm, validity concerns centre around the trustworthiness and authenticity (Lincoln & Guba, 1985) of the final narrative, from which the study findings are drawn. The key validation strategies chosen for this study are triangulation, member checking, prolonged engagement in the field, and maintenance of a chain of evidence (Creswell & Miller, 2000). A search for disconfirming evidence and thick description was also utilised.

Due to the complexity of the relationships between field, capital and habitus, it was recognised very early in the research design that multiple sources of data and collection methods would be needed. As illustrated by Figure 4-1 multiple data sources were identified as applicable to the construction of each of the key concepts applicable to the research questions of this study. The data collection process made use of these multiple sources of evidence to triangulate the findings. For example, data pertaining to student habituses was predominantly drawn from student

interviews but was also corroborated with staff interviews, observation of students and a review of study artefacts (such as student correspondence and interactions with the Learning Management System). The themes identified were drawn from convergence amongst multiple and different sources of data (Creswell & Miller, 2000).

Member checking of the draft findings chapters was undertaken with both staff and student informants. The four draft “results and findings” chapters were reviewed by two senior Faculty staff members, both of whom were embedded in the field during the period of the study. These staff have a particular focus on student learning and teaching as well as a strategic view of the wider field of engineering education. This qualifies them to review the four diverse findings chapters and to view the narrative from the perspective of key informants. On this basis they were able to provide comment as to whether the themes and categories discussed in the narrative made sense and whether the overall account was realistic and accurate (Creswell & Miller, 2000). In addition member checking of the key chapter concerning student educational narratives was undertaken by two of the student participants, who reviewed and confirmed the narrative for authenticity and an accurate portrayal of the student voice.

An advantage of the author’s status as a staff member within the institution chosen for the case study is her prolonged engagement in the field. Her physical location on the campus and daily interactions with students and staff of the Faculty of Engineering and Surveying enabled repeated observation and access to key actors, systems and locations throughout the duration of the study. This prolonged exposure is acknowledged as enabling a more detailed understanding of the context of participants’ views (Creswell & Miller, 2000) than would be available from a short stay in the field.

A chain of evidence was maintained for the collection and use of data in producing the findings. By continually referring back to the conceptual framework and the research questions throughout the development of the research protocols, evidence collection processes, production of a case study database, and final analysis, a consistent thread of inquiry was maintained. In this way the methodological procedures (themselves derived from the conceptual framework) and resulting

evidence were cross-referenced with the conceptual framework throughout the execution of the study.

A search for dis-confirming evidence, or evidence that seems to contradict emerging themes, formed part of the rigorous qualitative analysis. Once initial themes have been identified, researchers have a tendency to see confirming evidence in the data (Creswell & Miller, 2000). A conscious and iterative effort was adopted during the analysis phase to search for evidence that might contradict the emergent themes. As far as was possible, such data was taken into account when constructing the narrative.

Thick rich description is employed in qualitative reporting in order to give the reader a sense of having experienced the incident or situation being discussed (Creswell & Miller, 2000). The use of details and a narrative format contribute to the achievement of this objective. By this mechanism researchers help readers understand and appreciate the credibility of the account. While space restrictions have limited the level of detail offered in the findings and discussions chapters of this thesis, they are presented in a narrative format describing as far as possible the circumstances and details surrounding incidents illustrating the findings.

Internal validity

This test of rigour is predominantly a concern for cause and effect type studies, trying to establish direct causal relationships for an outcome. This was not the focus of this study, however more broadly it also addresses the concerns, often raised about qualitative studies, around the making of inferences during the analysis process. This has already been discussed above as part of the consideration of construct validity.

External validity (generalisability)

This study, like any single case study, is not intended to be statistically generalizable. Rather, it was undertaken in order to shed light on and enhance understanding of (Stake, 1995, p. 16) student success in general, and non-traditional student success in particular. The use of Bourdieu's conceptual framework to develop a proposition about the importance of socio-cultural congruence in student achievement allowed

the exploration of the issues surrounding higher education for non-traditional students.

Use of a conceptual framework to guide development of the research questions and the investigation design, together with a focus on interpreting results in terms of this framework allow findings to be “analytically generalizable” (Yin, 2014, p. 40) or transferable to other contexts (Lincoln & Guba, 1985).

According to Yin (2014),

“analytic generalisation may be based on either (a) corroborating, modifying, rejecting, or otherwise advancing theoretical concepts that were referenced in the case study design, or (b) new concepts which arise upon completion of the case study.”

The intent of this study was to test the proposition that socio-cultural congruence is important to engineering student academic achievement and to understand aspects of both field and individual habitus which may assist with achievement of adequate congruence. The field of engineering education could be considered a field in its own right, although it operates within and according to many of the same rules as the broader field of higher education. On this basis it should be expected that findings from this study would be transferable to other disciplinary and institutional contexts. In particular, the findings should be applicable not only to institutional contexts where high proportions of non-traditional students are enrolled but also more widely to those institutions that have historically had a more traditional student cohort and must cope with increasing student diversity into the future.

While this study focusses on the interaction of habitus and field in the context of non-traditional students, a greater understanding of this interaction and the learning and teaching issues that they illuminate should be expected to contribute to enhancing the possibility of success for all students.

Reliability

The reliability of research relates to the extent to whether findings might be reproduced if it were repeated. This is not to suggest that the same findings would be

found in a different context or by a different researcher but that, if the same study was repeated in the same context, the findings would be similar (Yin, 2014). This aspect is addressed by ensuring that the case study protocol is followed and a database of data collected and research decisions made is created and maintained. This was undertaken in the current study by the researcher who maintained a detailed research journal identifying research design decisions and the utilisation of NVIVO software as a repository for data as well as for analysis decision records.

4.2.3 Reflexivity

It is important for the researcher to be cognisant of his/her status within the research space. Bourdieu emphasised a need for reflexivity at every stage of the research process, or ‘construction of the object’ (Bourdieu & Wacquant, 1992, p. 224), in this case the relationship between the habitus of actors in the field and the field itself. He described the dichotomy of the researcher studying an object of which he is inevitably a part:

“The sociologist is thus saddled with the task of knowing an object – the social world – of which he is the product, in a way such that the problems that he raises about it and the concepts he uses have every chance of being the product of this object itself.” (Bourdieu & Wacquant, 1992, p. 235)

Bourdieu described the pre-reflexive tendency of researchers to unconsciously project their own social and epistemic experiences into the object of their investigations (Bourdieu, 2003). He was not, however, suggesting that researchers should, or could, completely remove themselves from their work: but that, through reflexivity, they could achieve ‘participant objectivation’ (Bourdieu, 2003). By identifying and mastering academic tendencies to construe the social world from a purely theoretical standpoint and utilising the insights from one’s own social experiences, greater understanding and insight can usefully be achieved.

“idiosyncratic personal experiences methodically subjected to sociological control constitute irreplaceable analytic resources, and that mobilizing one’s social past through self-

socio-analysis can and does produce epistemic as well as existential benefits."(Bourdieu, 2003)

The mechanism by which the researcher can make use of her own status as an element within the field for a positive contribution to the conduct and analysis of a research inquiry was termed by Bourdieu 'scientific reflexivity'. He described this as a form of reflexivity applied not only to the researcher themselves but to the academic and epistemic traditions within which they work and of which they are a product.

The writer was well aware of her own status as a female engineering academic and background as a non-traditional student. Acknowledgement of this engagement in the field provided a powerful perspective on the social tensions inherent within the field, which could be utilised during the data gathering and analysis processes. Ongoing reflection and discussion with senior colleagues and supervisors were used as tools to ensure that the interpretation of data during analysis remained consistent and unbiased. The social effects inherent in interviews (a key data collection method) were identified, considered and managed throughout the data collection process.

4.3 Data collection methods

This research drew on multiple methods of data collection, including survey, document analysis, interviews and observations. Participants in the study included a sample of all of the actors within the field, with the main groups being the student cohort and institutional staff.

Four distinct sets of data were collected, using multiple methods for each:

1. Qualitative data describing the landscape of higher education in Australia, as it relates to student diversity
2. Quantitative data describing student demographic backgrounds within higher education in Australia, at USQ and in the USQ engineering cohort in particular
3. Qualitative data describing the prevailing culture within the USQ engineering faculty
4. Qualitative data exploring the experiences of engineering students at USQ

The following sections describe the data collection methods and sources used in the compilation and analysis of these four sets of data. The data sets were compiled and analysed individually and more detailed descriptions of methods used for the collection of individual datasets, the contribution to answering the research question, data analysis and findings are reported in more detail in Chapters 5 through 8. This section provides a broad overview of the methods and analytical approach.

4.3.1 Confirmation of critical case: Demographics

It is important to ensure that single case studies are thoroughly investigated to ensure that it is in fact the case that it is thought to be and to avoid misrepresentation (Yin, 2009, pp. 49-50). Anecdotal evidence from within the teaching environment at USQ suggested that the student cohort in engineering was particularly diverse. To quantify this and to characterise the dimensions of this diversity an inquiry into the demographic backgrounds of student was conducted. This inquiry included the dimensions of diversity within higher education initially and then the specific case of USQ and USQ FoES.

The data sources for this phase of the study included published demographic data, at both institutional and national levels together with an interrogation of USQ student records and an online student survey.

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. National equity data published by the Department of Education, together with USQ institutional records were accessed and mined for raw data. This data was then subjected to a descriptive statistical analysis.

There are some limitations to using published data. For example, the exact definition used for ‘Low-SES status’ varies both within Australia and between countries (R. King et al., 2011; L. 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 that 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 ‘low-SES’ 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; L. 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. Data on first generation status is not collected or reported through national reporting systems.

In order to acquire more detailed demographic information about the particular student cohort comprising the case, a survey was developed and implemented.

4.3.2 Student Survey

A survey targeting the USQ engineering cohort was designed 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 under-represented groups in engineering education, and data on the prevalence of these factors are not directly obtainable from institutional records.

In late 2013, the entire cohort of students actively enrolled in USQ’s engineering and surveying programs was invited to participate in an online survey. The survey was hosted within the University’s learning management system which enabled respondents to be identified 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 in line with institutional ethics guidelines.

The survey was designed to provide a more finely-grained ‘picture’ of the engineering student cohort than was available through existing USQ 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 there were reminders and follow-ups of incomplete

submissions to maximise the response rate. The survey returned 568 valid responses, representing 15% of the total active engineering student cohort.

The survey reliability, or stability of the results, was addressed primarily through question design and review. The questions were designed to elicit objective responses as far as possible: they did not address participant behaviours, attitudes or expected outcomes. The data requested was data which was stable over time for respondents and did not require subjective interpretation. The questions were tested with a reference group to ensure that they were clear and unambiguous in the institutional context in which they were administered.

On completion of the survey the profile of the respondents, based on known demographic and program of enrolment data, was determined to be representative of the total cohort on those measures. This indicated that the overall survey responses were likely to be reliable.

Survey validity was addressed by basing question design on the literature around demographic indicators of disadvantage in higher education. Factors which were theoretically indicators of under-represented or disadvantaged groups were identified for measurement by the survey. The questions were then designed to extract that data. A content review by a reference group with some knowledge of the subject area was conducted to enhance the question accuracy and resulting data validity.

Student demographic data collected in the survey was subjected to a descriptive statistical analysis using the SPSS software as discussed in Chapter 6.

4.3.3 Interviews

The primary source of qualitative data was a series of semi-structured interviews, which was supplemented with classroom observations and the online interactions of students on the LMS. Interviews were conducted with both staff and student participants over a two year period, allowing for some follow up interviews with key student participants as they progressed through their studies. The data collected from student interviews was considered the primary data as it contributed directly to the final analysis of student habitus. However data from the staff interviews contributed

to an understanding of the dynamics of the field and informed the analysis of student interview data.

Informal, semi-structured interviews are an effective means of uncovering large amounts of expansive and contextual data, and discovering complex interconnections and relationships (Hughes, 2002). Thus, interviews with student participants were chosen as the most appropriate and natural means of eliciting their unique perspectives. This method was successfully used by Nash (2002) in an investigation of the relationship between elements of a student's habitus and their progress at secondary school using interviews with students focussed around topics associated with their experience of schooling. Asking participants to speak about their own educational experiences places them in the position of 'expert witness' and situates their narrative in the educational environment. Relevant dispositions such as their aspirations, perceptions of education, academic preferences and understanding of the 'rules of the game' can then be uncovered.

Naturalistic data was required in order to ensure that data being gathered represents the outlook and opinions of the participant. This was achieved through a semi-structured interview format where the participant was asked to 'tell their own story' to an interested interviewer. To minimise the influence of the interviewer a conversational tone was adopted and interviewer input was restricted to the introduction of educationally related topics and requests for clarification or more information. The objective of the interviews was to acquire naturalistic data in a narrative form pertaining to student perceptions of their studies which would reveal their subconscious dispositions.

This is a non-probabilistic study as it is not intended that the findings be statistically generalizable. The study was intended to provide a descriptive identification of dispositions which contribute to academic success within the context of a particular institution. A rich, reflective interview narrative is essential to allow subsequent identification of relevant elements of each student's habitus through analysis. Purposive sampling (Oliver, 2006) was used to select interview participants who fit the profile of the students of interest, and who were also most likely to provide a rich narrative reflection on their educational journey.

Interviews – number and saturation

As it is not intended to generalise from the findings a purposive, non-probabilistic sample has been used. A purposive sample is the most commonly used sample in applied research (Miles & Huberman, 1994, p. 27) where the participants are selected according to pre-determined criteria relevant to the research objective (Guest, Bunce, & Johnson, 2006).

Collection of qualitative data is undertaken without necessarily having a pre-defined ‘amount’ of data to collect. Sufficient data has been obtained when the researcher reaches “theoretical saturation” (Glaser, 1978). A purposive sample size is generally deemed to be adequate when this milestone of theoretical saturation has been reached (Guest et al., 2006). This criterion means that the actual number of interviews required is initially unknown and is determined inductively. Sampling continues until the ongoing preliminary analysis finds that saturation (in terms of emerging themes) has been reached.

Guest et al (2006) found that saturation occurred at 12 interviews, although their research found that the basic elements for meta-themes were present after just six interviews. This order of magnitude was confirmed in the present study, where a pilot of five interviews was sufficient for the emergence of meta-themes as well as enabling the refinement of research questions and interview protocols. A further twelve interviews with key participants (successful engineering students), corroborated by ten interviews with less successful students completed interview data collection prior to the final analysis. This number of interviews achieved saturation, enabling key themes to fully emerge from the data.

Participant selection: purposive sampling

The selection of participants, based on their possession of a particular type of academic capital, or position of power, is supported by Bourdieu’s approach in his analysis of the French academic world, *Homo Academicus* (Bourdieu, 1988). He argues (below) that, by selecting participants for their representativeness of a particular position within a social structure, an accurate representation of the social structure may be constructed.

“In contrast to random sampling, which would dissolve the structures (especially since a structurally determining position can be represented by a very small number of people and sometimes...by a single person), this mode of selection enables us to characterize the positions of power through the properties and the powers of their holders.... It goes without saying that the composition of the constructed population depends on the criteria – that is, on the powers – which we have chosen” (Bourdieu, 1988, p. 76)

Purposive sampling was used in this study. Two contrasting groups of students were recruited based on their positions of power within the social structure of the engineering education field, as represented by their stores of academic capital. (For a discussion of the categorisation of these two student groups please refer to the research approach section of Chapter 8.) Likewise, the staff interviewed occupied a particular position and were identified by their acknowledged teaching accolades or student focus.

Key student participants were recruited from amongst high achieving engineering students for the pilot study. Participants were enrolled in either full-time or part-time mode in a four year Bachelor of Engineering program. During Phase II of the interview program, follow-up interviews were conducted with two students to determine whether there had been any significant shift in habitus over the intervening period. A series of twelve further interviews was conducted with first time participants from this participant category.

Ten interviews were also conducted with students categorised as less successful. These students had quite different levels of academic capital and, although they were not the focus of the study, they provided a valuable contrast to the key participants. The data obtained from these students pertaining to their dispositions contrasted and highlighted the dispositions of the key group.

Interview protocol

Consistent with the purposive participant recruitment as representative, the interview protocol was designed to place the participant in the position of ‘expert witness’ to

their own narrative. Placing an interviewee in the position of ‘expert’, particularly where the interviewer is perceived to be in a more powerful social position, can be empowering (Miller & Glassner, 2004) This ‘distance’ can elicit explanations that may otherwise be assumed to be known by someone of a similar social status. However, this can only be accomplished if trust and rapport is established; otherwise the social distance can result in suspicion and lack of trust. Several elements of rapport building include establishing trust and familiarity, showing genuine interest, assuring confidentiality, and not being judgemental (Miller & Glassner, 2004).

The researcher’s status as a lecturer required that these issues of social status be considered in order to maintain the reliability of the interviews. This was addressed through careful attention to the interview protocols and particularly with respect to the less successful student participants. Interview protocols for the three sets of interviews are provided in an Appendix E to this thesis.

4.3.4 Institutional publications

Publically available University institutional documents were collected to inform a descriptive analysis of the field of higher education in Australia. Historical data pertaining to University origins as well as public statements on issues surrounding student diversity and descriptions of student support programs and resources were extracted. Documents accessed for this data included official University webpages as well as annual reports for the year 2013.

An analysis of the power structures (Bourdieu’s capital) within the field based on a content analysis of the data collected enabled a description of the relative positions in the field of different types of institutions. A more detailed description of data collection and analysis is provided in Chapter 5.

4.3.5 Cross-institutional diversity workshop

A facilitated workshop for engineering educators representing a range of Australian universities was conducted as a mechanism for collection attitudinal data pertaining to student diversity. The workshop was designed to collect data about perceptions of different types of universities and insights into the experiences and perceptions of engineering educators from different institutions.

A structured framework was used to encourage participants to share ideas and experiences relating to under-represented student groups in facilitated breakout groups. Groups shared their discussions and elaborated on ideas through discussion. Responses and workshop artefacts were collected for further content analysis.

The workshop protocol and key details of attendees is provided in Appendix C to this thesis.

4.4 Data analysis process

Lichtman (2013, p. 249) suggests that the analysis of qualitative data can take the form of either identifying themes in the data or of providing interpretation by telling a story. Finding themes is considered a reductionist approach to the data, in that it is reducing the lived experience of the participants in all its complexity and emotional nuances, to a set of common ideas or themes. This analytic approach is commonly associated with the principles of quantitative paradigms. Since the researcher comes from a highly quantitative background (engineering) and was writing for an audience with a similar background, this was considered this the most appropriate approach to the analysis and presentation of data. Presentation in the form of illustrative storytelling is not core within the author's skill set and potentially lacks credibility with the engineering education community.

Data analysis is essentially a process of the development of themes from the initial data and then making meaning of these. This study used a generic approach to coding (Creswell, 2009, p. 184) to analyse the qualitative data for themes and perspectives relevant to the research question and conceptual framework.

The researcher used a process of descriptive coding (Saldana, 2009) to identify themes, as described by Lichtman (2013) who details a process of interaction with the data in order to make sense of a large amount of data that is cumbersome and usually without clear meaning (Lichtman, 2013, p. 250). This process is iterative and meaning is developed from revisiting and reviewing initial interpretations of the data to sort and refine the ideas. Lichtman describes this as a process of moving from coding to categorizing to concepts, which she calls 'The Three C's (Lichtman, 2013, p. 251). This idea is illustrated by Figure 4-2 Lichtman's Three C's of data analysis – Distillation of raw data down to key concepts (Lichtman, 2013, p. 252).

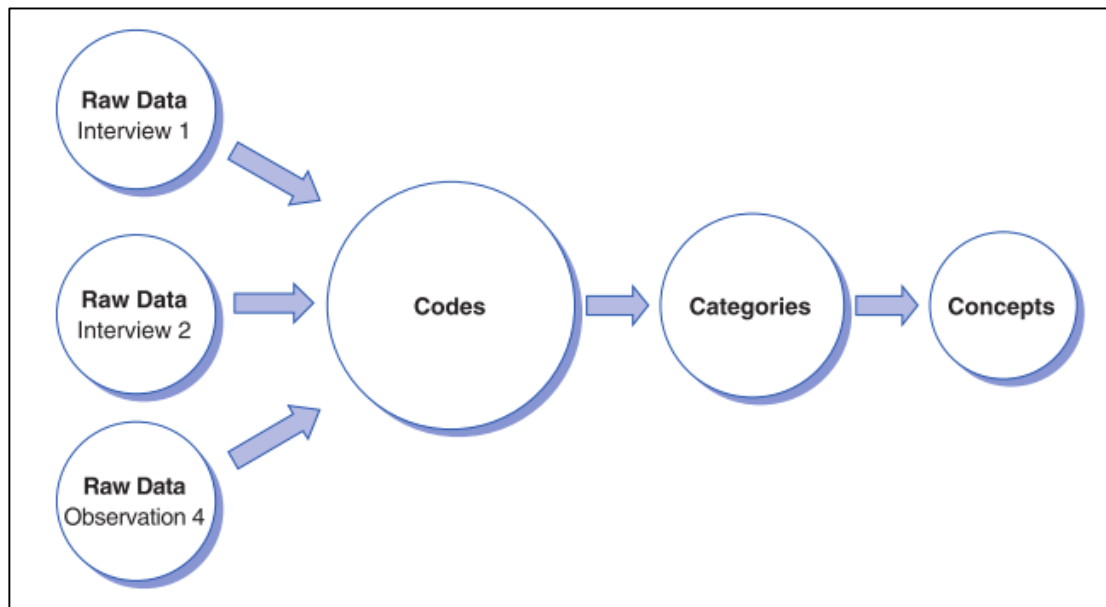


Figure 4-2 Lichtman's Three C's of data analysis – Distillation of raw data down to key concepts (Lichtman, 2013, p. 252)

This process is described by Lichtman (2013, pp. 250-255) as having using six key steps:

1. Initial Coding: Identifying initial, broad ideas from the participant's responses. Done through careful reading of transcripts and identifying phrases or words which summarise or represent ideas in the text
2. Revisiting initial coding: A process of sorting and grouping initial codes into a more manageable number. Redundant codes are removed by renaming synonyms and clarifying terms
3. Developing an initial list of categories: Codes are grouped into major categories, some codes become category topics in themselves, and others form sub-topics within a broader category
4. Modifying initial list of categories based on additional re-reading: A continuation of the iterative process, where the initial list of categories is combined or modified as needed to move towards recognition of important concepts
5. Revisiting your categories and subcategories: Judgement is used to identify categories which are more important or meaningful than others. The objective being to remove redundancies and identify critical elements.

6. Moving from categories to concepts: Key concepts that reflect the meaning that you attach to the data that you collect. Lichtman argues that fewer well developed and supported concepts are more valuable than many loosely framed ideas.

During the generation of categories, and subsequent coding, from the data Bourdieu's concepts were used as a guide. Indications of conflict, competition or struggle in the participants' narratives were given particular attention in the coding process for their insight value. Competition usually denotes a struggle over capital, and generates social activity (Bourdieu & Wacquant, 1992).

4.4.1 Data transcription and coding

Transcription of interview audio recordings was undertaken by a professional transcription service. Transcriptions were verbatim transcriptions of the interview and were checked with the audio recording by the author in order to improve reliability. The audio recordings were retained for subsequent reference so that the author could check emphasis and meaning during the analysis process.

All coding and analysis was undertaken by the author. Lichtman (2013, p. 262) proposes that using others to verify the themes or concepts that emerge is considered incorrect as this assumes that there are 'right' concepts to find or that some findings are better than others. The researcher should be closer to the data than anyone else and so is the 'expert' on that study. NVIVO software was used to manage the data and assist with the organisation, extraction, sorting and coding of data.

4.5 Ethical considerations

When designing the study it was apparent that data from human participants would be required. In alignment with USQ's institutional policy, approvals were obtained from the USQ ethics committee. Separate approvals were obtained for the initial pilot study and subsequent data collection. The ethics approval forms and documentation are included in Appendix B of this thesis.

Ethical considerations were particularly important for student interviews due to the differences in social power discussed in Section 4.3.3. A key precaution included the careful selection of interview participants to avoid actual or perceptions of potential conflict. Students were excluded from the pool of potential participants where they were:

- Enrolled in courses where the researcher was involved as a member of teaching staff at the time of inviting participation
- Students who had interacted with the researcher in her role as a Program Coordinator.

The interview protocols also required that a single initial invitation to participate was sent to participants to reduce any perception of pressure (on students) to participate.

4.6 Conclusion

As discussed in this chapter a case study approach was employed in this research. The case selected, Engineering at USQ, was chosen for the high proportion of non-traditional students who access and succeed within the engineering program at this institution. This case selection provided a rich source of data with which to investigate the socio-cultural interactions of successful, non-traditional students.

Four distinct sets of data were collected in order to

- Describe the higher education field in Australia
- Verify the critical case selected
- Explore the features of the engineering education field, at the particular location occupied by the case
- Investigate the dispositions of successful engineering students within the chosen case.

The specific data gathering instruments and analysis techniques used in the compilation of each of these datasets, together with the associated analysis and findings, are described in the following chapters.

5 THE AUSTRALIAN HIGHER EDUCATION LANDSCAPE

There are thirty-nine universities in Australia; they operate in a variety of socio-political contexts, evince a spectrum of mission statements, and have accumulated differing types and amounts of reputational capital. The public image that different institutions portray varies with these characteristics. In this chapter the dimensions of this variation, with particular reference to the concept of student diversity, are explored and described. By describing the various institutional contexts in which universities operate, a sketch of the relative position in the field of engineering education occupied by the University of Southern Queensland (USQ) Faculty of Engineering and Surveying (FoES) is developed.

Through the analysis of public documentation, representing the public identity that the institutions presents, a description of the capital, values and approaches to student diversity of different universities in the field of higher education is created. This qualitative evaluation of the higher education sector based on document analysis is used here to describe the dimensions of institutional positioning in the sector and to articulate the various forms of institutional capital that are operationalised. These findings are triangulated through an exploration of staff perceptions of student diversity from a sample of universities, drawing on a thematic analysis of data obtained during a national workshop for engineering educators.

The following topics are explored in this chapter:

- Institutional understandings of, response to and public positioning with respect to student diversity and variation with institutional context
- USQ's public positioning with respect to student diversity and access issues
- The location of USQ relative to other institutions within the landscape of higher education in Australia.

In order to explore these areas the landscape of higher education in Australia is first described in terms of the various groups and classifications of universities operating in Australia. Applying Bourdieu's framework of field, as defined by the distribution and type of capital valued in the field (which in turn defines the explicit and tacit

‘rules of the game’ by which the actors operate and determines their activities), an investigation of the values and priorities of different types of universities is conducted as a means of identifying variations in institutional capital. Institutional responses to stimuli, such as the Federal Government Widening Participation agenda, will be shown to vary with their stock of capital and the position that they occupy within the field. An inquiry into the relative capital and values of a range of institutions, together with a review of the range of responses to diversity issues is presented. Finally, the perceptions and responses of individual staff from a sampling of institutions are investigated in order to describe the distribution of understandings.

5.1 Approach

This investigation of the higher education landscape in Australia used a multi-method approach. An initial literature review of university types and classifications was undertaken to inform a subsequent document analysis, conducted with respect to a sample of Australian institutions. This was supported via a workshop exploring conceptions of diversity from different sectors of higher education within Australia.

Institutions operating in similar socio-political contexts were identified through formal groupings and a theoretical classification according to socio-political context. A sample of institutions from different institutional classifications was chosen as representative of institutions with different individual strengths, missions and values. A content analysis of readily available documents was used to explore differences in relative institutional strengths and focus, and their impact on positioning with respect to student diversity.

The variety of responses to diversity was then further explored at a micro-level by investigating the responses to issues of diversity of individual staff members from Australian universities, representing different institutional contexts.

5.1.1 Data gathering

Information pertaining to institutional identity was drawn from a sample of nine Australian universities through their publically available documentation on their official websites. Annual reports and other website information from each institution were used to provide data for a content analysis examining the public positioning of

these institutions in terms of the image they portray and their accompanying missions. The sample was selected to represent a variety of institutions, each of the formal Australian higher education sector groupings, discussed in section 5.2, is represented. It is not intended that the selection from each group be representative of that group but rather that the selection as a whole will be illustrative of the spectrum of approaches and relative values of institutions in Australia. Further, the documents selected represent a ‘snapshot’ in time relating to each university. The higher education environment is currently in a state of change due to external pressures in terms of public policy, funding and regulation. Projects and programs will vary considerably over time and the specifics of such initiatives are beyond the scope of this study. The array of initiatives and some of the different cultural considerations, relating to managing student diversity, occurring in Australian higher education is addressed in this chapter.

The sample included USQ, two other regional universities, two Go8 universities, two ‘New Generation’ universities, an ATN and an IRU university. Given that they share similar elements of historical, social and geographical contexts it was expected that the approaches of the regional and ATN institutions would demonstrate similarities, albeit with varying foci, to that of USQ. Two Go8 institutions were chosen as they represent the ‘other end of the scale’ in terms of ranking and reputation to USQ. The New Generation and IRU institutions were expected to have values and approaches unique to their socio-political situations but occupy a middle ground in terms of capital employed and aspirations.

Annual reports from the same reporting year (2013) were chosen as a public document which represents a public statement of the institution’s achievements, strengths and aspirations as perceived from within the institution. Annual reports serve a common purpose across all institutions, however differences in presentation and discussions within them are immediately clear to the analytically critical reader. The emphases made and the way in which the institution is discussed give insight into the public enactment of corporate values. The reports are valuable to this investigation for their natural focus on institutional strengths and corporate aspiration. For the purposes of this review, the financial statements were excluded and only the descriptive components of the reports were analysed.

Institutional websites represent the corporate ‘face’ that is shown to the world. They are usually designed in conjunction with and complement marketing campaigns and the public profile presented by the university. Digital media is an increasingly important source of public information about any institution, and the public perception of universities, particularly for those without direct experience of university, is often initially formed through online media.

In order to further explore a variety of institutional contexts and triangulate observations about the variety of ways in which they respond to the needs of under-represented groups at a more intimate level, data was collected from a facilitated workshop conducted for engineering educators from a variety of institutions. A structured framework was used to encourage participants to share ideas and experiences relating to under-represented student groups in facilitated breakout groups. Groups shared their discussions and elaborated on ideas through discussion. Responses and workshop artefacts were collected for further analysis.

5.2 Higher Education in Australia, an overview

There are currently thirty nine universities operating in Australia. They operate within a comprehensive framework of legislative and regulatory requirements mandated at both the state and federal levels. All offer undergraduate and postgraduate degree courses and undertake formal research to varying degrees. Australia’s historical links with the United Kingdom have influenced the modelling of the tertiary education sector and many parallels can be drawn. However, while Australian universities generally followed the traditional UK model of university activity and governance an Australian egalitarian flavour was evident from the establishment of Australia’s oldest university, the University of Sydney, in 1850. The University of Sydney was one of the first universities in the world to admit students solely on academic merit (University of Sydney, 2014), unlike the English system of the time in which social status was also considered.

During the initial phase of university development in Australia, seven universities were founded in the state and national capital cities between 1850 and 1946 and a second university in each of Australia’s two biggest cities, Sydney and Melbourne, were established in 1949 (University of NSW) and 1958 (Monash University).

A second phase of rapid expansion of the tertiary sector during the 1960s and 1970s occurred in response to a leap in demand for higher education from the baby boomer generation. During this phase the states established new universities in each of the mainland cities.

In the late 1980s and early 1990s the federal government instituted sweeping reforms to the post-secondary education sector, creating a more unified national higher education sector. As part of this process many of the Colleges of Advanced Education and Institutes of Technology were either granted university accreditation or merged with existing universities, increasing the number of federally funded universities offering degree qualifications.

The Australian higher education sector now has a unified system of national qualifications, which is controlled through the Australian Qualifications Framework. The 'Bradley Review' published in 2008 (Bradley et al., 2008) set new goals for expansion of access to university education and linked these to university funding. This, together with the currently proposed changes to the government funding model for tertiary education, has produced a period of change and uncertainty in the sector. However the current climate has also brought a renewed focus to the issues associated with higher education access, retention and progression.

It is widely established that different institutions have differences in student cohort make-up (see Chapter 7 for further discussion). One significant variation is the level of academic capital that commencing students generally possess. This level of academic capital is represented by a student's Australian Tertiary Admission Rank (ATAR), or in Queensland their Overall Position (OP) ranking. The remarkably uneven distribution of this capital is shown in Figure 5.1, Destination of OP 1-3 students commencing university (where a rank of OP 1-3 represents the highest achieving secondary school students).

The universities represented in Figure 5-1 are:

- University of the Sunshine Coast (USC)
- University of Southern Queensland (USQ)
- University of Queensland (UQ)
- Queensland University of Technology (QUT)

- James Cook University (JCU)
- Griffith University (GU)
- Central Queensland University (CQU)
- Australian Catholic University (ACU)

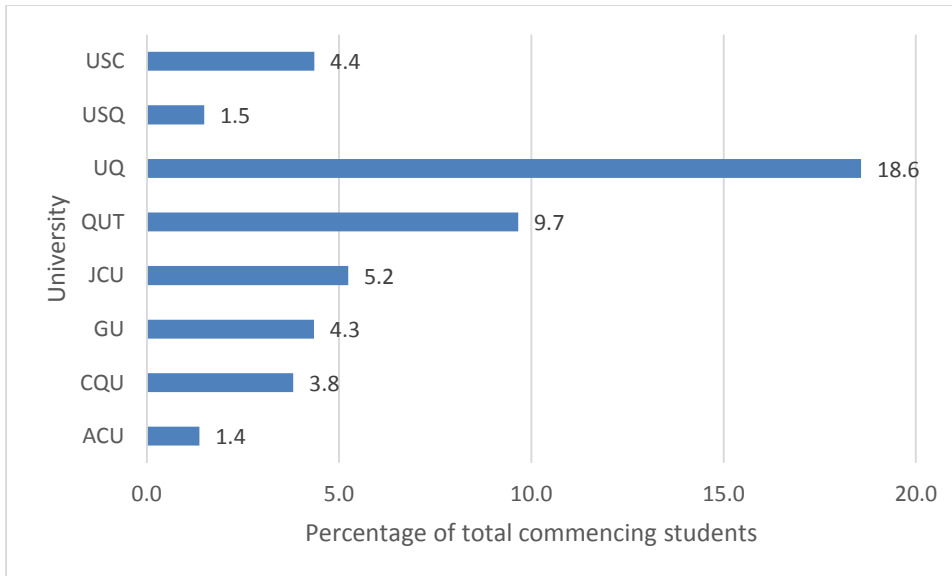


Figure 5-1 Destination of OP 1-3 students (or equivalent rank) commencing university in Queensland, 2013 (data sourced from DoE)

The data set shows that the highest achieving students are attracted predominantly to Queensland’s most prestigious university, the University of Queensland. It is not unreasonable to postulate that this distribution is correlated to the image of the various institutions. The public perceptions of education standards and level of learning support will likely vary with the public identity presented by institutions and influence student choices when applying for and entering university. Student choices and their perspectives are further discussed in Chapter 8. The various institutional identities, as evidenced by the way individual universities present themselves to the public, is explored in this chapter.

Australian universities have widely varying individual histories, operate in diverse contexts and have differing traditions, missions and goals. All of these factors affect public perception, or identity, and the way in which widening participation is approached by individual universities. It is useful to consider the different types of universities in Australia and the contexts in which they operate.

5.2.1 Formal Australian university groupings

Several formal groupings of higher education institutions in Australia exist, these have been established in order to promote the common interests of the member universities (website). The alliances have been formed between institutions that operate in similar socio-political contexts and represent institutions that have similar historical contexts and similar levels of research intensity. Parallels can be drawn with similar groups that have formed in the UK to advance the common interests of their members.

Given that each Australian group's members have background similarities that led to their formation, each group has some defining characteristics are described below.

Regional Universities Network (RUN)

Founded in 2011, this group comprises six universities which are regionally located:

- Central Queensland University (Rockhampton, Qld)
- Southern Cross University (Lismore, NSW)
- Federation University Australia (Ballarat, Vic)
- University of New England (Armidale, NSW)
- University of Southern Queensland (Toowoomba, Qld)
- University of the Sunshine Coast (Sippy Downs, Qld).

Although many metropolitan universities also have campuses located in regional cities the members of this grouping have their headquarters in regional centres, as shown in the list above. The network members have a shared commitment to building community and economic capacity in their respective regions, thereby contributing to Australia's national success. Activities undertaken by members such as education, research, skill building, social and cultural events are focussed on the regions and regional issues. The member universities enrol relatively high numbers of under-represented groups, such as Low-SES, Indigenous and regional and remote students, in higher education. A significant proportion of RUN students are studying externally (RUN, 2015).

Group of Eight (Go8)

The Group of Eight (Go8, 2015a) describes itself as a coalition of “*Australia's leading research universities*”. Its purpose is to advance the interests of its member institutions through activities such as influencing national higher education and research policies, network building and “sustaining quality brand recognition” (Go8, 2015b). The Group of Eight universities are the most research intensive of the Australian universities and attract the highest levels of research income.

The eight member institutions are the oldest universities established in the Australian mainland state capital cities and Canberra. Each of these institutions offers engineering programs.

This group describes itself in terms of the members’ high levels of research output and income, the professional and academic status of their graduates and staff and the fact that they attract the highest performing Australian school students (Go8, 2015b). These universities each have high accumulations of academic and socio-economic capital (Moodie, 2014) together with a strong appreciation of the value of their reputational capital (Go8, 2014).

The group of eight member universities are:

- The University of Sydney (NSW, founded 1850)
- The University of Melbourne (Vic, 1852)
- The University of Adelaide (SA, 1874)
- The University of Queensland (Qld, 1909)
- The University of Western Australia (WA, 1913)
- The Australian National University (ACT, 1946)
- The University of New South Wales (NSW, 1949)
- Monash University (Vic, 1958)

These universities are consistently ranked the highest of Australian universities in university league tables (see for example, QS University Rankings, 2015). They acknowledge the comparative quality of other members’ programs through group credit transfer and foundation program agreements.

The Go8 links research outcomes and standing to teaching and learning and specifically note that “students from disadvantaged backgrounds have better outcomes in terms of retention and success at Go8 universities” (Go8, 2015b). It should be noted that the proportion of students accessing these universities from disadvantaged backgrounds is significantly less than other universities (see Chapter 6) and possess high academic skills.

Innovative research universities (IRU) (1960-70s unis)

The Innovative Research Universities (IRU) group is a network of six universities which collaborate to enhance opportunities for stakeholders. In particular they work together to influence public policy, establish research concentrations and to generate investment across the member universities. They have established knowledge sharing networks for topics such as professional development, e-learning and new information and communications technology (IRU, 2015a). This group refers to its members as comprehensive universities, engaged in world class research. The member universities are located in every mainland state of Australia and the Northern Territory and some operate campuses and centres in a number of global locations. Campuses are located in outer metropolitan suburbs and regional centres.

The member universities have a common background in that they were established as research universities during the 1960 – 1970’s, This was a period of rapid expansion of the higher education sector in Australia in response to increasing demand from the baby-boomer generation. These new universities were established during a time of extensive innovation in educational design and delivery, hence the use of the term ‘innovative’. They have a tradition of a strong focus on teaching and learning. Collectively they enrol approximately 15 percent of Australian university students, and each has a significant proportion of ‘equity group’ students (IRU, 2015b).

The six current IRU member universities are:

- Flinders University (SA)
- Griffith University (Qld)
- La Trobe University (Vic)
- Murdoch University (WA)
- James Cook University (Qld)

- Charles Darwin University (NT)

The University of Newcastle left the network at the end of 2014 and Macquarie University was also a member until 2008.

The IRU member universities collectively enjoy relatively high international rankings (See for example, QS University Rankings, 2015), their members are generally positioned in the group below the Go8 member rankings.

Australian Technology Network (ATN)

The Australian Technology Network (ATN) of universities comprises five member universities which share a common background in that they were Institutes of Technology or Colleges of Advanced Education, prior to being granted university status in the late 1980s (ATN, 2015a). Many of these institutions had a history of working together through the DOCIT group (Directors of Central Institutes of Technology) (Moodie, 2014).

These institutions share a common focus on the practical application of tertiary studies to produce graduates ready to enter their profession. The ATN universities collectively enrol approximately 20 percent of Australia's university students and almost 25 percent of international students enrolled in Australian universities (ATN, 2015b), including 28 percent of engineering enrolments (ATN, 2015a).

The network members have a strong focus on industry linkage and collaboration, as well as a commitment to access and equity. They state that they have developed a strong reputation in the areas of practice-based learning, flexible and online delivery and collaborative research (ATN, 2015b). Graduates outcomes and research are closely aligned with the needs of industry and are aimed at delivering 'practical results through focussed research' (ATN, 2015b).

The member universities of this network are:

- Curtin University (WA)
- University of South Australia (SA)
- RMIT University (Vic)
- University of Technology Sydney (NSW)

- Queensland University of Technology (Qld)

The ATN universities also enjoy mid-range international rankings, similar to those of the IRU network.

New Generation Universities (NGU)

This university grouping has now been formally disbanded however, for the purposes of describing the variety of institutions on the Australian landscape, it is included in this discussion. The grouping was formed in 2002 by ten ‘new’ universities and was disbanded in 2007 (Australian Education Network, 2015). These universities were existing Colleges of Advanced Education which received university accreditation in about 1987 (Moodie, 2014), under the tertiary sector reforms of the time. Although they are collectively referred to a ‘new’ universities some have long histories of tertiary education prior to achieving university status which helps present a cohesive and strong institutional identity.

The member universities at the time of disbanding were:

- Australian Catholic University (multiple states)
- Central Queensland University (Qld)
- Edith Cowan University (WA)
- Southern Cross University (NSW)
- Victoria University (Vic)
- University of Ballarat (Vic)
- University of Canberra (ACT)
- University of Southern Queensland (Qld)
- University of the Sunshine Coast (Qld)
- University of Western Sydney (NSW)

Although these universities share some history and demographic characteristics with the ATN group, they are generally ranked lower on world ranking scales and do not have a collective political voice or focus on research.

5.3 University classifications

Although the formal university groupings discussed above are useful and represent some of diversity of institutions in Australia the listing is not comprehensive. For the purposes of groupings which are useful for analysis of student enrolments and strategy a modification of these formal groupings is suggested.

5.3.1 *Extending formal groups to university typing*

Moodie (2014) proposed a rearrangement of the formal groupings to form five informal categories of Australian universities for this purpose. Based on institutional history, geography, social context and political imperatives he suggested the following modifications to the formal groupings to form a set of university typings, as shown in Table 5-1

Regional Universities:

- Charles Sturt University, which is located in Bathurst, shares the regional context, together with the associated imperatives and pressures, of the RUN network
- Moodie (2014) argues that The University of Tasmania, although older and located in a state capital, draws from a smaller state population base and has similar strategies and approach to political lobbying as other regional universities and on this basis should be included with this group
- Although Charles Darwin and James Cook Universities are members of the IRU network they are also regionally located and are better included in the regional group for the purposes of socio-cultural analysis.

Thus he extends the membership of the formal RUN group to a larger group of ‘Regional Universities’.

ATN-like Grouping

Based on Swinburne University of Technology’s origins as technical colleges and its location in the eastern suburbs of Melbourne Moodie nominates this institution as sharing similar characteristics to the ATN group. With this addition the analysis group can be referred to as ‘ATN-like’.

IRU / 1960's – 1970's Universities:

The IRU network membership has changed several times (IRU, 2015a), former members such as Macquarie University and the University of Newcastle still share sufficient characteristics to be included with this group. Moodie also argues that the University of Wollongong, like Newcastle, shares similar demographics, age of establishment, innovative teaching approach and size of research budget with the IRU network. Thus he proposes a new grouping and re-naming to '1960s-1970's universities'. He argues that Deakin also has the characteristics most in common with the IRU group and should be included in this extended grouping.

New Generation Universities

Some of these former member universities are also regional universities. For the purposes of analysis it is convenient to consider only the metropolitan new generation universities. By including only metropolitan former members of the New Generation group a reduced grouping is formed, as shown in Table 5-1.

Table 5-1 Groups of university types, as proposed by Moodie (2014)

ATN-like	Group of Eight	1960s-1970s	New generation	Regional
Curtin	ANU	Deakin	Aus Catholic U	Ballarat
QUT	Monash	Flinders	Bond	Central Qld
RMIT	U of Adelaide	Griffith	Canberra	Charles Darwin
Swinburne	U of Melbourne	La Trobe	Edith Cowan	Charles Sturt
<u>UniSA</u>	UNSW	Macquarie	Notre Dame	James Cook
UTS	U of Queensland	Murdoch	Victoria Uni	Sunshine Coast
	U of Sydney	Newcastle	U Western Sydney	Southern Cross
	UWA	Wollongong		Tasmania
				UNE
				U Southern Qld

5.3.2 Further classification

Ranking of universities is commonly linked to their research intensity and degree of selectivity with respect to student admissions. These elements affect the rankings determined by the publishers of various university league tables or rankings which are periodically produced around the world.

A very broad classification system for discussing the types of universities found in Australia which takes into account student selectivity, was posited by Maclennan, Dundas and Musselbrook (2000), who distinguish two types of universities: “selecting” universities, which are confident of attracting more high achieving students to their programs than they can accommodate, and “recruiting” universities, which compete to attract students to their programs.

Selecting universities are able to choose from a pool of available students and tend to privilege high achieving students, typically entering university from traditional academic backgrounds. Recruiting universities attract fewer of the very high achieving traditional students and accept students from more diverse higher education entry pathways (Wheelahan 2008, 2009, Wheadon and Baker 2014). Wheelahan (2008) suggests that in Australia selecting universities could be considered as the ‘Group of Eight’ universities and all the other universities, while differentiated by varying levels of status and demand, are effectively recruiting universities.

This dual classification was further extended by Moodie (2009) into four ‘tiers’ or sectors of tertiary education. This model was developed in consideration of international as well as Australian tertiary sectors and takes into account formal ranking of universities. Moodie’s (2009) four tiers are described as follows:

Tier 1: ‘World research universities’, defined as universities which are acknowledged as producing significant levels of world class research, as demonstrated by their inclusion in Shanghai Jiao Tong University’s academic ranking of the world’s top 500 (or, more selectively, top 200) universities.

Tier 2: ‘Selecting universities’, defined as those universities, not included in tier 1, which attract two or more applications for every student place to be filled

Tier 2: ‘Recruiting universities’, defined as those universities that do not have the national or even regional standing of selecting universities, usually because they are younger institutions. These institutions typically accommodate a more flexible program delivery and a more diverse student cohort.

Tier 4: ‘Vocational institutions’, defined as enrolling 75% or more of their students in vocational programs such as diplomas or associate degrees in Australia. This tier does not apply to Australian universities, and encompasses the Vocational Education and Training (VET) sector.

These tiers broadly reflect the ranking of universities in the various league tables of universities produced internationally and nationally, and in turn the relative prestige of the universities. The exact differentiation of Australian universities between Tiers 2 and 3 using the application rate criteria suggested is not practicable as even the most selective of Australian universities have an approximately 70% offer rate based on applications for admission (DoE Undergrad offers report 2014).

However, usefully for this discussion, Moodie made explicit links between university tiers, rankings and the institution’s typical student demographic profile, as summarised in Table 5-2 below.

Table 5-2 Four tiers of university classification (from Moodie, 2009, Four Tiers)

Tier	Rank	Research	Selectivity	Class
World research university	SHJT/top 200	Intensive	Extremely selective	Elite
Selecting university	High in national rank	Strong	Highly selective	Weighted to middle-upper
Recruiting university	Middle to low in national rank	Active	Selective—less selective	Weighted to middle-lower
Vocational institute	Unranked	None	Less selective—open entry	Broad

These rankings and classifications are a pseudo measure of a university’s prestige. The highest ranking Australian universities are the oldest, research intensive universities. The prestige and reputation of a university was linked by Cyrene and Grant (2008) to its relative emphasis on student outcomes, research and community service. This emphasis can be explored through an investigation of universities’ mission statements and public image.

5.4 Exploring differing institutional identities

The proposition that the public identity portrayed by universities reflects their preferred position in the higher education landscape is used to explore the capital valued and operationalised by them. Through a discourse analysis of documents

produced by universities for public dissemination an evaluation of the capital most valued, as evidenced by the types of capital discussed and the way in which it is discussed, can be made.

The HE environment is very dynamic; changing regulatory and funding pressures are driving change and revision of priorities in most universities. It is acknowledged that the following discussion relates to a snapshot of institutional capital and values at one point in time (2013) and that the institutional priorities are likely to change. However as with all large institutions, while structure, programs, processes and outcomes can change relatively quickly the underlying values and culture of an institution is generally much slower to evolve. Universities of any age have a rich history and long corporate memory, on which strengths have been built and from which opportunities arise. These histories are not easily or quickly changed.

The sample of universities chosen are listed in Table 5-3, they are each denoted by a reference indicator that was employed for the purpose of analysis and discussion. The university type shown is based on the typing shown in Table 5-1 and a nominal classification, based on the definitions in Table 5-2, is provided for illustrative purposes.

Table 5-3 Sample group of universities chosen for analysis

University reference indicator	Type	Classification
USQ(Case Study Institution)	Regional	Recruiting
Go8-1	Group of Eight	World research university
Go8-2	Group of Eight	World research university
IRU	1960's-1970's	Selecting
ATN	ATN-like	Selecting
NGU-1	New Generation (Regional)	Recruiting
NGU-2	New Generation	Recruiting
RUN-1	Regional	Recruiting
RUN-2	Regional	Recruiting

5.4.1 Go8 identity

The two Go8 universities' publicly available material reinforces and demonstrates the prestigious reputational capital associated with those institutions. The use of the words 'prestige' and 'prestigious' in relation to the institution itself and groups to which the institution belonged was a feature of the public material not seen in

documentation from other universities. Both institutions have national and international influence in terms of industry and government policy. The institutions and their graduates are seen as leaders in academia and in industry. The institution, students and alumni have an implied obligation to use their education for the betterment of society, both locally but also on the international stage.

References to the very high world rankings achieved by the Go8 institutions were prominent in both websites and annual reports. The excellence in research achieved by these institutions is evidenced by the very high levels of funding they attract, international partnerships and prestigious fellowships achieved by staff.

For both Go8-1 and Go8-2 community engagement is discussed in terms of engagement with international communities. Go8-2 reported conferring honorary awards to international figures and Go8-1 characterises community engagement as “partnership ventures with business and industry, professional groups, civil society, government and research partners”.

Multiple references to “the brightest academic minds” (Go8-1) remind readers that these institutions provide opportunities for very high achieving students. Student diversity at the Go8s is primarily discussed in terms of the cohort of international students studying on campus. Each institution has a number of exchange programs and collaborations with international partners. These offer opportunities for both Australian students to study overseas and for groups of international students to study in Australia as part of sponsored programs.

Cultural activities are encouraged and sponsored by both these institutions and include art exhibitions and music concerts. The universities have connections to historically significant buildings and public museums which host exhibitions, concerts, events and public programs. Significant monetary prizes were available as part of the cultural and arts programs, acquisitions of art, both purchased by the university and gifted, were of significant monetary value.

Flexibility for undergraduates is offered by both Go8 institutions through their program offerings. A choice of double degrees and opportunities to accelerate through an undergraduate and post-graduate combination are available.

5.4.2 *The IRU identity*

Review of material associated with the sample university identifying as IRU revealed similarities, in terms of capital and reputational aspirations, to the Go8s. The concept of the institution having a position of influence and developing “tomorrow’s generation of influencers and leaders” was prominent for the IRU. Discussion of the university’s impressive international ranking was also prominent. This institution also showed strong outcomes for ARC grants and fellowships as well as fellowships to Australia’s learned academies, awarded to its staff.

The documentation has students as a slightly more prominent feature; opportunities are provided for “capable” students. This is a slightly broader term than the “high achieving” and “excellent” students who are attracted to the Go8 universities.

The institution specifically refers to education as a benefit to the individual, as well as the wider society, and discussion of student support to achieve their individual goals is also prominent. The student learning experience is supported by student centred learning activities.

Prominent and extensive discussion of learning and teaching and the student experience evidence the institution’s strong commitment to student participation and success.

This institution also specifically acknowledges the need to produce graduates that are ready to participate in the workforce. While the global mobility of students is acknowledged, relationships with industry are discussed in terms of building opportunities for students. (This contrasts with the Go8s who influence industry, partner with industry and receive funding from industry).

The IRU has specific programs for increasing participation and programs specifically developed for Low-SES, Aboriginal and Torres Strait Islander and international students. The documentation discussed the institution’s strong commitment to indigenous students in particular, with specifically designed learning spaces and programs to support the success of these students.

Student support staff embedded in the university's school is a key component of the retention strategy.

5.4.3 The ATN identity

The ATN annual report contrasts sharply with the Go8 and IRU reports in that it opens with a strong statement and discussion regarding the national agenda to increase participation in higher education. The ATN discussion affirms the institutional support of this agenda and discusses its response in terms of a strategy which pre-dates the current national focus. The discussion acknowledges direct financial support to this agenda by staff, through philanthropic donations. This suggests that the culture of support for students from disadvantaged backgrounds is indeed deeply embedded in this institution.

It is only after this discussion about widening participation that comment is made regarding building research capacity, infrastructure developments and outward mobility opportunities for students.

The institution's focus is on state-based contributions, its endeavours are aimed at making a difference for the state and its economy. Statements regarding institutional aspiration relate to positioning in the Australian higher education environment, rather than international standing.

ATN positions itself through its articulated, and reported, values as having a strong social justice agenda and as a client service provider.

Rankings are discussed in terms of the Australian ranking of specific programs rather than international rankings, as this is the area where credit has been accumulated.

5.4.4 The New Generation Universities identity

Of the two new generation universities analysed, NGU-2 is a very well established university, having a long tradition of teacher and other education as a College of Advanced Education prior to achieving university status. NGU-1 is a very new university. As a result of their different historical backgrounds they have very clearly different identities and aspirations.

The discourse from NGU-1 is preoccupied with the continued establishment and growth of the university capacity in terms of its facilities, research initiatives and teaching. A strong focus on students is demonstrated with the university's achievements in the areas of student access and success being given prominent position. Although the institution is naturally striving to become internationally and nationally recognised, through quality education and research, there is a strong community focus and the NGU-1's achievements are seen as bringing the wider benefits of education access and applied research to the community and wider region. Reporting of rankings is confined to the Australian Good Universities Guide, a guide which is focused on information provision to Australian students. The good results in this guide may carry less prestige than international rankings but they fit with the university's characterisation as a provider of quality opportunities for local learners.

Despite very large differences in historic development between NGU-1 and NGU-2, which are made clear in the documentation found in the annual reports and website, there are also similarities in their messages of education as a benefit to the community as well as simply work-readiness training for individual students. NGU-1 discusses the broader community benefits and characterises its practices as "regionally relevant", NGU-2 characterises tertiary study as "not simply an acquisition of knowledge but a transformational education" (NGU-2, Annual report).

NGU-2 has a very strong social justice agenda, which has been built into all of their programs. Students are encouraged to undertake voluntary practical work experience as part of several programs for the benefits of both the community and the student.

The NGU-2 documents discuss the importance of access to higher education, refer to strong programs to provide access to and support for students from severely disadvantaged groups to attend university, and demonstrates pride in the positive impact that this can have on the lives of those students.

Although the NGU group is the most disparate group in terms of background characteristics the sampling undertaken showed universities with strong similarities in terms of the focus on students, student achievement and the positive impact the institution aspires to have on the local community.

5.4.5 The Regional universities identity

The regional universities in the sample had a community focus similar to that seen with the NGUs. There were more references however to issues relating specifically to regional Australia.

The themes of student inclusiveness ran throughout the RUN-1 documentation, indeed this university “defines itself by who it embraces rather than who it excludes” (RUN-1 Annual report). This is demonstrated not only by such statements but elsewhere in the document where individuals, “from culturally and linguistically diverse backgrounds” are invited to contact an interpretation service if they need help understanding the report.

Both RUN-1 and RUN-2 have very clearly articulated values and missions, with social justice and opportunity for students from diverse backgrounds prominent features. Both RUN-1 and RUN-2 have a focus on the community impact that can be achieved through education and on the provision of opportunities for students from diverse backgrounds.

This practical approach to providing opportunities to education is apparent on the strong articulation of alternative entry pathways that RUN-1 has developed. Great pride in the university and its achievements is evinced, the university is characterised by its chancellor and emerging as a ‘great’ university, an appellation that demonstrates an alternative belief in what constitutes ‘great’. RUN-1 does not score highly on international ranking or attract large amounts of prestigious research grant funding, rather it is proud of its strong track record in the provision of student opportunity and the relationship between the university and its communities. The university does enjoy a national and international reputation and although not ranked highly overall it reports very high rankings in the QS international ranking systems for internationalisation, accessibility, online program delivery teaching and facilities. Indicating that RUN-1’s institutional focus on education delivery has been recognised. RUN-2 also has a focus on becoming “great”, with student engagement stated being a key part of this ambition (RUN-2 Annual report).

Performance ‘at a glance’ statistics demonstrate RUN-1’s focus. Sixteen out of twenty statistics cited relate to students; different student backgrounds, graduations,

programs, graduate outcomes and alumni. The other four statistics relate to staff numbers, physical facilities, art works and honorary awards. RUN-2's at a glance statistics also focus on student numbers, albeit the spread across campuses of total and domestic students, the only other statistic cited relates to staff (split by academic and professional staff).

Both institutions report on student engagement and support initiatives, funded both through the Higher Education Participation and Partnerships Programme (HEPPP) programs and Office of Learning and Teaching (OLT) grants relating to widening participation initiatives.

5.5 Public positioning with respect to diversity

This section explores universities' responses to diversity, in particular student diversity, through a sampling of universities from each of the types described above.

The way in which differing institutions discuss flexibility of curricula, community engagement and equity issues was discussed in the preceding section. A closer comparison of initiatives to encourage student diversity and the widening of participation in higher education across the selection of institutions is undertaken here.

5.5.1 Overview

When investigating the programs and services relating to students from disadvantaged groups available at different institutions it became apparent that the level of availability of information was extremely variable. Initial plans to document the types of programs being undertaken under the federal government's Higher Education Participation and Partnerships Programme (HEPPP) were not possible due to variations in the public availability of documentation. The HEPP Programme provided funding, on a competitive grant basis, to universities for programmes specifically aimed at increasing participation, retention and completion rates of students coming from Low-SES backgrounds (Department of Education and Training, 2015). While these programs do not represent the full extent of services and support available to students from diverse backgrounds they represent the latest

innovations and efforts in this area, as an outcome of government student diversification priorities.

One program supported by the Federal Government's HEPPP funding is a collaborative effort by a Widening Participation Consortium of university partners to stimulate interest in tertiary study and to widen participation amongst under-represented groups. This HEPP Programme provides funding for schools outreach and Indigenous engagement initiatives in particular. Seven of the sample institutions are members of this consortium, the initiatives reported under this program have been categorised and tabulated below in Table 5-4 and Table 5-5. These initiatives complement and extend the initiatives already in place at individual institutions and are presented here as an illustration of the areas of current focus. The consortium members have additional programs and initiatives funded under HEPPP, together with pre-existing programs and services, which are not reported here. It should be noted that some institutions have several programs grouped into one category.

Table 5-4 Consortium School Outreach initiatives (data sourced from the Widening Participation Consortium)

	Go8-1	IRU	ATN	NGU-1	NGU-2	RUN-1	RUN - USQ
Campus visits – residential camps /workshops			✓				
Campus visits – experience days	✓	✓	✓	✓	✓	✓	✓
School liason/visits	✓	✓				✓	✓
University/career advice and information – for communities/schools		✓	✓		✓	✓	✓
Targeted parent information/engagement	✓						
Resources for schools		✓					
Mentoring – secondary school students		✓					✓
Academic support & preparation				✓			
STEM initiatives				✓	✓		
Other (non-STEM) school curriculum enrichment initiatives				✓	✓	✓	
Targeting specific under-represented groups (non-Indigenous)		✓					
Accelerated university entry					✓		
Alternative entry program					✓		✓

Table 5-5 Indigenous Engagement (data sourced from the Widening Participation Consortium)

	Go8-1	IRU	ATN	NGU-1	NGU-2	RUN-1	RUN - USQ
Campus visits – residential camps /workshops	✓		✓				
Campus visits & experience days					✓	✓	✓
School liason/visits						✓	✓
University/career advice and information – for communities/schools						✓	✓
Targeted Parent information/engagement					✓		
Resources for schools							
Mentoring – secondary school students					✓		✓
Peer Assisted Learning							
Academic support & preparation	✓						
Employability initiatives							
Retention initiatives							
STEM initiatives							
Other (non-STEM) school curriculum enrichment initiatives							
Targeting specific subgroups						✓	
Accelerated university entry							
Alternative entry program						✓	✓

Some of these initiatives appear to pre-date the consortium, and HEPPP project funding has been used for expansion or refinement of existing programs. Public information regarding the consortium is difficult to locate on all but the Go8-1 and ATN websites. These institutions possibly place a higher value on the consortium as reputational capital but for different reasons. The ATN is the lead institution and the Go8-1 points to this program as evidence of its response to the widening

participation agenda. Other institutions discuss and document the various programs being shared as part of the consortium but do not specifically mention the collaboration in public documents.

As indicated by the different characteristics of the institutions discussed above there is a divide between institutional responses to diversity. Those institutions whose commencing cohorts typically have high levels of academic capital on arrival and whose focus is on world leading research (eg the Go8s) have a different approach to the other institutions sampled. The widening participation agenda is acknowledged and associated programs are promoted in the documents reviewed. The focus is however, generally on recruitment, particularly of Aboriginal and Torres Strait Islander students. Even here recruitment appears to be simply a widening of the existing pool as the requirement for the students to have established academic capital is reinforced:

“The substantial majority of Indigenous students at (Go8-1) obtain entry on their own merit through standard entry processes, and this trend is increasing.” (Go8-1 Indigenous education statement, 2012)

Throughout the Go8 documentation reviewed the use of the word ‘merit’ with respect to student selection and opportunity was used, academic merit is inferred by this. A key component of the Go8-1 widening participation focus is student outreach, a position description for an outreach officer starts with three paragraphs (out of five) describing the status of Go8-1 as a research university before referring to the student equity office and the “mandate to attract the best academically inclined students”.

There also appear to be differing interpretations of the definition of ‘widening participation’ within the Go8 universities, which on occasion is used to refer to ‘student support’. An example is a student support program aimed at supporting the transition of law graduates into the legal workplace being nominated for an award under the ‘widening participation’ category.

These institutions are working hard to raise awareness and understanding of widening participation and student diversity; many (international) guest lectures, seminars, newsletters and formal reports on these topics are available. By contrast, at

the other end of the spectrum in terms of student academic capital (eg regional universities), the term ‘widening participation’ is used less often and the discussion revolves around student engagement and experience; indicating that a diverse student cohort already exists on-campus and, although aspiration raising activities are still considered important as part of outreach, the realities of supporting and retaining students with varying levels of academic capital are more immediate.

This dichotomy is illustrated by a call for staff and student volunteers, made under the banner of diversity, at two different universities; at Go8-1 volunteers are required to “distribute printed information (pamphlets, brochures etc) around campus in order to raise awareness of diversity”, at USQ volunteers are requested to assist with translation services.

5.6 Structured workshop: staff perceptions of diversity

The apparent variation in institutional responses to student diversity with institutional context which was observed in the publication data was triangulated through an exploration of the perceptions of engineering education staff working in a variety of these institutional contexts. This was achieved through data gathering at a structured workshop on student diversity conducted at an Australasian engineering education conference.

A structured framework was used to encourage participants to share ideas and experiences relating to under-represented student groups and student diversity in facilitated breakout groups. Groups then shared their discussions and elaborated on ideas through discussion. Responses and workshop artefacts were collected for further analysis.

Participant groups were formed based on Moodie’s (2014) grouping of university types (Table 5-1) to ensure that members of each participant group were broadly representative of a university type. Four broad institutional types were represented and formed the four working groups: Regional universities, ATN-like universities, Go8 universities and a group from New Zealand universities (see Appendix C for institutions which were represented in each group.). This grouping of participants allowed some general observations to be drawn and compared across institutional contexts.

Data gathered from the workshops included:

- Written individual participant responses to questionnaires, completed at the start and towards the end of the session
- A ‘concept map’ produced by each working group, using butchers paper and ‘post-it’ notes
- Observation and reflection notes made by the four group facilitators and an independent observer.

The data was analysed and coded for emerging themes. These themes were then validated by an inter-coder reliability check (Saljo, 1988) carried out by one of the author’s supervisors plus an independent researcher.

Given that the participants self-selected for the workshop, as a part of an engineering education conference, they represented educators with an interest in learning and teaching issues, and in student diversity. This self-selection, from amongst a conference of engineering educators, has the potential to give results skewed towards a greater understanding and awareness of issues of student diversity than is generally prevalent amongst university staff. Nevertheless, results of the data gathering workshop indicated that there appears to be a whole spectrum of awareness regarding diversity which reflected that found through the document analysis reported earlier.

There were varying levels of sophistication between the groups in the way that diversity was discussed. A divide in the discussion around issues of student diversity was apparent between the Go8 group and the Australian ATN-like and Regional groups. The NZ group generally had the most sophisticated discussion around student diversity.

5.6.1 Go8 workshop group

There was a marked difference between the responses of the Go8 group participants and those of other groups. The outcomes are summarised in point form below:

- Go8 written responses reflected a narrow understanding of many of the dimensions of student diversity, individual responses were able to nominate

only one or two background dimensions of diversity (from such as nationality, SES status, age, gender, sexual orientation)

- Some acknowledged that the cohorts at their institutions are fairly homogeneous
- This group made no acknowledgement of situational diversity, which was identified at other tables (eg part-time study, employment, other commitments, varying academic preparation) or of potential socio-cultural challenges faced by non-traditional students
- Written responses to the question of how to support student diversity tended to be intellectual – referring to research activities and “educating my students about diversity”
 - Suggestions regarding support were limited to extrinsic options; additional programs or tutoring as an ‘add-on’ to regular classes, rather than inclusive educational experiences that are intrinsic to the curriculum. This reinforces a deficit conception of students who need to be “brought up to standard” or moulded to fit a more traditional student model
 - Only academic support mechanisms were discussed
- Verbal discussion was difficult, as indicated by observation and table facilitator reflections and notes. There seemed to be reluctance to articulate ideas and understandings of diversity amongst their group:
 - After prompting a discussion of diversity as relating to ‘LGBT’ (Lesbian, Gay, Bisexual and Trans-sexual)
- Observations suggest an intellectual engagement with diversity issues or a theoretical understanding of the issues, congruent with a disposition towards intellectual inquiry, rather than a lived experience of the academics.
 - Note that prominent academics as guest speakers, seminars and formal reports relating to widening participation and attendant issues were a feature of the Go8 websites
 - LGBT acceptance program is prominent on campus – a very ‘avant-garde’ cause that appeals to liberal progressive *stereotypes* at a traditional university

- Participants displayed a reluctance or inability to verbalise opinions about the issues, suggesting that this is not part of the lived experience of Go8 staff.
 - They are Bourdieu’s “fish in water” (who do not feel the weight of the water around them) in the higher education environment
 - This precludes empathy with socio-cultural issues of non-traditional students
 - The apperception of academics from a traditional background in a traditional university is lacking the past experience of dislocation in such an environment
- There is a willingness to engage with ideas of student diversity in a theoretical sense but no apparent need to engage in a practical sense as part of daily practice:
 - The majority of Go8 students, while they may come from different cultural background, have a high level of academic capital (in the form of high school grades) and relevant cultural capital (understandings of study requirements and the expectations of them made by the institution) before they enter higher education
- The general view of the Go8 group could be summarised by one of their comments, that “we accept the ‘best’ students, regardless of background”, and discussions of a ‘fair go for all’, which is suggestive of treating all students equally, rather than equitably.

5.6.2 Regional and ATN-like workshop groups

These groups were able to articulate the dimensions of diversity much more fully than the Go8 group. They were also able to describe some of the issues faced by students with divergent levels of academic capital entering the higher education classroom. In addition they were able to recognise and acknowledge the deficit conception of diverse incoming students – the idea that students ‘just need to be brought up to the right level’.

They had some difficulties articulating how practical support is offered. This may again be a case of the fish not perceiving the water around them. If classrooms full of students with diverse academic backgrounds are the norm, and the culture of the institution is such that supporting an facilitating the success of all students is part of

daily practice, then it would not be perceived that anything ‘different’ is being done for non-traditional students.

5.6.3 New Zealand workshop group

The NZ group provided a valuable counterpoint to the Australian groups. They tended to have the most sophisticated discussion around diversity and student support. Diversity in the NZ context is heavily tied to the relatively large numbers, and high focus, on Maori and Pacifica students at universities. These groups bring with them many of the other dimensions of diversity, such as Low-SES, regionality, cultural background and varying academic capital.

The NZ tertiary sector has a mature discourse concerning diversity in higher education and has produced cutting edge research on the topics of socio-cultural congruence and empathetic institutions (see for example Zepke & Leach, 2005).

The NZ group was the first to introduce the idea that ‘inclusive teaching practice’ is good teaching practice, which benefits all students, and is a fundamental part of an empathetic institution. Diverse student cohorts appear to be accepted as a part of the academic culture in the NZ universities represented.

5.6.4 Workshop summary

A model of the variations in the student diversity discourse from the workshop data is proposed in Figure 5-2 below. The four quadrants represent varying levels of awareness and understanding of diversity in terms of institutional policy and practice, as displayed by the workshop participants.

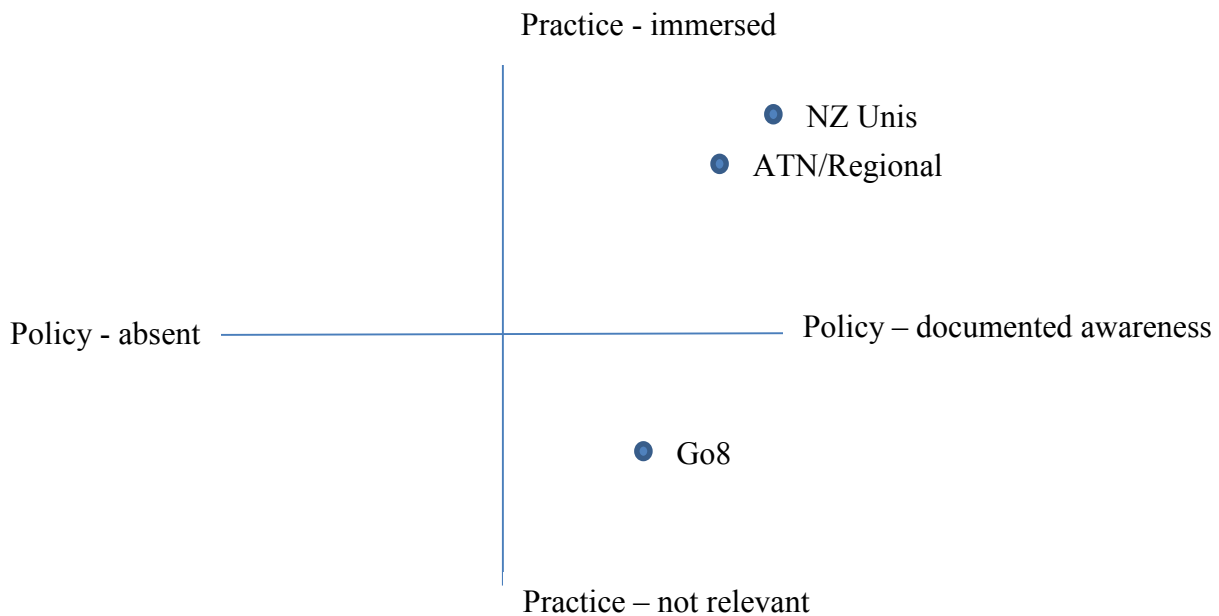


Figure 5-2 A proposed model: policy / practice quadrants

It appears that current government policies and pressures resulting from the Bradley Review (2008) have raised awareness of the widening participation agenda for all institutions. As a result, institutional policies reflect this awareness and have raised the profile of the widening participation discourse amongst the higher education sector.

The Go8 workshop participants demonstrated an awareness of the widening participation agenda but perceived it as an intellectual problem rather than from the perspective of lived experience.

The ATN-like and Regional groups demonstrated an awareness through exposure via daily practice. This is supported by a management focus on the disadvantaged groups who make up large proportions of their student cohort.

The NZ group seemed to have a slightly higher intellectual engagement with the socio-cultural issues faced by non-traditional students.

The results of the workshop are not construed as being representative of the sector, or of groups within the sector. However the findings from this sample of university staff mirror the findings of the discourse analysis of institutional documentation. This

reflection occurred despite the likelihood in the staff sample being skewed towards those who have an interest in issues of diversity and widening participation.

The positioning of non-traditional students as something other than a 'normal student', as observed in the Go8 discourses has the potential to alienate potential students. Archer and Hutchings (2000) noted the potential for institutional documentation to communicate to students a feeling of 'otherness', which can be detrimental to their persistence and aspirations for higher education. Such institutional discourses, which cast non-traditional students as 'other', that can disadvantage these students (Lillis, 1997; Tett, 2000) by reinforcing a disposition that university is 'not for the likes of me' (Bourdieu, 1999).

5.7 Conclusions

While issues of widening participation in higher education and supporting students from diverse backgrounds is firmly on the agenda for Australian universities, there appears to be a wide spectrum of understandings and priorities. The most noticeable feature is a discontinuity between the older, more world renowned Go8 institutions and the others. While the Go8 institutions are responding to the national widening participation agenda, and there is evidence of theoretical or intellectual engagement with diversity and equity issues within these institutions, they appear to be more variable in approach to diversity within these institutions.

At the other end of the spectrum, regionally located universities and newer universities that have backgrounds as technical or advanced education colleges have an embedded knowledge and understanding that is more consistent across institutional documents and the staff profile. These differences are not necessarily surprising given the differences in history and context between these types of institutions. The Go8 institutions are able to select their student intake from amongst an academically high achieving pool of applicants. Their mission is focussed on their ability to influence social policy and transformation at a national and international level, while regionals have a more localised focus on social change.

Table 5-6, (below), is presented as a synthesis of the findings discussed in this chapter. This table represents an interpretive mapping of the types of institutional capital which different Australian university types appear to value most. This

interpretation, based on a sampling of institutions and their documents from each classification, is not exhaustive and does not imply that each university does not possess and value each of these types of capital. Rather, it represents the relative emphasis which appears to be placed on different types of institutional capital based on the data analysed. By mapping the differing types of capital most valued and operationalised it is possible to perceive the differing relative positions occupied by institutions in the higher education landscape.

The history, geography and social context of an institution influence its public identity, priorities, focus and relative strengths. Creating an empathetic institution for diverse student cohorts requires more than the implementation of programs or the documented statements of values. These are important, but an institutional culture (the way in which institutional policies are interpreted and operationalised on a daily basis) is derived from operational history and is more directly determinative of the student experience.

Table 5-6 Summary of findings in terms of relative value placed on institutional capital (based on discourses found in document and workshop analysis)

	G08-1	G08-2	IRU	ATN	NGU-1	NGU-2	RUN-1	RUN-2	RUN-3
International Reputation	✓	✓							
Political and international influence	✓	✓							
Academic excellence	✓	✓	✓						
Academic leadership	✓	✓							
Prestigious associations (individuals and institutions)	✓	✓	✓						
Research funding, grants and awards	✓	✓	✓						
International rankings	✓	✓	✓						
Graduates as leaders of industry and society	✓	✓	✓						
Graduate work readiness				✓	✓			✓	✓
Impact on local region				✓	✓		✓	✓	✓
Impact on broader society / effecting social change			✓	✓	✓	✓			
Industry linkages			✓	✓	✓				
Student self-actualisation						✓	✓		✓
Student satisfaction ratings				✓	✓			✓	✓
Engagement with local community					✓		✓		✓
Social justice				✓			✓		✓
Student engagement				✓	✓		✓	✓	✓
Inclusiveness in curriculum				✓		✓	✓		✓

6 STUDENT DEMOGRAPHICS AT USQ

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 more diverse in their backgrounds, and to have a profile distinct from that of more traditional metropolitan universities.

USQ is a regionally-located distance educator in Toowoomba, 150km west of Brisbane. Students that are attracted to USQ could thus be expected to have a different demographic background to more traditional students. Classroom observations anecdotally suggest that the USQ Engineering students are far more likely to be mature age, employed and studying part-time than engineering student cohorts from the wider university sector. Many engineering students have commenced at USQ through alternative academic entry paths such as the Vocational Education and Training (VET) sector or USQ's access and equity program. Many students are also regionally located and come from diverse socio-economic backgrounds.

In this chapter quantitative data regarding demographic indicators drawn from published national data, is discussed and the profile of USQ's student cohort is situated against data from other universities. A survey to gather finer grained demographic details about the USQ Engineering cohort specifically was also undertaken, and the resulting cohort profile is discussed. These analyses provide evidence to support the anecdotal observation that USQ's student cohort, and the engineering cohort in particular, is very diverse and includes high proportions of traditionally under-represented groups in higher education.

A statistical analysis of the academic performance of engineering students at USQ provides no evidence to suggest that students from social groups which are under-represented in higher education under-perform when compared to the total USQ engineering cohort.

6.1 Approach to investigating student demographics

The selection of USQ as a case study for the investigation of the habituses of non-traditional students was predicated on the observation that it caters to a diverse cohort of engineering students. As part of the research the extent to which the USQ student cohort, and the engineering cohort in particular, is diverse was quantified through the collection and analysis of student demographic data.

The questions explored in order to underpin this part of the research were:

- In what way do the demographic profiles of student cohorts vary by institution type?
- To what extent does the demographic profile of students at USQ exhibit similarities or differences to other institution types?
- What is the broad demographic profile of engineering students at USQ, in terms of non-traditional identifiers?
- Is there a difference in academic performance between students with non-traditional identifiers and those without?

The data collected was restricted to domestic Australian students. Although international student enrolments in Australian engineering programs are rising, the focus of this thesis is under-represented social groups of domestic students. The challenges facing international students are also significant but are beyond the scope of this thesis.

6.1.1 Data collection

Data for the analysis was drawn from three sources: nationally published data reported by all higher education institutions to the Department of Education, USQ's internal databases, and a student survey administered to the USQ Engineering cohort.

Most government statistical reporting on the results of the widening participation agenda 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.

Data on 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 are not directly obtainable from institutional records. A survey of students in the USQ Engineering and Surveying Faculty was used to gather these details.

6.1.2 Nationally published institutional data

The Department of Education (DoE) in Australia regularly publishes data and reports pertaining to higher education students, their backgrounds and their access, participation and retention in the higher education system. The Australian higher education sector’s equity policy framework, which has been in place since the 1990s, facilitates the collection and dissemination of student data pertaining to identified equity indicators.

These equity indicators identify groups that include students who (James et al., 2004):

- Are from Low-SES (socioeconomic status) locations, based on postcode of permanent home residence
- Are from regional and remote locations based on postcode of permanent home residence
- Are from non-English speaking backgrounds (NESB)
- Have a disability
- Identify as indigenous, or
- Are women in non-traditional areas (including women in engineering);

Data retrieved from DoE publications for analysis included only Australian domestic students enrolled at public universities. The most recently available data at the time of analysis was for 2012 with postcode based indexes based on 2011 census data.

This data was used to compare the participation rates of students in the identified equity groups at different university types, and to describe the broad profile of USQ’s student cohort.

6.1.3 Equity indicators used by the Department of Education

Participation rates are calculated as the number of students in an identified equity group as a percentage of all domestic onshore students. The following mechanisms were used when identifying data for participation rates of identified equity groups. Alternative definitions and classifications exist (for example for ‘low-SES’, regional and remote groups) but, for consistency, the definitions discussed briefly below have been used for calculations and reporting throughout this thesis.

Socio-economic categories

The use of the concept of socioeconomic background as a broad indicator of likelihood of attending university is an expedient method of identifying groups who are under-represented and is adopted by the Department of Education (DoE). The measurement of ‘high’, ‘medium’ and ‘low’ socioeconomic status for the purpose of the data used by the DoE is based on the postcode of a student’s home address and data from the 2011 census.

Australian postcodes are identified as Low (bottom 25% of the population), Medium (middle 50%) or High (top 25%) socioeconomic status (SES) by the Australian Bureau of Statistics (ABS) using a set of Socio-Economic Indexes for Areas (SEIFA) (Pink, 2013). The SEIFA indexes used for classifying postcodes by socioeconomic status are the education and occupation indexes. An estimate of the number of ‘Low-SES’ students for higher education reporting purposes is made by counting the number of domestic students whose reported postcode of permanent home location is a Low-SES postcode. (Department of Education, 2014b).

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.

Although this is only a rudimentary approach to identifying the likely socioeconomic status (SES) of an individual it has been shown that people from Low-SES backgrounds are significantly under-represented in higher education (James, 2008b). An indicator of Low-SES is also likely to encompass other indicators of disadvantage.

Regional and remote indicators

The identification of students as coming from a regional or remote area is based on a mapping of the student's home address postcode to the 'MCEETYA' (Ministerial Council on Education, Employment, Training and Youth Affairs) classification (R. Jones, 2004), which defines geographical areas as metropolitan, regional or remote. The MCEETYA codes used by the Department of Education are derived from the Australian Standard Geographical Classification (Australian Bureau of Statistics, 2014) with some adjustments to cater for The Department of Education's special needs (Department of Education, 2014b).

Non-English speaking background (NESB)

The Department of Education Statistics table defines a NESB student as

“a domestic student who arrived in Australia less than 10 years prior to the year in which the data were collected, and who comes from a home where a language other than English is spoken”.

Disability or Indigenous identification

Students self-identify as having a disability or long-term medical condition that affects their studies. This data is available and correlated by the DoE for the purposes of tracking the higher education performance of this student group.

Data from students who self-identify as Aboriginal or Torres Strait Islander when enrolling in higher education is also available and correlated by the DoE for the purposes of tracking the higher education performance of this student group.

Women in non-traditional areas

Although the overall participation of women in higher education exceeds that of men (James et al., 2004) participation in non-traditional areas such as Engineering and Information Technology is low enough for women to be considered an under-represented group. Comparative data for this group was drawn from the 2013 DoE publication of data pertaining to equity groups.

6.1.4 Survey of engineering student backgrounds

The entire cohort of students actively enrolled in USQ's engineering and surveying programs was invited to participate in an online survey in late 2013. Responses identified as coming from international students were excluded from the subsequent database. 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 to ensure confidentiality. Data was de-identified prior to analysis and subsequent reporting. 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 the engineering student cohort than was available through institutional data and national reporting systems. 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. Since, the real test of a survey sample's validity is its representativeness, not just the raw response rates, the data was checked for representativeness before being subjected to a descriptive statistical analysis utilising the SPSS (IBM, 2013) software.

6.2 Results: student demographics of the HE landscape

The variety of understandings and priorities between different types of institution when it came to supporting students from diverse backgrounds, was discussed in Chapter five. In this section, the demographic profiles of students attending these different types of institution is presented. The investigation and analysis used published data about students from identifiable equity groups and revealed that differences in the demographic composition of cohorts between university types were also apparent.

The proportion of students from different equity groups as a percentage of total enrolments at each Australian university is shown in Table 6-1 which shows the percentage of enrolled students who belong to an identified equity group. The table is sorted by university type as identified in Chapter five.

The size of different institutions varies considerably, as shown by the total enrolments for each institution in the right hand column of Table 6-1. To enable analysis based on the relative weighting of equity groups within each university's student cohort, the size of the equity group at each institution is shown as a percentage of that institution's enrolments. These percentages are used for the initial comparative analysis.

It should be noted that students can be counted in more than one category. For example, a female engineering student from a Low SES regional community is counted in three categories.

The largest concentrations of students from a Low-SES geographic area are found at regional universities. Central Queensland University has the highest concentration of this category of student (51% of enrolments) and USQ the second highest (34% of enrolments) nationally. The contrast between the regional and Go8 university types

is very apparent, with Australian National University having the lowest rate of Low-SES enrolments at 3.89%.

High concentrations of equity groups are not confined to regional universities. As can be seen in Table 6-1 the concentrations of the NESB students and women in non-traditional areas are generally higher in the Go8 universities than regional universities. For example USQ has 1.51% NESB students compared to a concentration of 2.99% at its nearest geographical Go8, the University of Queensland (UQ). Likewise the concentration of women in non-traditional areas is 19.55% at USQ and 21.36% at UQ.

Table 6-1 Percentage of domestic students in equity categories (data from DoE 2014), highlighted numbers are discussed above.

University Type/Institution	Low SES (%)	Regional and Remote (%)	NESB (%)	Disability (%)	Women in non-trad areas (%)	Indigenous (%)	Domestic Undergrad Students
Regional Universities (17% Total domestic undergraduate enrolments)							
Charles Sturt University	24.16	50.53	1.50	4.16	13.13	3.04	23,380
Southern Cross University	26.41	61.00	0.59	7.04	17.97	3.34	9,490
University of New England	31.11	50.28	0.64	7.82	15.06	3.00	12,961
Federation University Australia	23.21	72.55	2.78	6.81	12.23	0.82	4,994
Central Queensland University	51.15	63.33	1.83	5.72	18.54	2.50	10,470
James Cook University	25.53	24.34	2.25	6.09	14.54	4.42	11,978
University of Southern Queensland	34.03	53.41	1.51	6.79	19.55	2.25	14,734
University of the Sunshine Coast	15.76	30.61	0.72	6.27	18.16	2.02	7,539
University of Tasmania	29.79	41.34	1.97	9.03	10.23	1.66	16,914
Charles Darwin University	19.15	63.38	3.69	5.51	11.23	6.88	5,958
Go8 Universities (25% Total domestic undergraduate enrolments)							
The University of Sydney	7.53	5.36	3.91	3.69	16.66	0.75	26,999
University of New South Wales	10.21	7.99	4.48	3.19	24.18	1.04	25,483
Monash University	11.80	13.89	4.72	4.19	20.56	0.40	30,429
The University of Melbourne	8.92	14.93	5.04	5.00	28.22	0.61	17,747
The University of Queensland	14.54	17.10	2.99	2.75	21.36	0.87	29,011
University of Western Australia	7.97	12.11	3.56	8.46	29.47	1.02	16,308
The University of Adelaide	16.56	13.55	3.38	8.05	15.81	0.89	14,873
The Australian National University	3.89	13.11	4.15	7.21	19.39	1.03	7,832
1960s - 1970s Universities (23% Total domestic undergraduate enrolments)							
Macquarie University	7.65	5.03	3.98	5.59	22.27	0.88	21,270
University of Newcastle	28.29	12.14	1.02	5.85	11.09	2.67	20,844
University of Wollongong	21.46	23.10	1.09	11.67	15.51	1.72	14,092
Deakin University	12.60	23.75	1.99	6.38	16.24	1.96	28,177
La Trobe University	19.63	34.55	2.83	6.79	15.26	0.55	21,284
Griffith University	15.23	10.64	3.72	4.43	17.89	2.11	26,982
Murdoch University	23.76	20.77	2.74	8.82	21.32	1.27	11,058
Flinders University	24.79	19.40	5.06	7.42	12.65	1.23	12,518
ATN-Like Universities (20% Total domestic undergraduate enrolments)							
University of Technology, Sydney	10.93	3.82	5.54	4.54	25.41	0.91	19,126
RMIT University	13.68	8.70	5.96	5.01	19.36	0.40	23,042
Swinburne Uni of Technology	15.13	14.40	2.75	3.84	19.05	0.46	18,693
Qld University of Technology	13.34	11.22	2.43	3.37	19.64	1.60	29,872
Curtin University of Technology	15.00	15.75	3.87	3.00	17.47	1.23	24,458
University of South Australia	26.86	16.87	4.78	8.17	16.14	1.64	19,214
New Generation Universities (15% Total domestic undergraduate enrolments)							
University of Western Sydney	24.94	4.39	6.57	3.41	17.87	1.39	32,207
Victoria University	19.81	10.58	5.72	5.16	12.61	0.45	15,028
Bond University	7.70	11.47		5.56	13.41	1.44	2,573
Edith Cowan University	14.12	19.77	3.05	5.24	12.68	1.19	16,340
University of Notre Dame Australia	9.26	7.27	0.85	4.64	7.65	0.52	8,596
University of Canberra	7.00	19.25	3.69	5.94	19.85	1.70	9,810
Australian Catholic University	11.84	11.83	2.53	6.63	5.80	1.93	17,550

Boxplots were used to explore the relationship between the type of university and rate of enrolment by equity groups. The median and inter-quartile ranges were used as the measures of centre and spread in this analysis since the distributions within each equity category were not symmetric. A side-by-side boxplot figure for each of the student equity groups is produced and discussed below. Each boxplot shows the median rate of enrolment by equity group students and the spread of those enrolment rates between different types of universities.

The shaded boxes show the inter-quartile range (IQR) of enrolment rates for each group of university types. The median rate for each group is shown as the thick black line dividing the shaded box and the upper and lower parts represent the upper (75%) and lower (25%) quartiles. The whiskers above and below the boxes extend to the approximate maximum and minimum of results, representing the upper and lower 25% of results. Outliers and extreme results are excluded from the calculation of these maxima and minima. For the purposes of this analysis, and in line with the default SPSS calculations, a data point is considered an outlier if its deviation above the upper quartile or below the lower quartile is more than 1.5 times the IQR. (Denoted on the plots with ○.) A point lying 3 times the IQR above the upper quartile or below the lower quartile is considered an extreme result (denoted on the plots with ★).

Tables of descriptive statistics for each equity group are also presented with each plot for each university type.

Based on the 2013 DoE data, regional universities have a higher proportion of students from disadvantaged backgrounds enrolled than most other universities. This is demonstrated by the proportion of enrolled students with a 'Low-SES' indicator (based on postcode). The median proportion of students who are from Low SES backgrounds for all Australian universities is 15.2% (mean 18.1%). Regional universities have a median of 26.0 % (and average of 28.0%) of students coming from Low-SES locations. USQ has approximately 34% of enrolled students who have a Low-SES background.

In order to compare these apparent differences in the rate of equity group enrolments at different university types, a one way analysis of variance (ANOVA) was also

conducted for each of the six equity group measures. A Tukey post-hoc test was also performed for each equity group in order to make pairwise comparisons between the university types. This enabled the identification of mean enrolment rates at different university types that were significantly different to each other (which groups are different). Tukey’s method is considered a conservative method for unequal sample sizes and was conducted with a 95% confidence interval (Taylor, 2010).

6.2.1 Low-SES students

Figure 6-1 illustrates the spread of distribution of students coming from a Low-SES background for different types of institution. The proportion of Low-SES students at each of the different university types is used in this summary to adjust for the large differences in total university enrolments and so give a more meaningful comparison. Although variances exist amongst universities in each category, looking at Table 6-2 with the 95% confidence interval, Low-SES numbers are significantly higher at Regional universities than Go8 and New Generation universities, and higher than the ATN-like group.

Table 6-2 Descriptive statistics: Proportion of Low-SES students by university typing, 2013

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
					Regional	10		
Go8	8	10.18	4.06	1.44	6.78	13.57	3.89	16.56
ATN-Like	6	15.82	5.61	2.29	9.93	21.72	10.93	26.86
1960s-70s	8	19.17	6.89	2.44	13.41	24.94	7.65	28.29
New Gen	7	13.52	6.67	2.52	7.35	19.70	7.00	24.94
Total	39	18.07	9.47	1.52	15.00	21.14	3.89	51.15

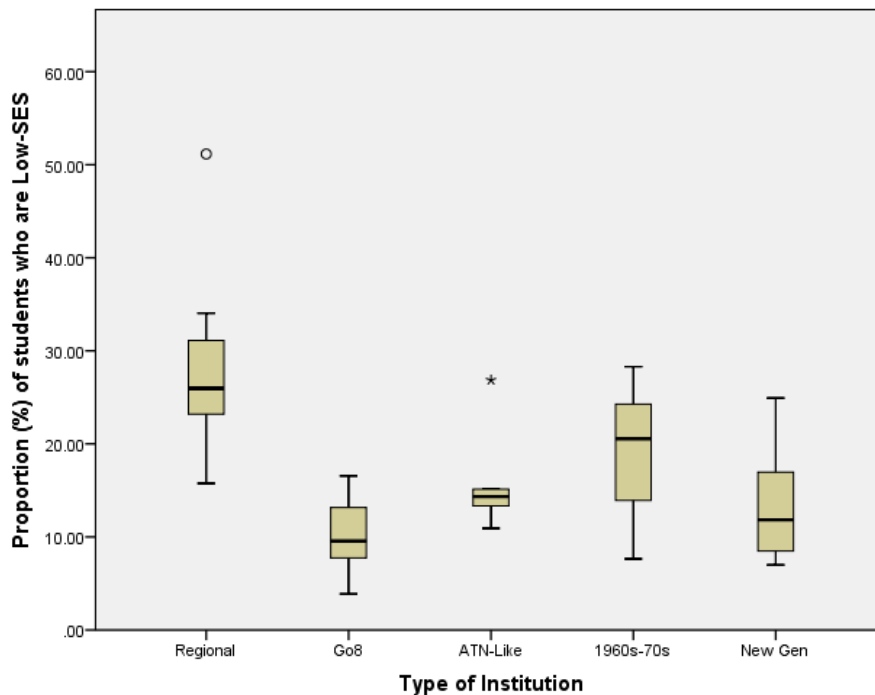


Figure 6-1 Proportions of Low-SES enrolments for differing university types, 2013 (Median and Interquartile ranges depicted)

The Low-SES initial boxplots indicated that regional universities appear to have higher rates of enrolment for students coming from Low-SES backgrounds. This was supported by the ANOVA which shows a significantly higher mean enrolment of Low-SES students at regional universities (Figure 6-2) compared to all but the 1960's-70's university group. The pairwise comparison (Table 6-3) confirms that the mean enrolment of Low-SES students at regional universities is significantly higher, at the 95% confidence interval, than all university types other than the 1960's -70's universities. This type of university is not significantly different to any other university type.

It is possible that relatively high rates of enrolment by Low-SES students in regional universities are a result of the geographical location of regional universities in or near postcodes which are classed as 'Low-SES'. In Australia, students do not tend to travel far from their home location to attend university in the same numbers as they do in, say, the United States. This tendency to study 'close to home' is possibly

exaggerated for students of Low-SES backgrounds who are regionally located, due to the financial pressures of relocating to a metropolitan institution.

In addition, most of the established distance programs are offered by regional universities. This type of program, particularly in part-time mode, could be attractive to Low-SES students from metropolitan areas, as it offers the opportunity to maintain full-time employment.

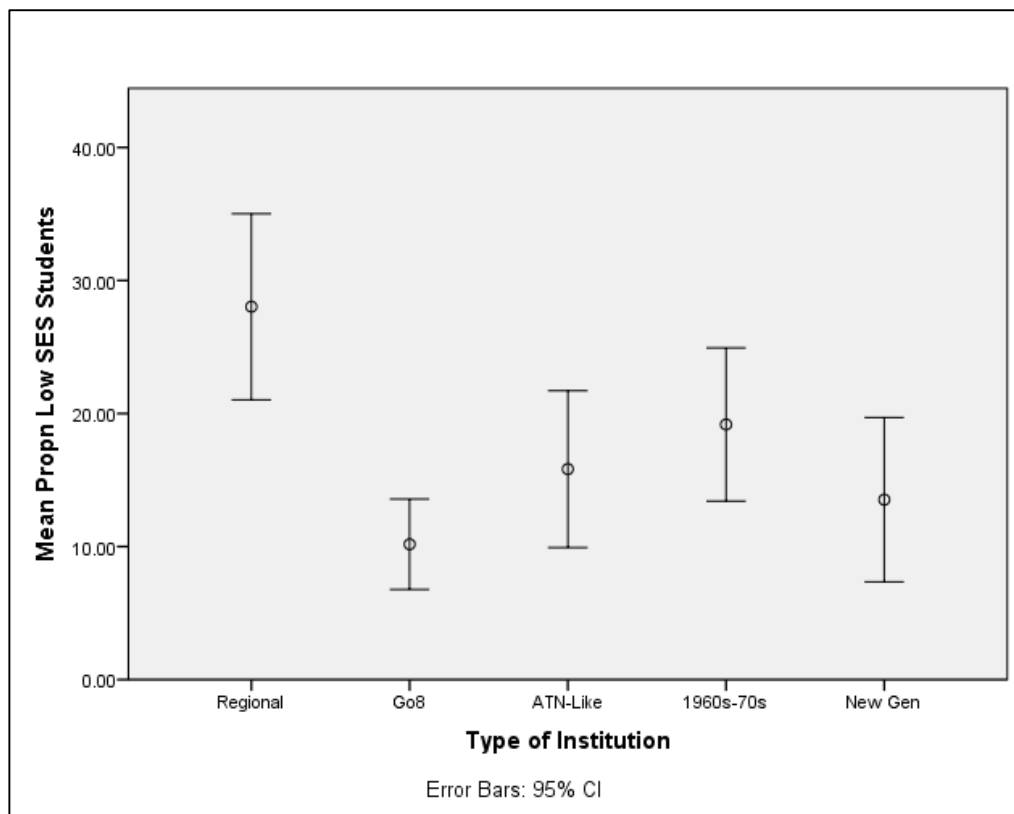


Figure 6-2 Mean proportion of Low-SES students by type of university (95% Confidence Intervals)

Table 6-3 ANOVA: Proportions of Low-SES students at different university types

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1675.1	4	418.8	8.22	0.000
Within Groups	1733.1	34	51.0		
Total	3408.1	38			

Multiple Comparisons

Dependent Variable: Proportion Low-SES students

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	17.9*	3.39	0.000	8.10	27.60
	ATN-Like	12.2*	3.69	0.018	1.59	22.82
	1960s-70s	8.9	3.39	0.090	-0.90	18.61
	New Gen	14.5*	3.52	0.002	4.37	24.64
Go8	Regional	-17.9*	3.39	0.000	-27.60	-8.10
	ATN-Like	-5.6	3.86	0.592	-16.75	5.46
	1960s-70s	-9.00	3.57	0.110	-19.80	1.28
	New Gen	-3.35	3.67	0.893	-13.99	7.29
ATN-Like	Regional	-12.21*	3.69	0.018	-22.82	-1.59
	Go8	5.65	3.86	0.592	-5.46	16.75
	1960s-70s	-3.35	3.86	0.906	-14.46	7.75
	New Gen	2.30	3.97	0.977	-9.14	13.73
1960s-70s	Regional	-8.85	3.39	0.090	-18.61	0.90
	Go8	9.00	3.57	0.110	-1.28	19.27
	ATN-Like	3.352	3.86	0.906	-7.75	14.46
	New Gen	5.656	3.70	0.551	-4.99	16.29
New Gen	Regional	-14.51*	3.52	0.002	-24.64	-4.37
	Go8	3.35	3.70	0.893	-7.29	13.99
	ATN-Like	-2.30	3.97	0.977	-13.74	9.14
	1960s-70s	-5.65	3.70	0.551	-16.29	4.99

*. The mean difference is significant at the 0.05 level.

Proportion of Low-SES students

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05	
		1	2
Go8	8	10.18	
New Gen	7	13.52	
ATN-Like	6	15.82	
1960s-70s	8	19.18	19.18
Regional	10		28.03
Sig.		0.126	0.136

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.581.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.2.2 Regional and remote

Table 6-4 and Figure 6-3 provide information on the proportion of regional and remote students by university type. As expected, the Go8 institutions exhibit the lowest proportion and the regional group the highest.

Table 6-4 Descriptive statistics: Proportion of Regional and Remote students by university typing, 2013

Proportion of Regional and Remote students

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Regional	10	51.08	15.26	4.83	40.16	61.99	24.34	72.55
Go8	8	12.25	3.81	1.35	9.07	15.44	5.36	17.10
ATN-Like	6	11.79	4.93	2.01	6.61	16.97	3.82	16.87
1960s-70s	8	18.67	9.23	3.26	10.96	26.38	5.03	34.55
New Gen	7	12.08	5.71	2.16	6.80	17.36	4.39	19.77
Total	39	23.42	18.95	3.03	17.28	29.57	3.82	72.55

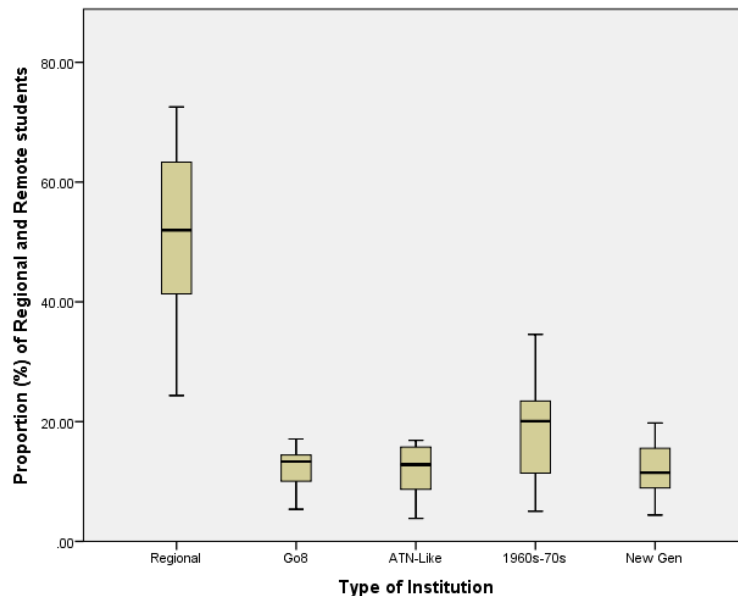


Figure 6-3 Proportions of Regional and Remote students by differing university Types, 2013 (Median and Interquartile ranges depicted)

As expected, Figure 6-4 and Table 6-5 show that the mean enrolment of regional and remote students is higher at regional universities than any other university type,

with no overlap of error bars. This difference is statistically significant at the 95% confidence interval.

This is not unexpected, given the geographical position and history of regional universities. As discussed in relation to Low-SES students, regional universities offer the opportunity for rural and regional students to study close to home. This is potentially more attractive for both financial and social reasons than re-locating to a metropolitan area to pursue studies. It is also possible that remote students are attracted to smaller regional universities or the possibility of distance study offered by many of those institutions.

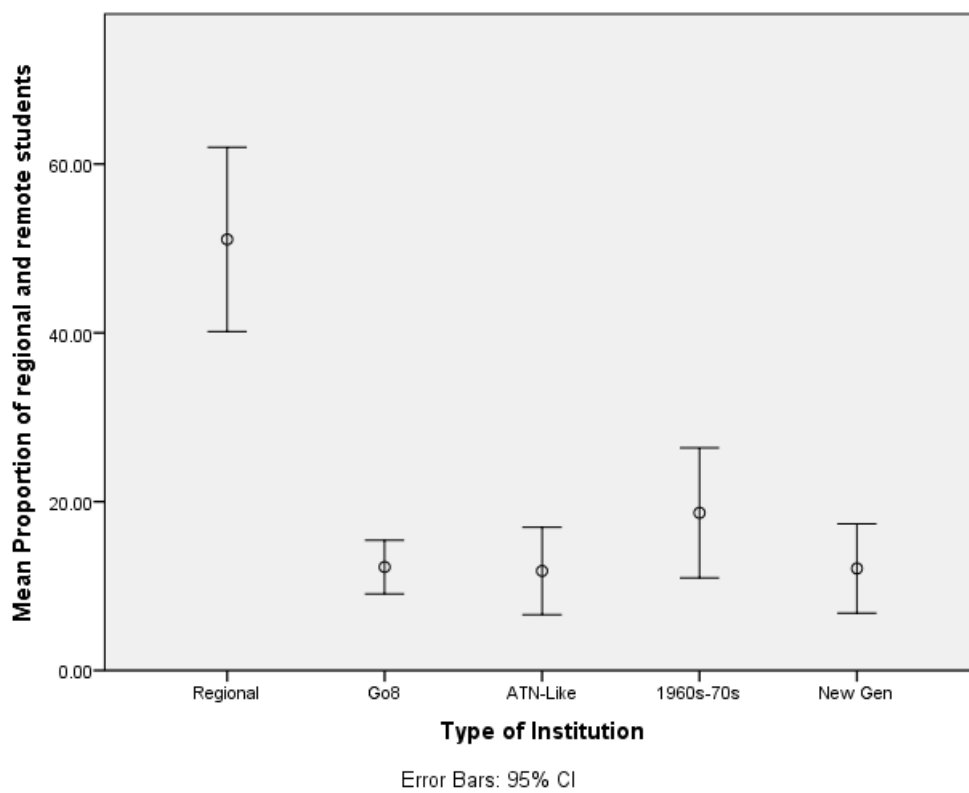


Figure 6-4 Mean proportion of regional & remote students by type of university (95% Confidence Intervals)

Table 6-5 ANOVA: Proportions of regional & remote students at different university types

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10538.0	4	2634.5	28.80	0.000
Within Groups	3110.4	34	91.5		
Total	13648.3	38			

Multiple Comparisons

Dependent Variable: Proportion Regional and Remote students

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	38.82*	4.54	0.00	25.76	51.89
	ATN-Like	39.28*	4.94	0.00	25.06	53.51
	1960s-70s	32.40*	4.54	0.00	19.34	45.47
	New Gen	39.00*	4.71	0.00	25.42	52.57
Go8	Regional	-38.82*	4.54	0.00	-51.89	-25.76
	ATN-Like	0.46	5.17	1.00	-14.41	15.34
	1960s-70s	-6.41	4.78	0.67	-20.19	7.35
	New Gen	.17500	4.95016	1.000	-14.08	14.43
ATN-Like	Regional	-39.28367*	4.93915	0.00	-53.51	-25.06
	Go8	-.46167	5.16548	1.00	-15.34	14.41
	1960s-70s	-6.87917	5.16548	0.67	-21.75	8.00
	New Gen	-.28667	5.32126	1.00	-15.61	15.04
1960s-70s	Regional	-32.40450*	4.53690	0.00	-45.47	-19.34
	Go8	6.41750	4.78231	0.67	-7.35	20.19
	ATN-Like	6.87917	5.16548	0.67	-8.00	21.75
	New Gen	6.59250	4.95016	0.67	-7.66	20.85
New Gen	Regional	-38.99700*	4.71350	0.00	-52.57	-25.42
	Go8	-.17500	4.95016	1.00	-14.43	14.08
	ATN-Like	.28667	5.32126	1.00	-15.04	15.61
	1960s-70s	-6.59250	4.95016	0.67	-20.85	7.66

*. The mean difference is significant at the 0.05 level.

Proportion regional and remote students

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05	
		1	2
ATN-Like	6	11.79	
New Gen	7	12.08	
Go8	8	12.26	
1960s-70s	8	18.67	
Regional	10		51.08
Sig.		0.632	1.00

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.581.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.2.3 Non English speaking background (NESB)

Table 6-6 and Figure 6-5 describe the distribution of NESB students by institution type. The lowest proportion of NESB students are found in the Regional group, with highest concentrations occurring in the metropolitan Go8 and ATN-like universities.

Table 6-6 Descriptive statistics: Proportion of NESB students by university typing, 2013

Proportion of NESB students

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Regional	10	1.75	0.99	0.31	1.04	2.46	0.59	3.69
Go8	8	4.03	0.70	0.25	3.44	4.62	2.99	5.04
ATN-Like	6	4.22	1.45	0.59	2.70	5.75	2.43	5.96
1960s-70s	8	2.80	1.42	0.50	1.62	3.99	1.02	5.06
New Gen	6	3.74	2.11	0.86	1.52	5.95	0.85	6.57
Total	38	3.15	1.60	0.26	2.63	3.68	0.59	6.57

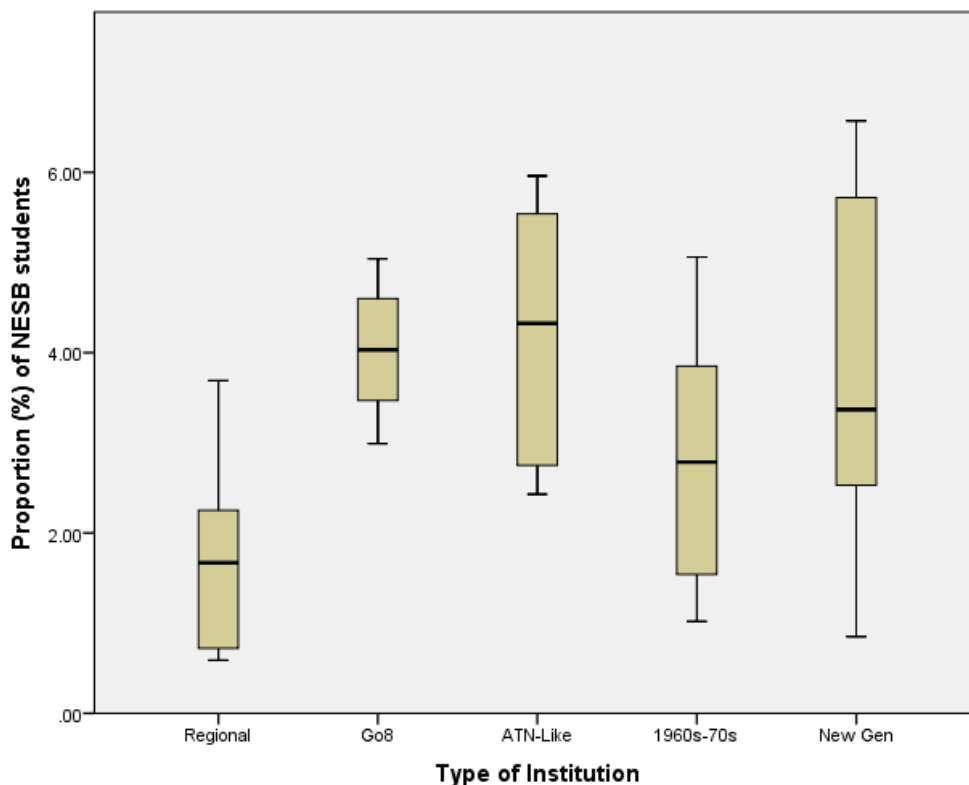


Figure 6-5 Proportions of NESB students by differing university Types, 2013 (Median and Interquartile ranges depicted)

The mean enrolments of NESB students is lower at regional universities than at other types of universities, with some overlap of error bars (Figure 6-6). The pairwise comparison, Table 6-7, confirms that the overlap in error bars between Regional and the 1960's-70's and New Generation universities causes the mean differences to not be significant. There are significant differences between the Regionals and both the Go8 and ATN-like universities.

These figures are for domestic student enrolments, so they do not account for rates of international students. Domestic NESB students would typically be from second generation migrant communities. Higher concentrations of migrant based communities in metropolitan areas together with a greater prevalence of tertiary education in metropolitan areas probably contributes to the higher rates of NESB students in metropolitan universities.

Changing government policies with regards to migrant relocation in recent years have resulted in migrant communities becoming more common in regional areas. It will be interesting to see whether in coming years, as communities become more settled and children progress through the Australian education system, the rate of NESB attendance at regional universities increases.

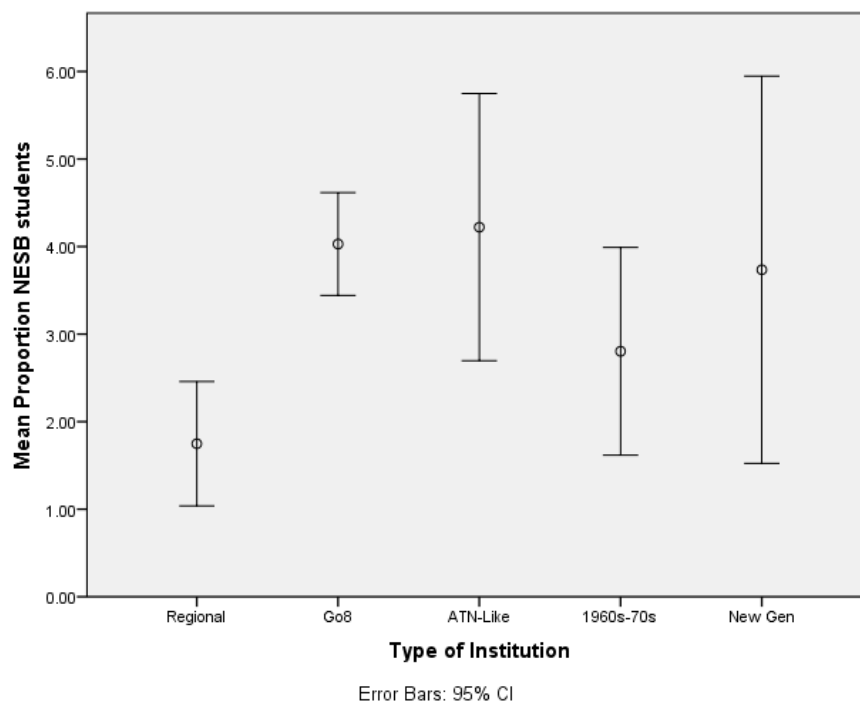


Figure 6-6 Mean proportion of NESB students by type of university (95% Confidence Intervals)

Table 6-7 ANOVA: Proportions of NESB students at different university types

Proportion NESB students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	35.74	4	8.93	4.98	0.003
Within Groups	59.24	33	1.80		
Total	94.97	37			

Multiple Comparisons

Dependent Variable: Proportion NESB students

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	-2.28*	0.64	0.01	-4.11	-0.45
	ATN-Like	-2.47*	0.69	0.01	-4.47	-0.48
	1960s-70s	-1.06	0.64	0.47	-2.89	0.78
	New Gen	-1.99	0.69	0.05	-3.98	0.01
Go8	Regional	2.28*	0.64	0.01	0.45	4.11
	ATN-Like	-0.192	0.72	1.00	-2.28	1.89
	1960s-70s	1.22	0.67	0.38	-0.71	3.16
	New Gen	0.29	0.72	0.99	-1.79	2.38
ATN-Like	Regional	2.47*	0.69	0.01	0.48	4.47
	Go8	0.19	0.72	1.00	-1.89	2.28
	1960s-70s	1.41	0.72	0.32	-0.67	3.51
	New Gen	0.48	0.77	0.97	-1.74	2.72
1960s-70s	Regional	1.06	0.64	0.47	-0.78	2.89
	Go8	-1.23	0.67	0.37	-3.16	0.71
	ATN-Like	-1.42	0.72	0.31	-3.50	0.67
	New Gen	-0.93	0.72	0.70	-3.02	1.16
New Gen	Regional	1.99	0.69	0.05	-0.01	3.98
	Go8	-0.29	0.72	0.99	-2.38	1.79
	ATN-Like	-0.49	0.77	0.97	-2.72	1.74
	1960s-70s	0.93	0.72	0.70	-1.16	3.02

*. The mean difference is significant at the 0.05 level.

Proportion NESB students

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05	
		1	2
Regional	10	1.75	
1960s-70s	8	2.80	2.80
New Gen	6	3.74	3.74
Go8	8		4.03
ATN-Like	6		4.22
Sig.		0.056	0.28

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.317.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.2.4 Women studying in non-traditional areas

Table 6-8 and Figure 6-7 document the distribution of women studying non-traditional programs. As with the NESB students the highest concentrations are found in the metropolitan G08 and ATN-like institutions and the lowest found in New-Generation and Regional institutions.

Table 6-8 Descriptive statistics: Proportion of Women studying in non-traditional areas, by university typing, 2013

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Regional	10	15.06	3.34	1.06	12.68	17.45	10.23	19.55
Go8	8	21.96	5.01	1.77	17.77	26.14	15.81	29.47
ATN-Like	6	19.51	3.18	1.30	16.17	22.85	16.14	25.41
1960s-70s	8	16.53	3.88	1.37	13.29	19.77	11.09	22.27
New Gen	7	12.84	5.02	1.90	8.19	17.48	5.80	19.85
Total	39	17.06	5.07	0.81	15.42	18.71	5.80	29.47

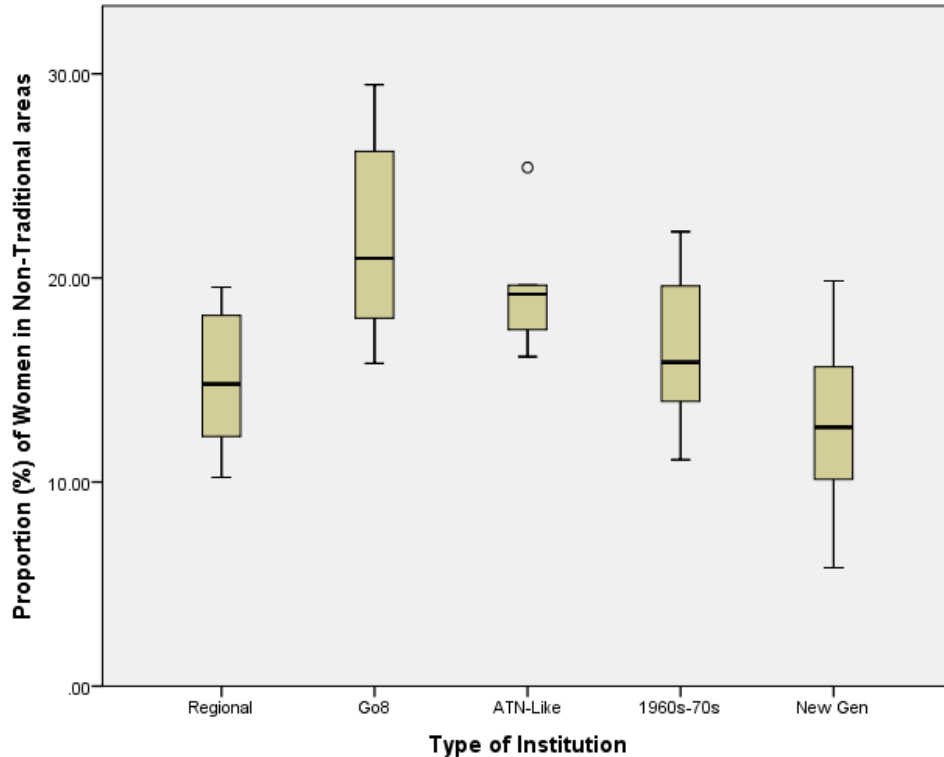


Figure 6-7 Proportions of Women studying in non-traditional areas, by differing university Types, 2013 (Median and Interquartile ranges depicted)

The mean enrolment of women studying in non-traditional areas is lower at regional universities than at any other type of university besides New Generation (Figure 6-8). The ANOVA (Table 6-9) confirms that non-traditional female enrolments are significantly different between regional and Go8 universities but the difference is not significant between regionals and other types of university, at the 95% confidence level.

It is not clear why females studying engineering and other non-traditional subjects are found in lower concentrations at regional universities. There is some evidence (James et al., 2004) that women from regional areas are more likely to relocate to metropolitan areas to study, regardless of discipline. There could be many social factors involved in this phenomenon and this is worthy of further study.

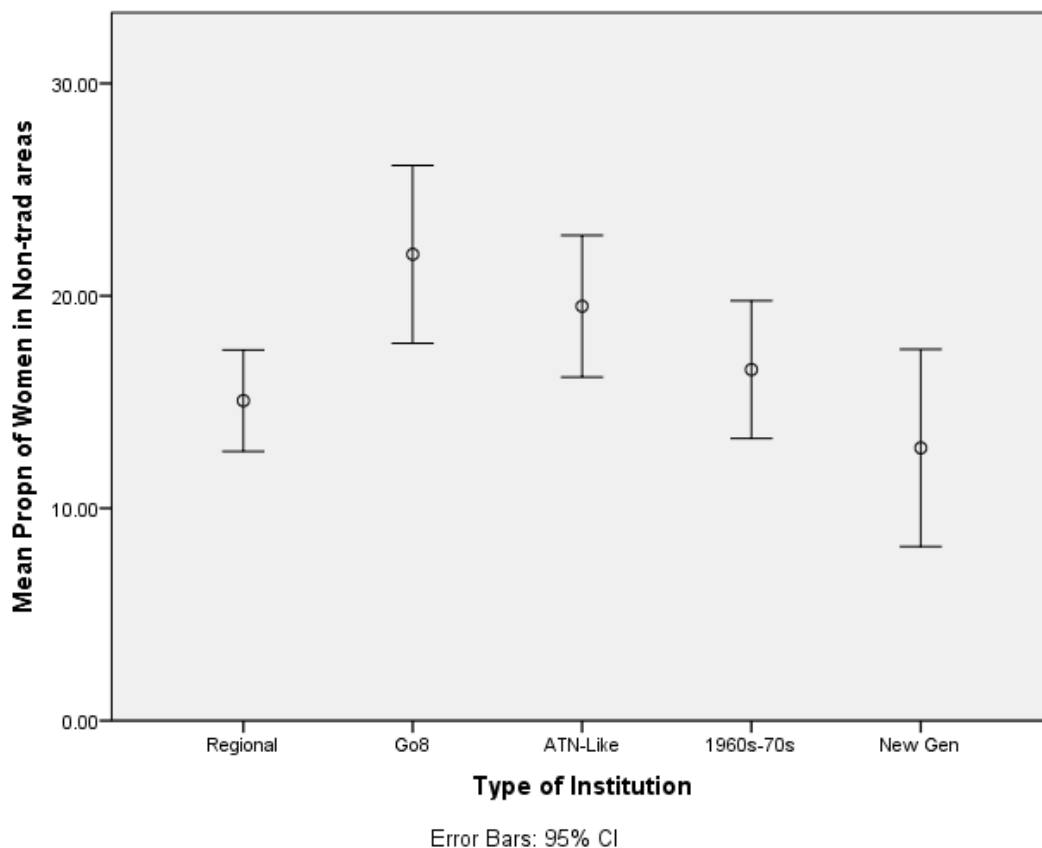


Figure 6-8 Mean proportion of Women studying non-traditional areas, by type of university (95% Confidence Intervals)

Table 6-9 ANOVA: Proportions of Women studying non-traditional areas at different university types

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	394.7	4	98.67	5.76	.001
Within Groups	582.8	34	17.14		
Total	977.4	38			

Multiple Comparisons

Dependent Variable: Proportion of Women in non-traditional areas

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	-6.89*	1.96	0.01	-12.55	-1.24
	ATN-Like	-4.45	2.14	0.25	-10.60	1.71
	1960s-70s	-1.46	1.96	0.94	-7.12	4.19
	New Gen	2.22	2.04	0.81	-3.65	8.10
Go8	Regional	6.89*	1.96	0.01	1.24	12.55
	ATN-Like	2.44	2.24	0.81	-3.99	8.88
	1960s-70s	5.42	2.07	0.09	-0.53	11.39
	New Gen	9.13*	2.14	0.001	2.95	15.29
ATN-Like	Regional	4.45	2.14	0.25	-1.71	10.60
	Go8	-2.44	2.24	0.81	-8.88	3.99
	1960s-70s	2.98	2.24	0.67	-3.46	9.42
	New Gen	6.67*	2.30	0.05	0.0406	13.31
1960s-70s	Regional	1.46	1.96	0.94	-4.19	7.12
	Go8	-5.43	2.07	0.09	-11.39	0.53
	ATN-Like	-2.98	2.24	0.67	-9.42	3.46
	New Gen	3.69	2.14	0.43	-2.48	9.86
New Gen	Regional	-2.22	2.04	0.81	-8.10	3.65
	Go8	-9.11*	2.14	0.001	-15.29	-2.95
	ATN-Like	-6.67*	2.30	0.05	-13.31	-0.041
	1960s-70s	-3.69	2.14	0.43	-9.86	2.48

*. The mean difference is significant at the 0.05 level.

Proportion of Women in Non-traditional areas

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05		
		1	2	3
New Gen	7	12.84		
Regional	10	15.06	15.06	
1960s-70s	8	16.53	16.53	16.53
ATN-Like	6		19.51	19.51
Go8	8			21.96
Sig.		0.43	0.25	0.10

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.581.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.2.5 Students with a disability

The proportions of students who identify as disabled are low and there do not appear to be significant differences in enrolment rates across the university types (Table 6-10, Figure 6-9 and Figure 6-10). This is confirmed by the ANOVA data, Table 6-11.

Table 6-10 Descriptive statistics: Proportion students with a Disability, by university type, 2013

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Regional	10	6.52	1.33	0.42	5.57	7.47	4.16	9.03
Go8	8	5.32	2.27	0.80	3.42	7.22	2.75	8.46
ATN-Like	6	4.66	1.87	0.76	2.69	6.62	3.00	8.17
1960s-70s	8	7.12	2.25	0.80	5.23	9.00	4.43	11.67
New Gen	7	5.23	1.02	0.39	4.28	6.17	3.41	6.63
Total	39	5.88	1.93	0.31	5.25	6.51	2.75	11.67

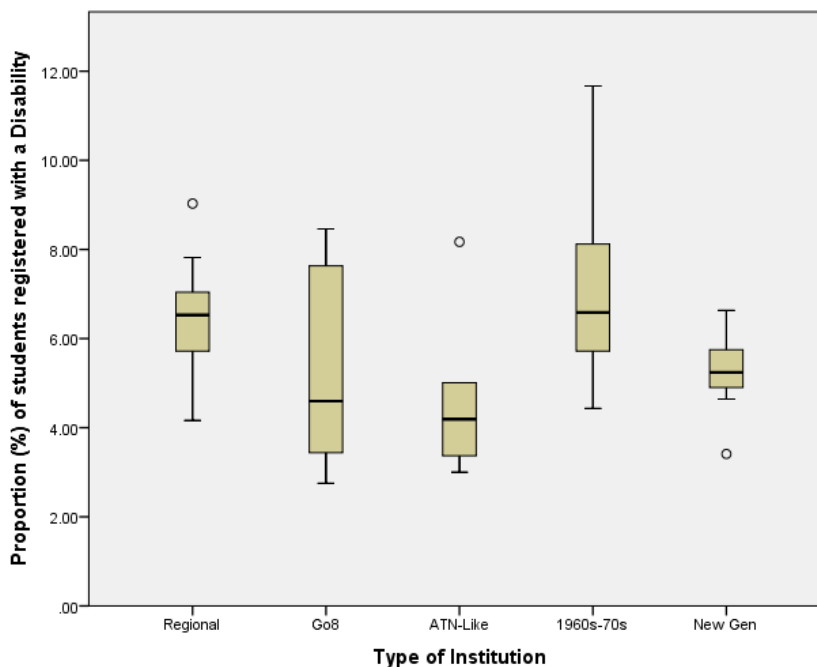
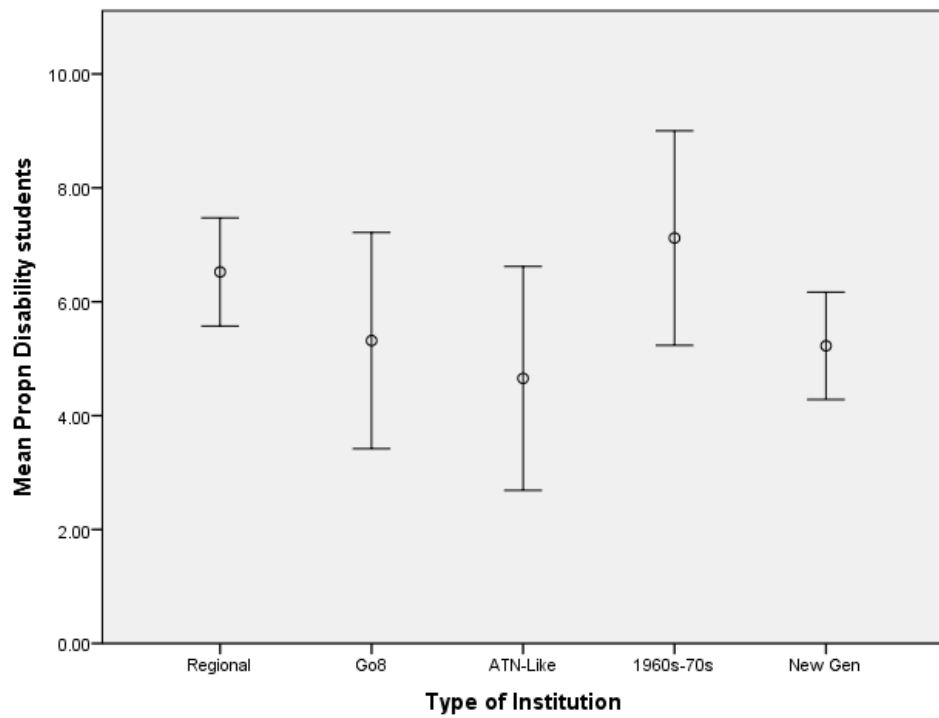


Figure 6-9 Proportions of students with t registered disability, by differing university Types, 2013 (Median and Interquartile ranges depicted)



Error Bars: 95% CI

Figure 6-10 Mean proportion of Disability students by type of university (95% Confidence Intervals)

Table 6-11 ANOVA: Proportions of Disability students at different university types

Proportion Disability students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	31,0	4	7.74	2.37	0.072
Within Groups	111.3	34	3.27		
Total	142.2	38			

Multiple Comparisons

Dependent Variable: Proportion of Disability students

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	1.21	0.86	0.63	-1.26	3.68
	ATN-Like	1.87	0.93	0.29	-.82	4.56
	1960s-70s	-0.60	0.86	0.96	-3.07	1.88
	New Gen	1.30	0.89	0.60	-1.27	3.87
Go8	Regional	-1.21	0.86	0.63	-3.68	1.26
	ATN-Like	0.66	0.98	0.96	-2.15	3.48
	1960s-70s	-1.80	0.90	0.29	-4.41	0.80
	New Gen	0.09	0.94	1.00	-2.60	2.79
ATN-Like	Regional	-1.87	0.93	0.29	-4.56	0.82
	Go8	-0.66	0.98	0.96	-3.48	2.15
	1960s-70s	-2.46	0.98	0.11	-5.28	0.35
	New Gen	-0.57	1.01	0.98	-3.47	2.33
1960s-70s	Regional	0.59	0.86	0.96	-1.88	3.07
	Go8	1.80	0.90	0.29	-0.80	4.41
	ATN-Like	2.46	0.99	0.11	-0.35	5.28
	New Gen	1.89	0.94	0.28	-0.80	4.59
New Gen	Regional	-1.30	0.89	0.60	-3.87	1.27
	Go8	-0.09	0.94	1.00	-2.79	2.60
	ATN-Like	0.57	1.01	0.98	-2.33	3.47
	1960s-70s	-1.89	0.94	0.28	-4.59	0.80

Proportion Disability students

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05
		1
ATN-Like	6	4.66
New Gen	7	5.23
Go8	8	5.32
Regional	10	6.52
1960s-70s	8	7.12
Sig.		0.08

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.581.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.2.6 Indigenous students

Table 6-12 and Figure 6-11 show the distribution of indigenous students by university type. The total numbers of enrolments are low but as expected the highest proportions are found in the Regional universities, in particular Charles Darwin University.

Table 6-12 Descriptive statistics: Proportion of Indigenous students, by university type, 2013

Proportion of Indigenous students

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Regional	10	2.99	1.68	0.53	1.79	4.20	0.82	6.88
Go8	8	0.83	0.23	0.08	0.63	1.02	0.40	1.04
ATN-Like	6	1.04	0.54	0.22	0.47	1.61	0.40	1.64
1960s-70s	8	1.55	0.70	0.25	0.97	2.13	0.55	2.67
New Gen	7	1.23	0.56	0.21	0.71	1.751	0.45	1.93
Total	39	1.64	1.25	0.20	1.23	2.04	0.40	6.88

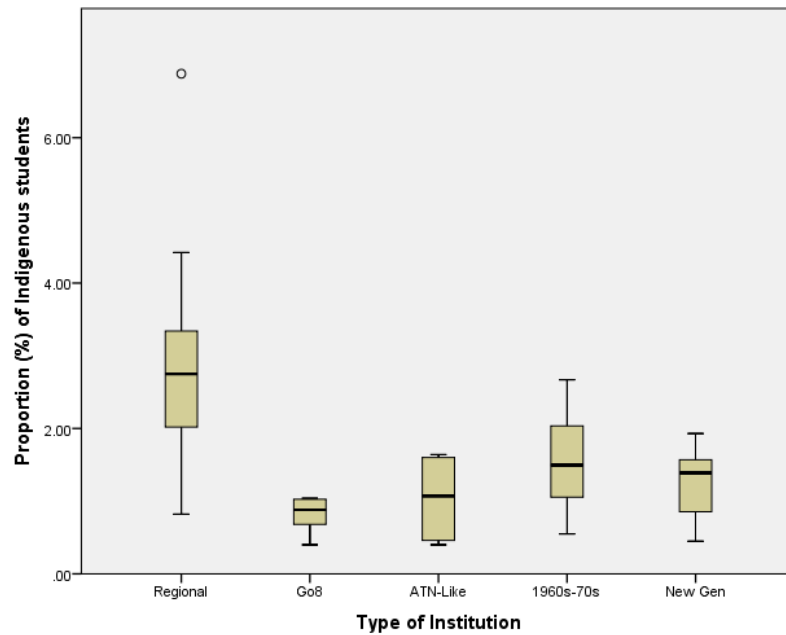


Figure 6-11 Proportions of Indigenous students, by differing university Types, 2013 (Median and Interquartile ranges depicted)

The mean enrolment of Indigenous students in regional universities is significantly higher than at any other type of university at the 95% confidence interval (Figure 6-12,

Table 6-13). This is not unexpected as the highest concentrations of Indigenous students are found in regional and remote locations. In particular, large concentrations of indigenous communities are found in northern Queensland and the Northern Territory. These areas are serviced by James Cook University (JCU) and Charles Darwin University (CDU) respectively, and these two institutions have the highest proportions of Indigenous students in Australia (see Table 6-1, Figure 6-13).

USQ has one of the lower rates of Indigenous enrolments amongst the regional universities (Figure 6-13), having 2.25% Indigenous enrolments. Nevertheless this is a higher rate than any other non-regional university other than the University of Newcastle (1960's-70's university, 2.67% indigenous enrolments).

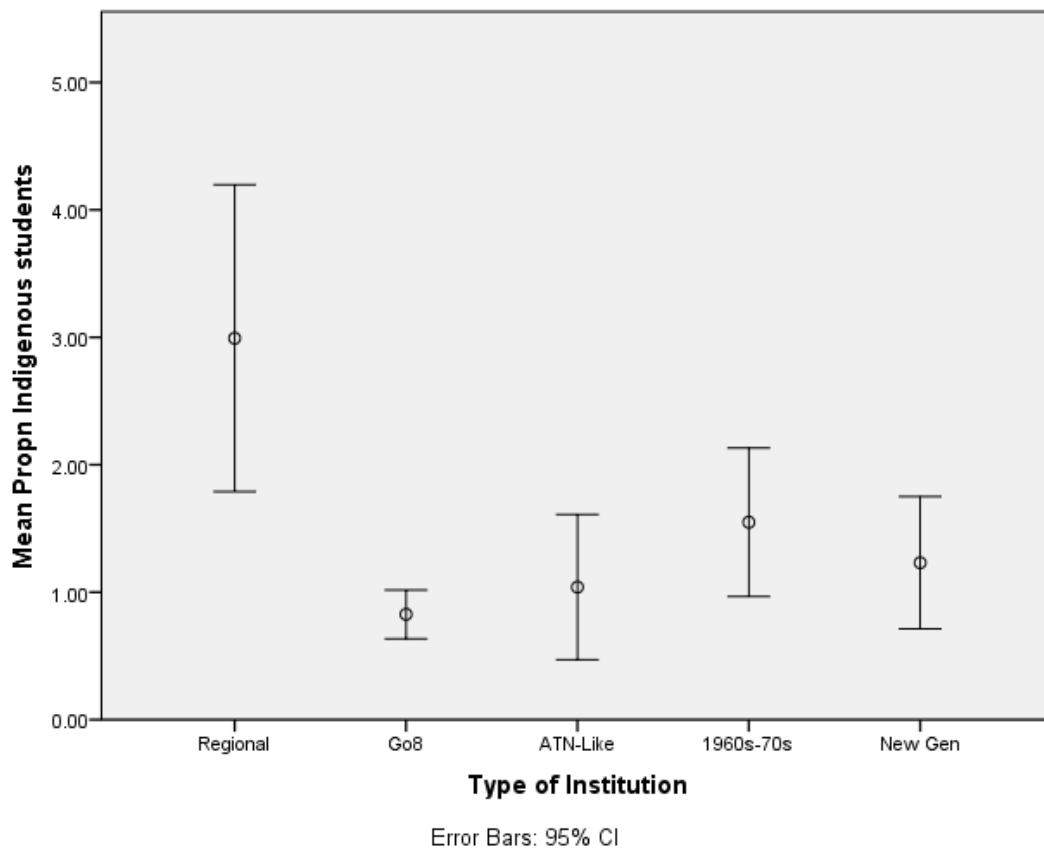


Figure 6-12 Mean proportion of Indigenous students by type of university (95% Confidence Intervals)

Table 6-13 ANOVA: Proportions of Indigenous students at different university types

Proportion Indigenous students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.00	4	6.75	7.03	0.000
Within Groups	32.63	34	0.96		
Total	59.63	38			

Multiple Comparisons

Dependent Variable: Proportion Indigenous students

Tukey HSD

(I) Type of Institution	(J) Type of Institution	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Regional	Go8	2.17*	0.46	0.00	0.83	3.50
	ATN-Like	1.95*	0.51	0.00	0.50	3.41
	1960s-70s	1.44*	0.46	0.03	0.11	2.78
	New Gen	1.76*	0.48	0.01	0.37	3.15
Go8	Regional	-2.17*	0.46	0.00	-3.50	-0.83
	ATN-Like	-0.21	0.53	0.99	-1.74	1.31
	1960s-70s	-0.72	0.49	0.59	-2.13	0.69
	New Gen	-0.41	0.51	0.93	-1.87	1.05
ATN-Like	Regional	-1.95*	0.51	0.00	-3.41	-0.50
	Go8	0.21	0.53	0.99	-1.31	1.74
	1960s-70s	-0.51	0.53	0.87	-2.03	1.01
	New Gen	-0.19	0.55	1.00	-1.76	1.38
1960s-70s	Regional	-1.44*	0.46	0.03	-2.78	-0.11
	Go8	0.72	0.49	0.59	-0.69	2.13
	ATN-Like	0.51	0.53	0.87	-1.01	2.03
	New Gen	0.32	0.51	0.97	-1.14	1.78
New Gen	Regional	-1.76*	0.48	0.01	-3.15	-0.37
	Go8	0.41	0.51	0.93	-1.06	1.87
	ATN-Like	0.19	0.55	1.00	-1.38	1.76
	1960s-70s	-0.32	0.51	0.98	-1.78	1.14

*. The mean difference is significant at the 0.05 level.

Proportion of Indigenous students

Tukey HSD^{a,b}

Type of Institution	N	Subset for alpha = 0.05	
		1	2
Go8	8	0.83	
ATN-Like	6	1.04	
New Gen	7	1.23	
1960s-70s	8	1.55	1.55
Regional	10		2.99
Sig.		061	0.05

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 7.581.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

6.3 USQ’s student profile in the context of the HE landscape

As expected from a regional university that specialises in distance education, the broad-brush demographic data from equity reporting indicates that the student cohort contains a larger proportion of non-traditional students than many other universities. This particularly applies to the group broadly labelled as ‘Low-SES’ and ‘regional’. Table 6-14, shows the participation rates (students in the equity group as a proportion of all domestic onshore students) for particular equity groups. Participation rates were calculated, from 2013 DoE data (Department of Education, 2014a), as the fraction of students in an equity group relative to all domestic onshore.

Table 6-14 Comparison of broad demographic indicators; Participation rates of identified equity groups, 2013 published data. (Department of Education, 2014)

Demographic Indicator	National Rate (%)	USQ Rate (%)
NESB students	3.4	1.5
Students with a disability	5.5	6.8
Women in non-traditional areas	17.7	19.6
Low-SES, by post code (2011 SEIFA)	17.4	34.0
Regional students,	18.8	51.1
Remote students	0.9	2.3
Indigenous students	1.5	2.3

With the exception of students with a Non-English Speaking Background (NESB) the participation rates of students in all equity groups is higher at USQ than national averages (Table 6-15). In particular students coming from low-SES, regional and remote backgrounds are found in greater concentrations at USQ, with Regional being the most significant category as expected.

Table 6-15 Participation Rates for Higher Education Providers, 2007 to 2012 (DoE, 2014)

	Low-SES, by 2006 Post Code (all ages)					
	2007	2008	2009	2010	2011	2012
Average National Rate (%)	14.93	14.99	15.14	15.45	15.75	16.01
University of Southern Queensland (%)	30.03	30.69	32.05	33.35	33.13	33.73
	Low-SES, by 2006 Post Code (under 25 years old)					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	15.30	15.25	15.31	15.63	15.97	16.24

University of Southern Queensland (%)	32.72	33.38	34.91	36.73	36.81	37.83
	Non-English Speaking Background					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	3.78	3.83	3.72	3.56	3.56	3.70
University of Southern Queensland (%)	1.45	1.41	1.33	1.39	1.38	1.66
	Disability					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	4.11	4.13	4.26	4.58	4.76	4.98
University of Southern Queensland (%)	3.83	4.12	4.42	4.34	4.79	5.55
	Regional (McEETYA Category)					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	17.96	17.95	17.83	18.06	18.15	18.09
University of Southern Queensland (%)	51.95	50.20	50.66	51.07	50.03	49.47
	Remote (McEETYA Category)					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	1.13	1.09	1.07	1.03	1.01	0.99
University of Southern Queensland (%)	3.13	2.97	2.85	2.55	2.58	2.45
	Indigenous					
	2007	2008	2009	2010	2011	2012
Rate for National Total (%)	1.28	1.28	1.33	1.34	1.37	1.40
University of Southern Queensland (%)	1.88	1.74	2.06	2.23	2.19	2.28

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 6-16.

Table 6-16: A comparison of national and USQ institutional enrolment modes

	National HE Average (DoE) (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.

6.3.1 USQ and other regional universities

The university type to which USQ belongs is the regional group. As discussed in a previous chapter, the universities in this group exhibit commonality with USQ in terms of their socio-political context, history and aspirations. The student profiles of each of the universities in this group, based on equity data, are shown in Figure 6-13.

The data shows that the proportions of equity group students attending USQ are not unlike those found in most other regional universities. The highest concentrations of low-SES students are found in USQ and Central Queensland University. These two universities also have the highest concentrations of low-SES students nationally. The effect of this concentration would be to make these students more visible at the institutions.

Figure 6-14 shows a comparison of USQ demographics with the Go8 universities. This figure is presented as a special case since the eight Go8 universities represent a significant portion of the student enrolments (25% of total domestic enrolments) and it was noted in the previous chapter that their approach to student diversity differs from other types of university, and from regional universities in particular. The differences in student demographics were shown to be statistically significant in the ANOVAs carried out in section 6-2, for students in the low-SES, regional and remote and Indigenous categories. However, NESB student were statistically more likely to be found in the Go8 universities.

Figure 6-13 Comparison of equity student participation rates at regional universities, 2013

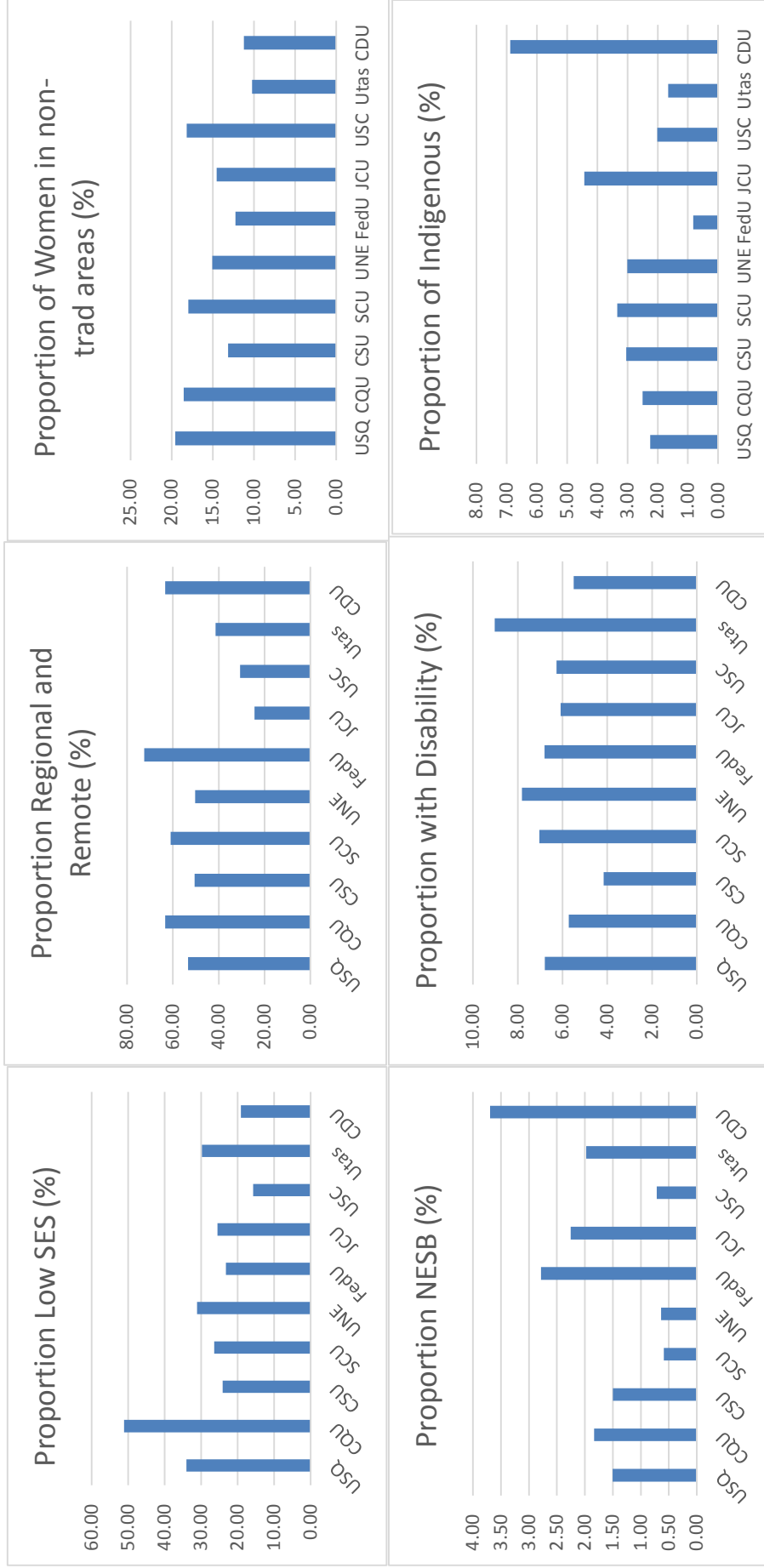
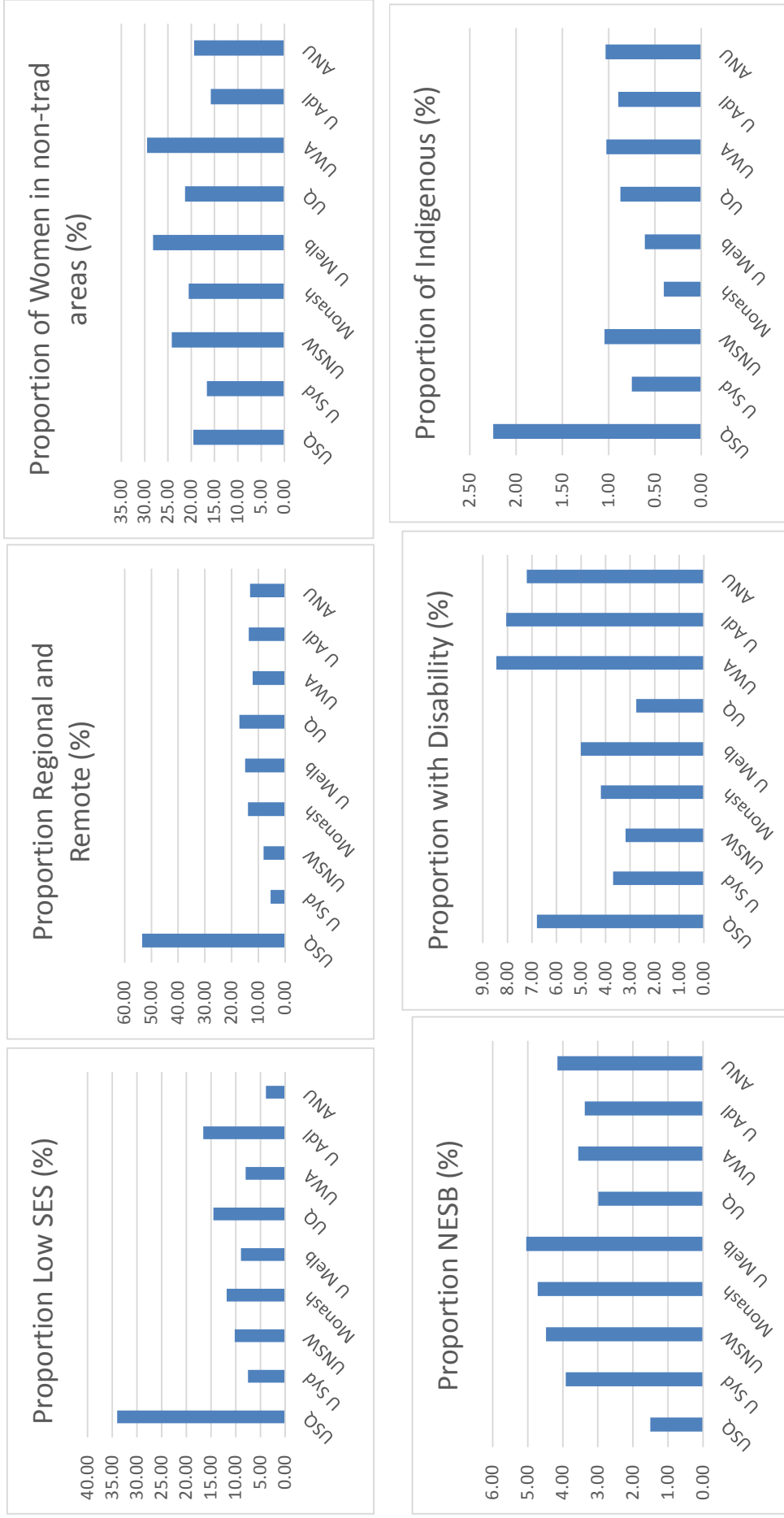


Figure 6-14 Comparison of equity student participation rates at USQ and Go8 universities, 2013



6.4 USQ Engineering student profile survey

The results of an engineering student survey conducted in late 2013 were analysed to give a more fine-grained picture of the demographics of the particular cohort. The response rate to the survey (15%) was satisfactory for a voluntary survey. The response rate can probably be attributed to the heavy promotion of the survey to students during 'Project Week', a week when all third and fourth year Bachelor of Engineering students attend an on-campus student conference. An added incentive was an opportunity to win a prize by participating.

To ensure the representativeness and validity of the survey sample, a comparison of known attributes for the entire active student cohort and the survey respondents was conducted. 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 6-17. The analysis demonstrates, at the 95% confidence interval, that the survey respondents were broadly representative of the total cohort. A representative sample for a particular attribute is achieved if the fraction of the total cohort falls within the confidence interval.

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 under-represented. This is not overly concerning as females represent a small percentage of the overall cohort and are very unlikely to skew the results overall when assessing other demographic characteristics. The focus of this thesis is on Bachelor of Engineering students and in some analyses this group of respondents will be isolated for more detailed analyses, and their slight over-representation is beneficial.

Table 6-17 Analysis of whether the survey respondents are representative of the total student cohort

Attributes	Total Cohort (N=3815) %	Survey Respondents (n=568) %	95% Confidence Interval %	Representative
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 & TSIs	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 & unspecified	26.0	18.5	15.3 – 21.7	

6.4.1 Age profile of USQ engineering students

One of the key differentiating characteristics of USQ’s engineering cohort is the age profile of the students. Approximately 20 % of commencing undergraduates in Australia are aged over 25 (James, 2008b). In contrast, over 50% of the student survey respondents at USQ were aged over 25 (Figure 6-15).

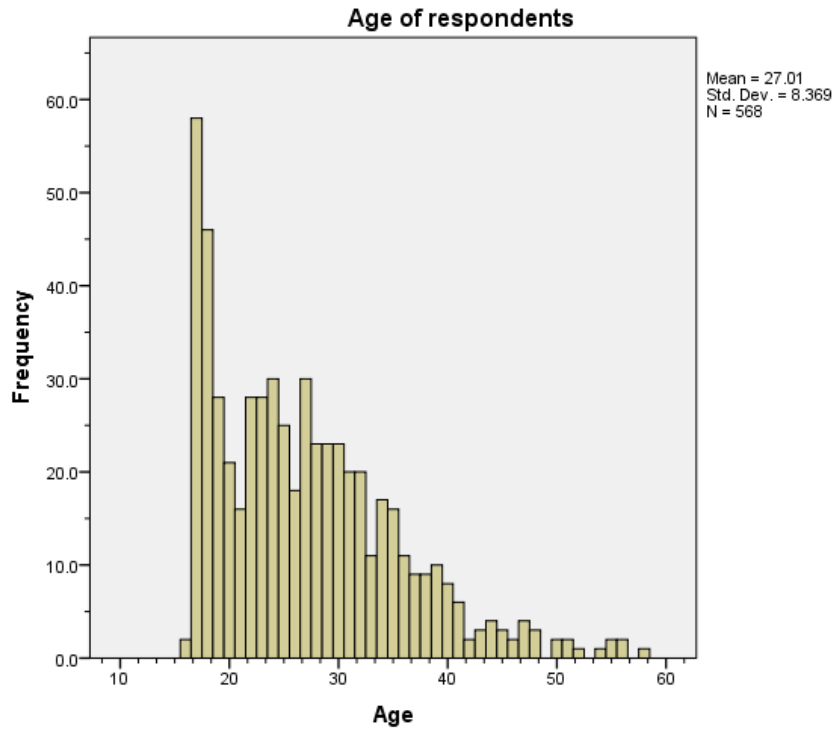


Figure 6-15 Ages of survey respondents

While the largest age group was 17-year-olds (10.2 percent of sample), 48.1 percent of students were aged between 25 and 40 years (Table 6-18).

Table 6-18 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

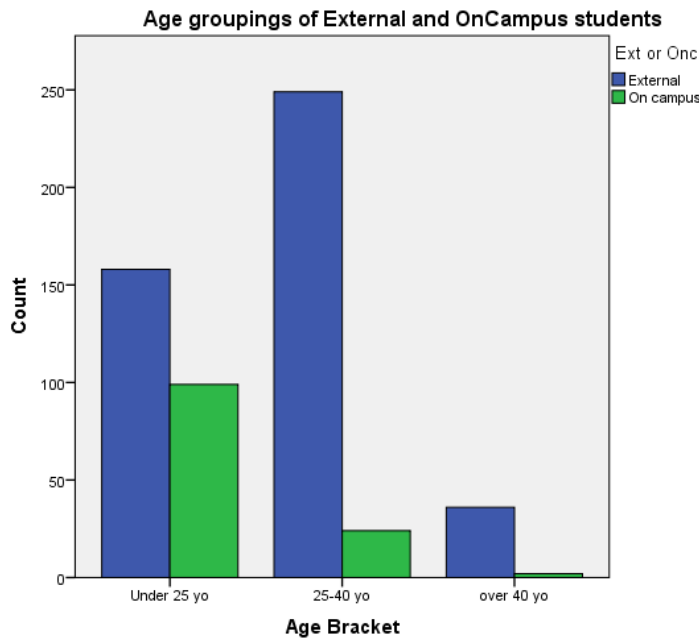


Figure 6-16 Age groupings of external and on-campus students

Due to flexible delivery, the engineering programs offered at USQ are attractive to students who are already working in industry and want to enhance and advance their careers. This is reflected in the age profile of the students and the large number of students who are mid-career.

6.4.2 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. It was found that the relationship remained statistically significant even after controlling for other socio-demographic factors.

At USQ the vast majority of engineering students (68%), most of whom study externally, are in full-time paid employment (more than 25 hours per week), as shown in Figure 6-17, theoretically putting them in a high risk category in terms of their retention, as defined by McMillan (2005).

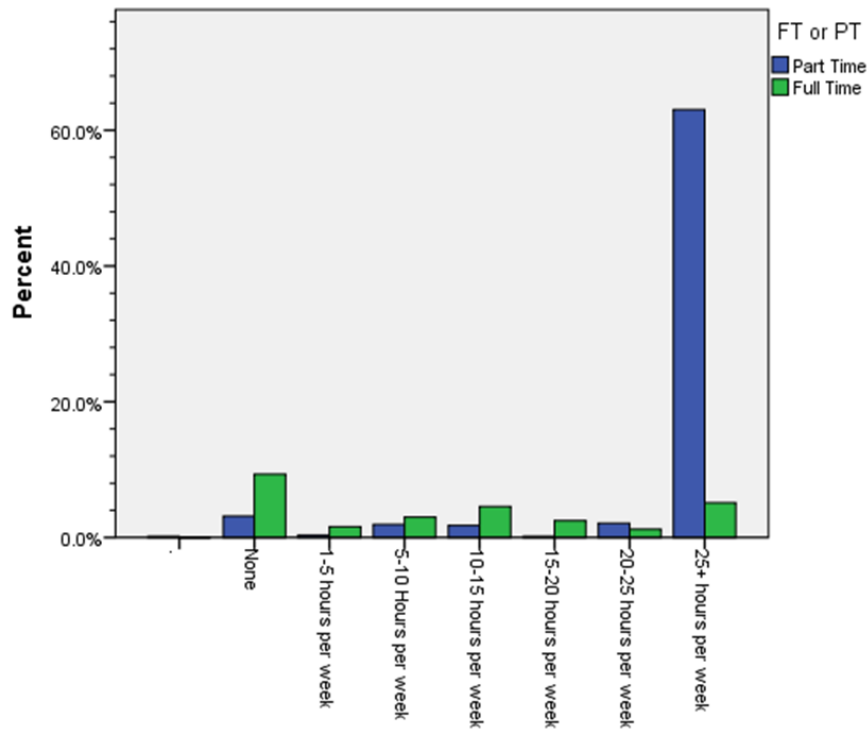


Figure 6-17 Hours of paid employment during semester, n=568

6.4.3 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. USQ has a high level of such engineering students, where 73 percent of students’ fathers, also 73 percent of students’ mothers have not completed a university level program. Parental education levels for engineering students at USQ, based on survey data, are depicted in Figure 6-18 , overpage.

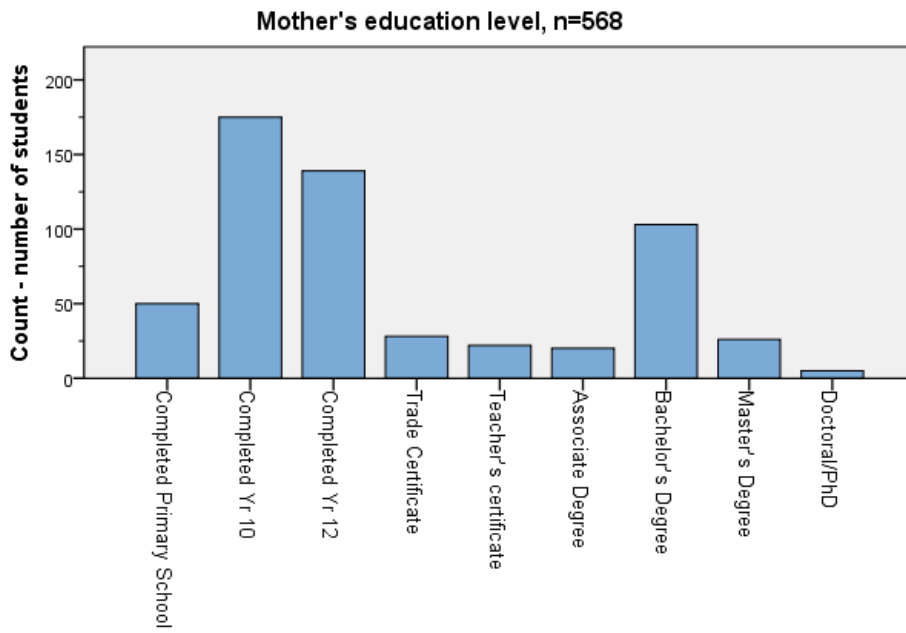
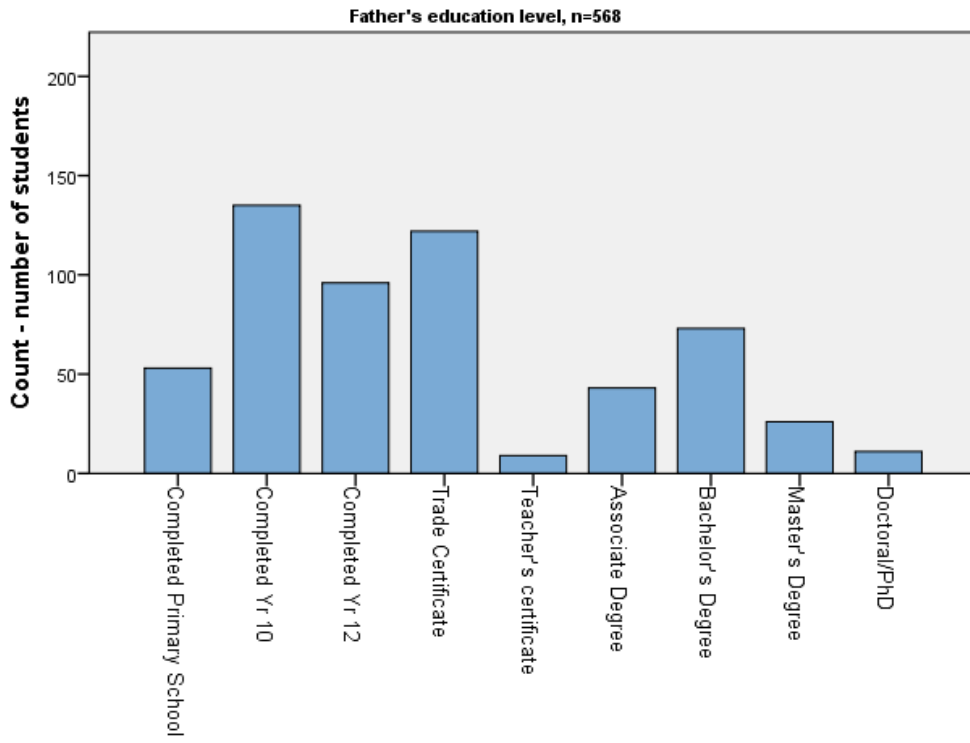


Figure 6-18 Parental Education Levels

Parental education levels are related to the figures for first generation students (students who are the first in their family to attend university). Figure 6-19 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 that explicates the inherent expectations of academia.

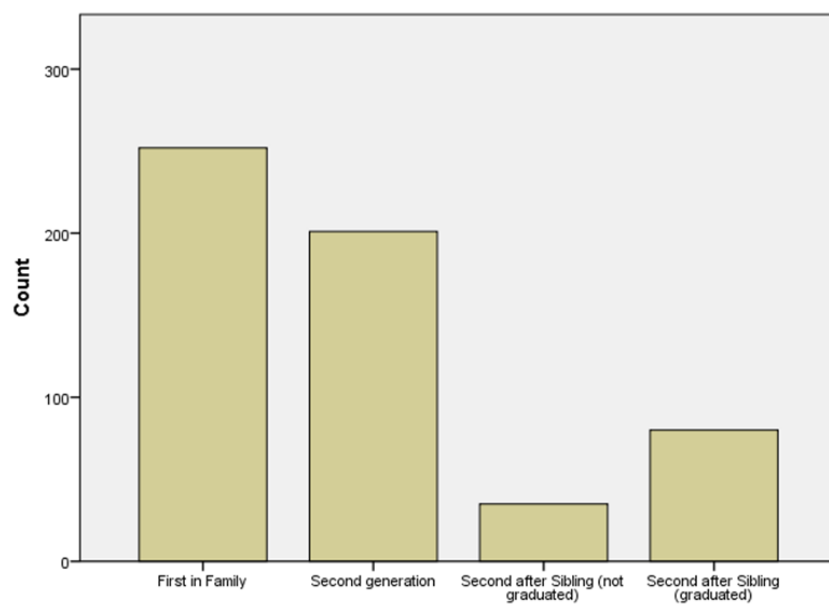


Figure 6-19 First/second generation university attendance within engineering, n=568

6.5 Analysis of USQ engineering student academic achievement

To assess the statistical evidence that a non-traditional background affected the academic performance of engineering students an analysis of students' Grade Point Average (GPA) performance against demographic indicators was undertaken. A student's GPA is the average of all the final grades for courses within their program, weighted by the unit value of each of these courses. Data was sourced from USQ databases as well as from the student survey.

An independent T-test was used to compare the GPA means of students with a non-traditional indicator against means for all other students without that indicator.

Indicators of demographic difference sourced from USQ databases investigated include:

- Gender
- Non-English speaking background
- Disability
- Low-SES status
- Rural or remote status
- Parental education

Data from the student survey was also used to compare the academic performance of students who:

- Were the first in their family to attend university
- Work full-time while studying
- Have dependents
- Parental education – split by father's and mother's education
- Are aged over 25

The results are summarised in Table 6-19 and illustrated by error bar charts in Figure 6-20.

Using overall GPA as a measure of academic success, the t-test statistics were used to analyse the performance of students with less traditional backgrounds against that of their more traditional peers. The difference in mean GPAs for the various factors were not significant other than for the disability and age factors.

Students who indicated a disability had a lower GPA ($M=4.12$, $SE=0.110$) than students who did not report having a disability ($M=4.61$, $SE=0.023$). This difference, 0.49, 95% CI [-0.717, -0.263] was significant $t(2692)=4.238$, $p=0.000$.

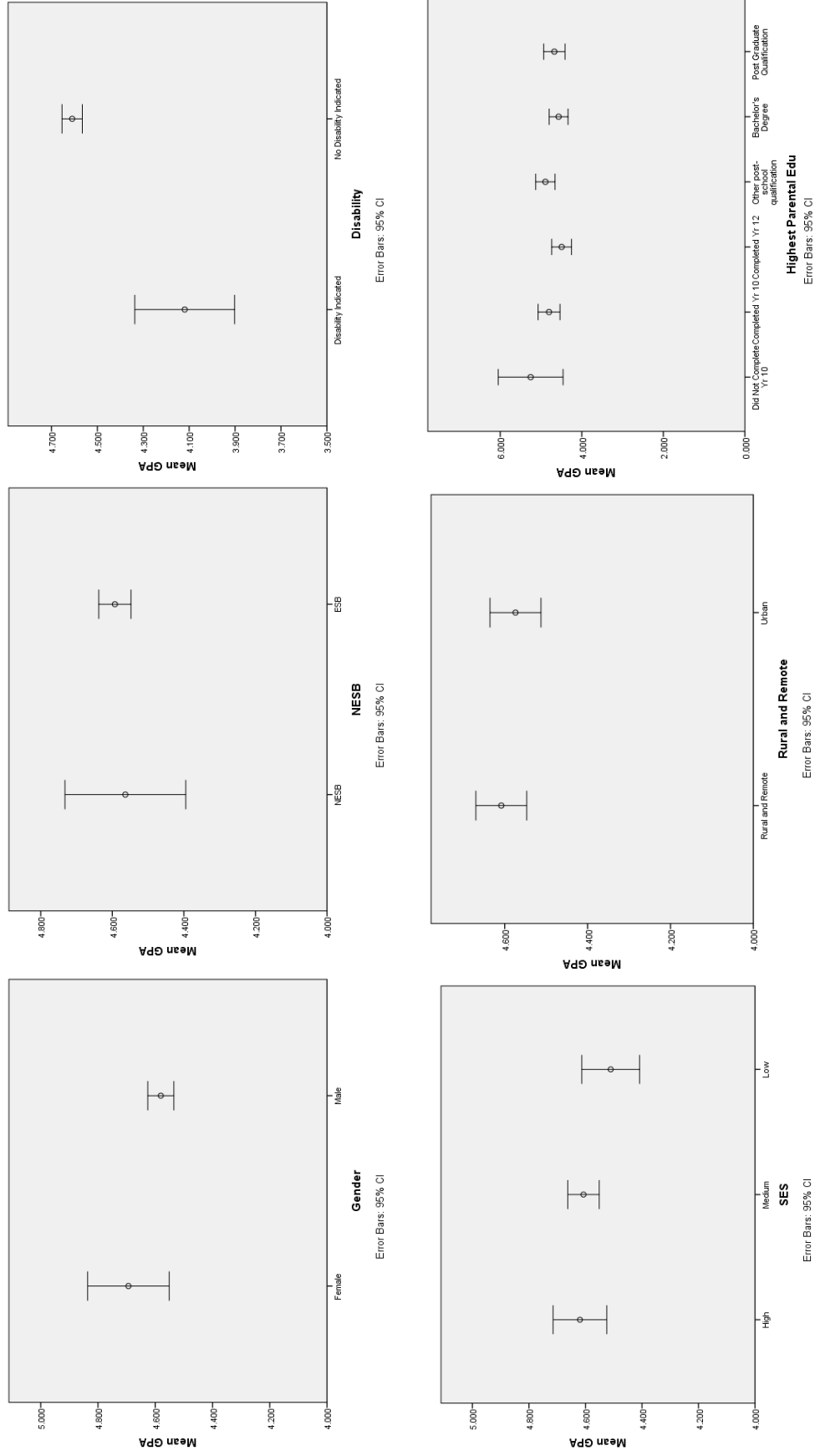
Students who were older than 25 years had a higher GPA ($M=4.68$, $SE=0.026$) than students who were younger than 25 ($M=4.34$, $SE=0.041$). This difference, 0.34, 95% CI [0.241, 0.435] was significant $t(2692)=6.826$, $p=0.000$.

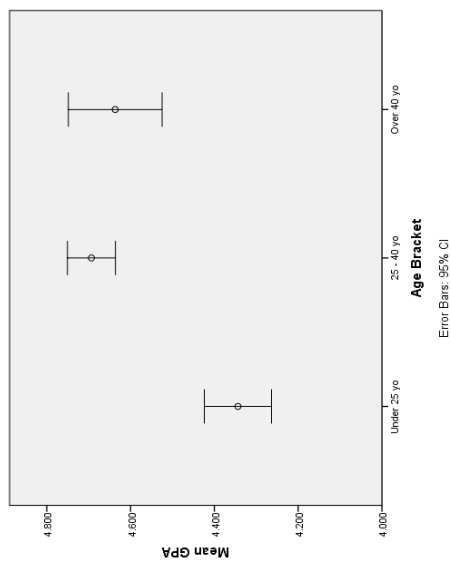
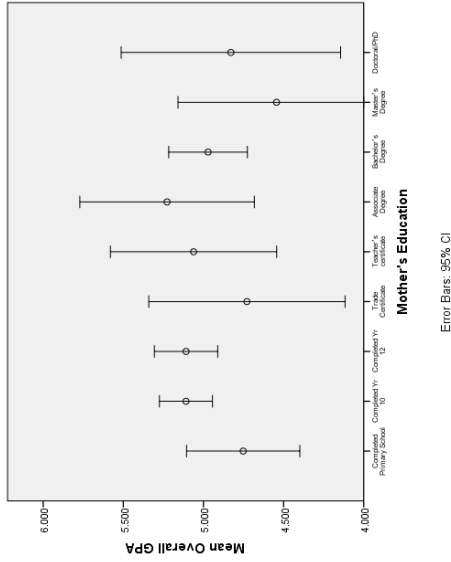
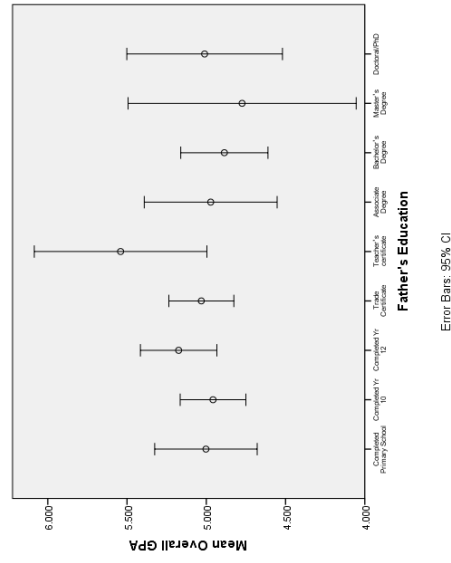
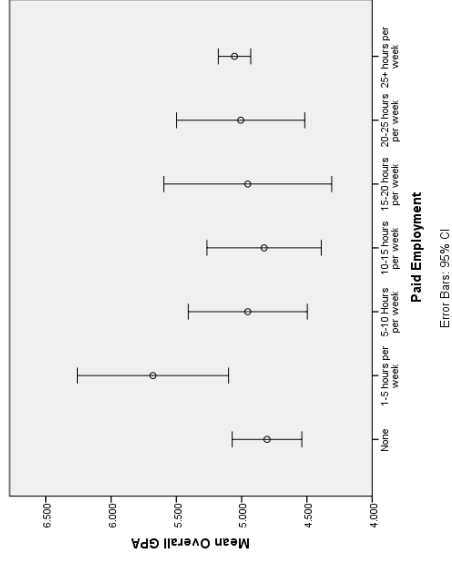
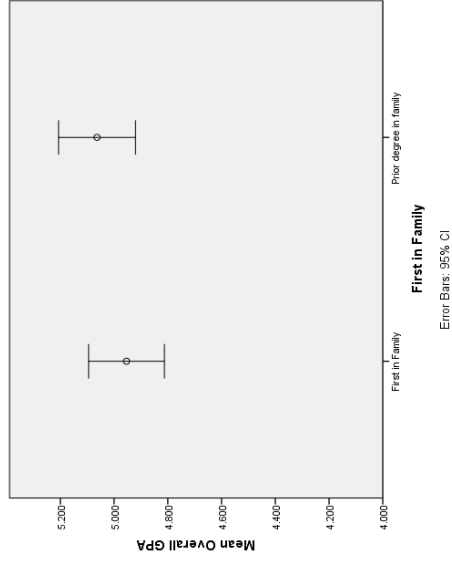
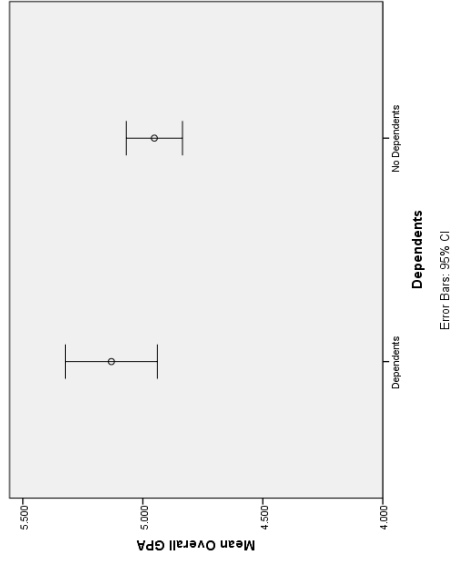
For all other demographic factors investigated, such as gender, SES status, rural status, non-English speaking background, parental education level, hours of paid employment, dependents and first in family status there was no evidence to suggest that these factors had an influence on students' GPA

Table 6-19 Results of independent t-tests to investigate the differences in mean GPA for different demographic groups

Non-Traditional Indicator	Non-Traditional Group		Traditional Group		t-test results			
	Mean GPA	Std Error	Mean GPA	Std Error	df	t	Significance p	No significant difference
Females in engineering	4.69	0.072	4.58	0.023	2692	1.48	0.14	✓
NESB	4.56	0.085	4.59	0.023	2692	0.311	0.76	✓
Disability indicated	4.12	0.110	4.61	0.023	2692	0.424	0.000	
Low-SES	4.51	0.052	4.61	0.024	2692	1.786	0.07	✓
Rural and remote backgrounds	4.61	0.031	4.57	0.31	2692	0.775	0.439	✓
No HE qualification by parents	4.75	0.071	4.61	0.088	503	1.254	0.211	✓
Dependents	5.13	0.097	4.95	0.059	566	1.628	0.104	✓
First In family (to attend university)	4.95	0.072	5.06	0.073	566	1.074	0.283	✓
Full-time work (>25 hrs/week)	5.05	0.063	4.92	0.086	565	1.231	0.219	✓
Father not tertiary educated	5.04	0.055	4.87	0.124	566	1.307	0.192	✓
Mother not tertiary educated	5.05	0.057	4.88	0.111	566	1.360	0.174	✓
Over 25 years old	4.68	0.026	4.34	0.041	2692	6.826	0.000	

Figure 6-20: Error bar chats comparing GPA means for different demographic factors





6.6 Conclusion

The cohort of students enrolled at USQ is demonstrably different to most other Australian universities. This is the case for most regional universities, although within that group there are differences. The difference in student profile at USQ and regional universities is most evident compared to enrolment at the Go8 universities.

The most significant areas of difference, for USQ in particular, are the concentrations of Low-SES and regional students. These groups, together with women in non-traditional areas, comprise the largest numbers of disadvantaged students. They also encompass more specific indicators of disadvantage such as age, employment and first in family status. This research relates most significantly to these groups as they are strongly represented in the chosen case. While findings are also likely to be applicable to other equity groups such as disability, NESB and Indigenous, it is recognised that these groups have some very specific needs and challenges, which are beyond the scope of this study.

The data collected in the engineering survey confirms that the engineering cohort at this institution includes many under-represented groups. This largely mirrors the overall enrolment patterns at USQ. The cohort is heterogeneous and displays multiple indicators generally associated with ‘disadvantage’ in higher education. Despite its diversity, previous studies, for example Gibbings, Godfrey, King and Wandel (2010), have shown that the retention and progression rates for students at USQ are amongst the best in Australian engineering programs. This is supported by the comparison of academic performance based on GPA ranking, which suggests that students who have diversity indicators are not disadvantaged academically when compared to the rest of the USQ engineering cohort.

The backgrounds and previous experiences of all of students attending university affect the amount and type of capital that they bring to their studies. Whether that capital is valued in the field and can be profitably leveraged will affect their progress, retention and academic success. The amounts and types of capital which may be successfully employed in their academic endeavours will be affected by the culture of the institution they attend. This in turn will affect the way in which institutional policies and procedures are manifested as the practices of the academic and

administrative staff who interact with the students. This premise is investigated further in the research through a study of the culture manifested in the USQ Engineering and Surveying Faculty

7 FACULTY CULTURE

Student experiences and learning at university are mediated by the ethos or culture of the institution that they encounter during their studies. The institutional culture is a composite of staff behaviours, values and attitudes. Policies and institutional leadership can influence the organisational culture but culture, as lived and experienced by the staff, mediates the way that those formal policies are interpreted and enacted as practices. When academic culture is congruent with the dispositions, social capital and cultural capital of a student, then the logic of the field at that point is more easily grasped by the student. This enables the adoption of appropriate practices by the student and so academic success is more easily achievable.

In this chapter the results of an investigation and documentation of the prevailing culture in the Faculty of Engineering and Surveying (FoES) at USQ at the time of the study are presented. The effect of this culture with respect to the resulting expectations made of students is discussed as a means of describing the field into which a student enters on commencement of an engineering program at this institution.

Bourdieu's 'habitus' must be understood in the context of the 'fields' within which individuals act. The field of engineering education is structured by both the wider field of higher education and the field of engineering in industry. The concept of culture within the faculty has been used as a mechanism to explore and describe a particular position within this the field occupied by the Engineering Faculty at USQ. This enables contextualisation of the student experiences and discussion in subsequent chapters around any dispositional congruence of students.

7.1 Background

As discussed earlier USQ, along with other institutions particularly regionals, positions itself as a provider of higher education for diverse student cohorts. Policy and the broad operational framework have been developed as a result of the institution's history as an accessible provider.

Policy is important because it “consists of texts which are (sometimes) acted on” (Beilharz, 1987, p394 as cited in Ball 1993). Action is constrained by, but not determined by, policy. Policy documents do not instruct staff what to do, rather they “create circumstances in which the range of options available in deciding what to do are narrowed or changed” (Ball, 1993). For this reason, the framework of policies within which engineering education at USQ occurs, was investigated as a means to identifying the broad constraints within which the process of education is occurring.

Enactment of a policy is mediated by the context of practice and the realities of the environment (Ball, 1993). Documented policies can facilitate change but things can stay the same or even change in different ways in different settings. Often the resulting change is not that intended by the policy authors. For this reason documented policies can be less important than the context or culture in which they are enacted.

Through their daily practices, staff at the interface of student interaction are the primary determinants of student ‘experience’. The way that staff engage with students, through the ‘classroom’ and administrative functions, are practices driven by their own habitus interacting with the logic of the field. Relevant aspects of staff habitus include conceptions and expectations of students and their perceptions of engineering and engineering education. The institutional culture within which they operate describes the aspect of field (the unspoken, underlying field logic) that structures enactment of formally articulated policies and procedures.

Bourdieu’s ‘rules of the game’, which define the particular position in the field that is occupied by an engineering faculty, are determined by the localised culture within the faculty and the shared habitus of the staff within that faculty. The rules of the game can be described as the expectations, both explicit and implicit, which participants of the game (or actors within the field) understand. The higher education system can often be alienating and confusing for students who come from demographic backgrounds not traditionally associated with higher education (Devlin, 2011; Lawrence, 2005). Conversely, if a student entering the field of engineering education innately understands and can respond appropriately to the ‘rules of the

game' (or the implicit expectations of them) then they will have a greater opportunity to succeed in that environment.

The majority of student engagement research focusses on how students interact with their educational environment, rather than the way that the relevant institution engages with them. The relationship that an institution has with its students and the way it chooses to engage with them will vary substantially and is dependent on how an institution "conceives of its students" (van der Velden, 2012).

This portion of the study investigated the enactment of policy through culture, and the resulting practices of staff in relation to student engagement and interaction. Policy is more than documents; it is enacted within the educational field (Ball, 1993) and the way that it is enacted is mediated by the cultural context of that field. In this chapter the organisational culture of a faculty of engineering, and its relationship to student engagement through the actions and perspectives of its staff is discussed.

Silver (2003) argued that universities do not have consistent cultures; different schools or faculties within an institution will demonstrate varying cultures. This inquiry looks specifically at the culture of an engineering faculty that is enabling of the success of a diverse and non-traditional student cohort within the engineering discipline. The culture explored will be particular to engineering education and exists within the engineering disciplinary domain and epistemology.

7.2 Approach to exploring Faculty culture

In order to explore the way in which the Faculty interacts with its students the following aspects are investigated in this chapter:

- The prevailing academic culture in the USQ Faculty of Engineering and Surveying.
- The expectations made of engineering students as a result of that culture.

As discussed in Chapter 5, most Australian institutions have student engagement policies and programs, however the premise of this study is that the effectiveness of

these is mediated by the culture of the institution. The values and ethos of the institution are demonstrated through its practices.

7.2.1 *Data collection*

Data was collected with respect to the organisational culture that was prevalent in 2013. This time period corresponded to the period when student data was collected and it is acknowledged that significant organisational change has occurred subsequent to this period. This is not a longitudinal study, it has been confined to the study of student success during a period of the Faculty's operations, the impact of significant organisational changes and the attendant changes in academic culture is worthy of further investigation but beyond the scope of this research.

The key source of data was a series of seven interviews with Engineering Faculty staff, both academic and professional, supported by observational field notes made over the period of the research. This was coupled with a mini survey of cultural factors administered to six different academics. The survey served to provide a broad typology of the organisational culture within which individuals were operating. It is described in detail below as it is specific to the part of the research reported in this chapter.

Data from staff interviews, field notes, the survey instrument and subsequent participant discussions were subjected to a thematic analysis to firstly produce a broad picture of the localised organisational culture. Further detailed analysis (see methodology chapter – iterative induction) using Bourdieu's framework was then used to identify some broad 'rules of the game' or implicit expectations of students by staff. Findings were validated through discussion with senior engineering education research staff located within in the Faculty at the time in question.

7.2.2 *The cultural survey*

The academic culture typology framework, developed by McNay (1995), was used for initial identification of the broad features of interactions between Faculty culture and operations (practices). This mapping of the culture against the extended McNay (1995) model was undertaken by a survey of key learning and teaching staff. The

survey responses were discussed with participants to clarify the meanings and significance of their responses. The survey was not intended to be statistically generalizable, it was an instrument for eliciting the meta-themes associated with culture in the Faculty and mapping them against a theoretical framework. The survey results informed subsequent staff interviews, which enriched the data and provided triangulation of the themes which emerged.

The application of the survey of teaching academics was modelled on the initial approach of McNay (1995) and subsequently van der Velden (2012). A questionnaire addressing the factors describing the four cultural typologies identified and tabulated by McNay and van der Velden (Table 7-1) was developed. It was modified to incorporate language and terminology specific to the Faculty investigated. This modification assisted a consistent interpretation amongst respondents. It also ensured that the typologies elaborated by McNay were articulated in a locally recognisable and meaningful form.

This survey questionnaire was presented to six academics who rated each response on a five point scale, according to their perception of the relative prevalence of a particular cultural feature. As part of the subsequent analysis the ratings were subjected to algorithmic manipulation to rate each response on a ten point distributed system, reflecting the ranking approach originally taken by McNay (1995). This variation to McNay's method was used after initial testing of the survey indicated that a simpler ranking approach produced a more intuitive response from participants. As a result, for each question, a notional ten points are distributed between four response options, representing each of the four culture typologies. The distribution was designed by McNay to reflect the relative prevalence of the various manifestations of cultural factors as identified by McNay and extended by van der Velden (Table 7-1).

The questionnaire was tested and modified, based on feedback, to ensure that the question/response interpretation, was meaningful in the local context, and was consistent with the intent of McNay's typologies. Subsequent discussion of question interpretation and response was undertaken with each respondent to unpack and confirm the understanding behind respondent's individual responses to each

question. In some instances the survey values were adjusted by the respondents after clarification of the typological factors discussed. The survey questionnaire is included in the Appendix D.

Expert respondents were invited from amongst academic staff with an acknowledged focus on learning and teaching, rather than (for example) technical research, and who were perceived to have insight into the decision making practices, staff attitudes and values existing during the 2013 period of interest. Respondents were academics at the interface of student interaction, with varying levels of responsibility within the faculty. Their experience of the localised faculty culture was explored through the application of the questionnaire and subsequent discussion of the concepts.

A further series of semi-structured interviews conducted with both academic and administrative staff was used to triangulate and enrich the picture which emerged from the application of the survey questionnaire.

7.3 McNay's model of academic organisational culture

McNay's (1995) taxonomy describes four organisational cultural types: collegium, bureaucracy, corporation and enterprise, according to the continuums of institutional policy definition and control of implementation. The organisational culture of this faculty is mapped against a typology developed by McNay (1995), and which was later extended by van der Velden (2012) to specifically include aspects of institutional engagement with students. This framework was further extended to include the perception of academic staff and tested against the culture demonstrated by staff, as identified through interviews.

Van der Velden (2012) found that corporate and bureaucratic institutional cultures that may respond well to external pressures on institutions (regulation, performance indicators, audits and policy pressure) are not necessarily conducive to engagement with student opinion. The stronger preference of students remains a collegial, partnership-based approach for enhancement of the student experience.

7.3.1 Theoretical framework, the McNay typology of university cultures

Based on earlier work on organisational cultures (Clark, 1983; Handy, 1993; Mintzberg, 1989 ; Weik, 1976), McNay produced a model of four types of higher education organisational cultures. He uses two axes; ‘the definition of organisational policy’ and ‘the control over activity, or the implementation of any policy’ to define his model Figure 7-1. These axes run between extremes of loose definition/control and tight definition/control, within each quadrant he then labelled the organisational types which would reside there. McNay’s (1995) taxonomy can be used to map the culture of a higher education institution (or specific part of it) against his typologies. The four organisational cultural types identified by McNay are labelled collegium, bureaucracy, corporation and enterprise. He is quick to explain that any pejorative connotations associated with these labels are not intended, they are simply descriptors.

McNay’s model has been used to explore the effect of HE institutional culture on topics as diverse as funding and resource allocation (H. G. Thomas, 1996), the use of e-learning (Czerniewicz & Brown, 2009) and student engagement (van der Velden, 2012).

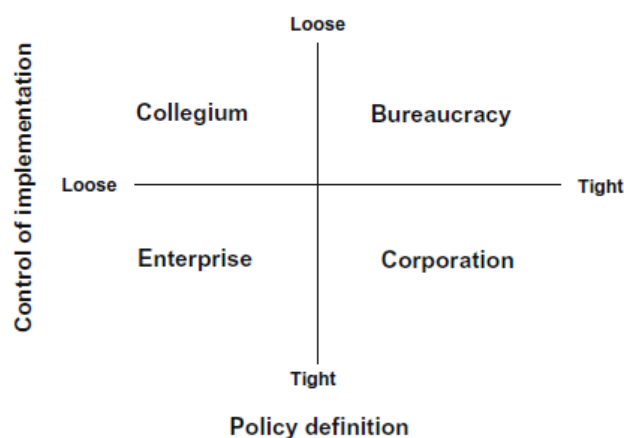


Figure 7-1 Organisational cultural types (McNay, 1995)

The four quadrants of McNay's (1995) model, incorporating van der Velden's extensions (2012), can be described as follows.

Collegium: According to McNay the concepts associated with the collegium are academic freedom and autonomy. The collegium thrives on debate amongst perceived equals and direction is set by consensus, although individual voices can rule temporarily. It is a culture that allows change to occur organically and over an extended time period. The role of the student is perceived as an 'apprentice academic', or in the engineering context an emerging professional. Van der Velden's (2012) extended description of this typology, to include more detail on student engagement, refers to an approach of consensus, collegiality and direct communication between staff and students. Students are included in the collegial group and treated as equal partners with academics in determining academic issues.

Bureaucracy: McNay's bureaucratic typology relates to organisations which emphasise regulation and management through formalised structures, such as committees. Students are viewed through the lens of 'statistics', and change is usually the result of regulatory body requirements or audit outcomes rather than student needs. Student input is 'received' through formal evaluations and monitoring, which makes it passive or indirect in nature.

Corporation: Rational planning activity by senior management, which sets direction and makes decisions on behalf of the institution, is the hallmark of a corporation university. Senior staff make decisions without seeking input from other staff. A directive, authoritarian approach to management is taken, with loyalty expected from staff. Students are viewed as a 'unit of resource' and are represented through performance indicators used for planning by senior staff. Communication with students will be centrally managed and well structured.

Enterprise: In the enterprise institution the focus is on the client, change can be brought about rapidly in anticipation of client and market needs. Focussed task groups or project teams, composed of individuals with relevant competencies, are used to bring about change or innovation. Students have a 'client' status, where, as McNay (1995) puts it "the knowledge and skills of experts, and the needs and wishes of those seeking their services, come together"

7.4 Faculty culture within McNay's framework

The results of the survey are tabulated in Table 7-1. Average values for the spread of points across typologies for each factor are given as a number to one decimal place, summing to ten across each factor row. The dominant typology for each factor, as perceived by staff, is indicated by the highest number and highlighted in Table 7-1. From the survey mapping, both a bureaucratic and enterprise model is suggested, with collegial elements. At first glance this seems an incongruent pairing of opposites on the McNay model. However, further analysis suggests that elements of these differing typologies do indeed co-exist and are dynamic as McNay suggested. Furthermore, the dominant type appears to depend on the situational context. In the discussion of cultural context below the authors' interpretation of the McNay type demonstrated is provided in brackets.

When considering the nature of change, in particular, and the mechanisms by which innovation occurs, insight can be gained into the culture which was described by participants. Change can occur on many levels and the mechanisms used within the Faculty varied depend on the nature of the change and the scope of the resulting implications. While minimum required standards were in place (Bureaucratic), individuals were encouraged to innovate and modify the teaching elements which were under their autonomous control (Collegium), such as teaching materials and delivery, particularly in the interests of enhancing student learning (Enterprise). Change in these areas occurred organically as a result of the teaching and research experiences, shared through collegial discussion, together with changing student needs and expectations (Enterprise), mediated by the inclinations of individual academics (Collegium).

However, a defined structure and operating procedures (Bureaucratic) were also in place to control operations as well as to allow larger changes to occur. The faculty was arranged into disciplinary groups, which met regularly and provided a forum for collegial debate and the exploration of ideas relevant to the group as whole (Collegium). Crossover between Collegium and Bureaucracy is demonstrated in that committees were used as a forum for debate and voicing of opinions, often building

on more informal discussions, while providing a framework for decisions to be made and projects to move forward.

These findings were presented to the Dean of the Faculty of Engineering and Surveying for comment. The staff perceptions of leadership and Faculty management that had been gathered were discussed in a subsequent interview. The Dean confirmed that the findings did reflect his own understandings of his management style, as had been verified through normal psychometric testing. The culture displayed was deliberately fostered by him, as was demonstrated by his work to establish of a Centre for Engineering Education research.

Table 7-1 Summary characteristics of four university models (McNay, 1995), extended by van der Velden and incorporating survey results

Factor	Type			
	Collegium	Bureaucracy	Corporation	Enterprise
Dominant value (Clark 1983)	Freedom 2.7	Equity 1.9	Loyalty 1.8	Competence 3.5
Role of central authorities	Permissive 2.9	Regulatory 2	Directive 1.8	Supportive 3.3
Dominant unit	Department/individual 2.7	Faculty/committees 2.9	Instit / senior management team 1.9	Sub-unit/project teams 2.5
Decision Arenas	Informal groups/networks 2.4	Committees and administrative briefings 3.1	Working parties and senior mgmt.. teams 1.7	Project teams 2.7
Management style	Consensual 3.6	Formal/"rational" 2.2	Political/tactical 2.0	Devolved leadership 2.1
Nature of change	Organic innovation 2.4	Reactive adaptation 2.3	Proactive transformation 2.6	Tactical flexibility 2.7
External referents	Invisible college 1.7	Regulatory bodies 3.1	Policymakers as opinion leaders 2.1	Clients/sponsors 3.1
Internal referents	The discipline 3.2	The rules 1.9	The plans 1.7	Market strength/ students 3.2
Basis for evaluation	Peer assessment 2.8	Audit procedures (eg ISO9001) 0.5	Performance indicators 2.1	Repeat business 4.6
Student status	Apprentice academic 2.2	Statistic 1.7	Unit of resource 2.5	Customer 3.6
Administrator roles: servant of ...	The community 1.8	The committee 2.8	The chief executive 2.4	The client, internal and external 3.0
Information provision to students	Largely under control of departments 3.5	Centrally scrutinised information mostly static (handbooks, website) 0.5	Internal corporate communication 1.8	Specialised student communications: dynamic information provision 4.2

Student voice: most felt presence	Staff-Student liaison committee 1.8	Formal committees 3.4	Planning processes 1.6	Surveys, focus groups, evaluations 3.3
Level of most active engagement with students	Programme/ department 3.7	Committees/with directors of programme(s) 0.9	Communicate with managers directly 2.0	Anywhere, subject to topic 3.5
Role of enhancement activity	Students routinely involved in enhancement/development projects 2.2	Student data inform planned enhancement (no direct involvement) 4.2	No direct involvement enhancement instigated from 'above' 3.3	Project teams work closely with students as clients /users 0.3
Role of student union	Partnership 1.5	Membership representation 3.0	Student empowerment 3.3	Stakeholder 2.2
Academic staff status	Individual, autonomous 3.1	Part of a larger entity 2.7	Narrowly Defined roles 0.3	Professionals 3.8

Specific working parties and committees were set up for particular projects or operational requirements, their composition varying from experienced and senior staff (operational committees) (Bureaucratic) to competent, interested individuals (project working parties) (Enterprise). Nominations would be called for from time to time and a mixture of voting for a representative (Collegium) and delegation by the faculty head (Bureaucratic) was used to compose committees and working parties. This was replicated at the faculty executive level. When a decision requiring authority within the structure was needed, a head of discipline or faculty would generally consider arguments and input from all interested parties (Collegium) before making the decision on behalf of the group (Bureaucratic). This was often perceived as autocratic by individuals within the group, particularly if their views were not upheld, indicating a sometimes unfulfilled expectation of a more Collegium autonomy.

Decision making tended to be regulated and reasoned, with a preference for basing decisions on data (Bureaucratic). This approach is perhaps not unexpected in an engineering faculty, where mathematics and logical structure are valued. However, the best interests of the student cohort as a whole or the needs of engineering employers were usually the 'litmus test' applied to decisions (Enterprise). Innovation and change were often initiated from the 'grassroots' level, rather than dictated from above. Two new programs were recently introduced; both arising from the ideas of individual academics in response to industry needs (Enterprise). Technological

innovations in teaching were investigated, trialled and championed by individual academics in response to the needs arising in their own classrooms (Enterprise).

While a bureaucratic type of formal structure and operating procedure was generally embraced for the efficiency and standardised curriculum quality, it allowed the thread of best interests of the student to run throughout the discussion. Without exception, staff interview participants, when asked to explain what they loved about their job, said that they felt that what they did could make a difference to students. Students were generally recognised as the reason for the faculty's existence, rather than a more traditional Collegium view of academic scholarship for scholarship sake.

The comments of one long standing, senior academic embody the student focussed approach of academic staff. When explaining, and justifying, the substantial additional work taken on by individual academics (outside formal procedures or expectations) to make individual engineering subjects accessible to incarcerated students he stated that "these are severely disadvantaged students who are trying to make the best of their circumstances and better their lives through education, so we have a moral obligation to support that".

Discussion with respondents, to ensure that question/response interpretation was consistent with the McNay's typology descriptions, revealed limitations to the use of a questionnaire to map a complex, dynamic concept like culture. The key limitation found was in concisely wording a question around the, sometimes archaic, terminology used by McNay to be meaningful in the local context.

For example, the word 'customer' was loaded with connotations for the respondents which were inconsistent with the intent of the questions. One respondent stated that the word 'customer' was never used with regard to students and the prevailing attitude amongst staff was that 'we do not have customers'. This was at odds with other data suggesting that an Enterprise approach, whereby daily activity and innovation were nearly always driven by the best interests of the student body, was in operation. It transpired that the word 'customer' brought with it connotations of payment for goods (you cannot 'buy' a degree) and the idea that 'the customer is always right'. The latter idea was rejected by academics who frequently encounter instances where the requests of individual students cannot or should not be

accommodated. The larger student body, rather than the individual student, is a better conception of ‘the customer’ in this Faculty. For example, upholding academic standards, regardless of the often negative social and financial implications for an individual student, was seen as ultimately benefitting the larger student body.

In summary, any survey instrument used to map institutional culture will be limited by the interpretation of individual respondents. This is particularly evident when trying to pin down a more intangible concept like culture, where lived experiences and individual ontologies merge to produce the ethos or values of a group. A finer grained analysis can be achieved through the use interviews which allow for the probing and unpacking of statements to clarify interpretations and paint a clearer picture of the lived experience of the individual. The questionnaire does provide a mechanism by which to commence the unpacking of an individual’s experience of institutional culture. The themes emerging from this data were further explored and articulated based on the staff interviews to form the findings with regard to faculty culture. These were then distilled into some general ‘rules of the game’, or expectations made of students entering the Faculty.

7.5 Findings: Faculty culture

The following discussion outlines the themes that emerged from analysis of the staff interviews. The culture of the particular engineering faculty explored in this study is discussed with particular reference to the resulting expectations made of students.

7.5.1 Social cohesion and practice within the wider institution

A consistent theme that was expressed by both academics and professional (support) staff was the cohesiveness of the Faculty as a group within the wider institution. The emphasis on this aspect was probably influenced by the environment of institutional change at the time and the feeling of staff that this traditional cohesion was under threat. Nevertheless, staff consistently expressed appreciation of the social cohesion within the Faculty and recognised the good working relationships that generally existed between academics, student support staff and technical support staff. The Faculty had a long history of shared social activities, which had promoted the development of this social cohesion.

There was a general recognition that the wider institution had a set of overarching policies and procedures by which the Faculty abided. However, the view of the Faculty as an almost autonomous operation within the wider institution was also evident. The interpretation and implementation of the higher level policies and procedures were made at a Faculty level and were embodied in a dynamic document called the 'Faculty Guidelines'. This document articulated the operational and administrative details which had been decided at a Faculty level when institutional procedures contained insufficient detail for the purposes of consistency of application within the Faculty.

This document reflected a culture of transparency and individual accountability as demonstrated by the guidelines for academic staff workload allocation. This guideline had been developed within the Faculty specifically for the purposes of an equitable and transparent distribution of time resources amongst staff. Staff knew how teaching workload was distributed each year and the guideline set clear guidelines by which staff could 'qualify' for the allocation of precious research time.

A significant portion of the guideline deals with academic issues directly affecting students. Guidelines for grading and operation of courses were clearly articulated and focussed on a consistent approach and fair and high quality service delivery to students. A focus on the impact of policy and procedure on students and their educational outcomes, rather than the adoption of policy and procedure purely for the sake of efficiency and standardisation is clearly evident. For example, the guideline for final grading of students and how marks at the 'boundaries' between grades should be treated are based on an acknowledgement that assessment marking is not always completely 'accurate' and marking consistency can vary, thus the 'benefit of the doubt' is given to students at grade boundaries.

This focus on the impact of policy and procedure on students was also evident in the level of practical support provided to students. The Faculty-based student support team supplemented the wider student support initiatives of the University with program specific knowledge and assistance. One student support staff member, who had previously worked in other Faculties, commented on the very high level of support that was given in comparison to other areas, describing it as 'babying our

(engineering) students'. Another described the implementation of a special single point of contact support service in response to the needs of a particular student cohort.

7.5.2 Industry focus

The Faculty appears to have adopted an 'engineering approach' to education. An industry focus, which tends to set engineering faculties apart from those of other disciplines, together with an inclination to efficiency and standardisation, are both evident. Practices and processes were continually reviewed for efficiency and effectiveness and modified where possible, although always within the overarching university policies and procedures.

This particular Faculty has historically been very grounded in industry, through both its staff profile and curriculum aspirations. In addition the distance education offered by the Faculty has enabled the development of strong links with industry by allowing students working in a technician capacity to study from their workplace. There is a general acknowledgement by staff that students often bring valuable workplace skills and perspectives to their study. The diversity regularly seen in the student cohort has enabled an understanding of the unique perspectives brought to their study by non-traditional students.

Since the curriculum is grounded in the practical application of theoretical (scientific) principles to everyday problems, a practical appreciation of 'real world problems' is valued. Staff expressed a view that students from non-traditional academic backgrounds are often viewed as having an advantage over 'school-leavers' in this respect, staff expressed opinions including:

- Students from rural and regional areas are often seen as having practical problem solving expertise by virtue of their agricultural background
- Mature age students have 'life experiences' which they bring to their problem solving
- Students working in a relevant industry while studying have practical examples of the problems that engineers deal with available to them on a day to day basis.

7.5.3 Engineers as academics

The industry focus is also reflected in the perceived roles of academics within the faculty as engineering educators. Academic staff are viewed from within the faculty as competent professionals who provide an educational service, rather than more traditional (Collegium) view of academics as scholars primarily pursuing more esoteric objectives.

Most engineering academics at USQ have industry experience and are proud to call themselves an engineer. Some have noted that they categorise themselves as ‘engineer’ when filling out forms, rather than ‘lecturer’ or ‘academic’. Completion of a Bachelor of Engineering is seen as allowing entry into a somewhat exclusive professional club (both literally and metaphorically represented by Engineers Australia membership). This is viewed as a desirable goal in itself by engineering academics, and students are expected to develop an emergent professional pride as they progress through their studies.

7.5.4 Disciplinary boundaries

One of statements in the EA Code of Ethics refers to the need to practice competently (acting on the basis of adequate knowledge and representing areas of competence objectively). This is a principle that seems to be taken to heart by engineers within the Faculty, there is a professional pride in their knowledge but also a recognition of the limitations of own and disciplinary knowledge boundaries. Professionally, engineers work with a variety of other disciplines, both professional and non-professional, and need to have at least an appreciation of the skills and knowledge that other disciplines can bring to a project, together with an understanding of their own limitations. This requires a certain respect for other disciplines, demonstrated by not assuming or asserting knowledge in an area to which an engineer has had only superficial exposure.

Students are expected to develop this respect for the knowledge of others during their studies. This is demonstrated by the refusal (often accompanied by irritation on the part of academics) to allow students to undertake final year projects which are not within their discipline. This is not only a requirement of the project course (ie it is a

capstone application and demonstration of disciplinary knowledge gained during the foregoing studies) but also can be traced to the expectation of disciplinary pride and working within competencies.

7.5.5 Academic standards

The focus on graduate competency by staff means that students are expected to reach the benchmarks set for them. While assistance is available to meet the required standards, students are expected to appreciate and value the need for academic standards to be maintained. The expression of this appreciation for standards is expected to be demonstrated by students through their acceptance of the assessment framework developed for each course and the acceptance of final grading decisions.

Assessment is developed for each course in consideration of the course objectives but the application of the assessment is routinely modified to accommodate particular student needs; for example, students with disabilities or students without access to regular internet or computing facilities. In these cases the assessment is modified so that the same overall assessment criteria is achieved but the required execution of the task is modified (for example, a print based version is produced in lieu of electronic).

7.5.6 Expectations of students

Students are expected to take responsibility for their own academic performance. One academic commented that they looked more favourably on a request for an extension, made early in semester on the basis that a student would be away for work at the appointed due date, as it showed that they were thinking about and planning their semester's studies.

The student's responsibility for their own performance is also seen in comments from examiners like "I don't pass or fail students, I just set the assessments and add up the marks". The intent behind this comment was that ultimately it is not the course materials, delivery or assessment that determines a student's grade but their own abilities and efforts. There was general agreement that to succeed students needed to be motivated, independent and willing to 'seek out' the information that they need. There was a general belief that a high level of support is provided (by both

academics and support staff) and it is accessible to all students if they are willing to look for it or ask for direction.

The ability to make logical deductions and inferences is expected of students. Logic, as well as the ability to draw on and apply multiple areas of knowledge, assist with problem solving using traditional engineering approaches. Students are expected to be able to identify the limits of applicability of a given problem solution and to think about why a particular solution is appropriate for a given set of constraints.

In terms of the conduct, of students it was generally felt that they were given a good deal of latitude in the way they interacted with staff. Informal modes of address (for example, by first names) are expected and students were generally welcome to approach staff without a prior appointment. Some staff commented that student queries or questioning of marks and grades were given more consideration and tolerated more than might occur at other institutions. Whether this is the case or not, the perception was that students' queries, even on apparently 'sacrosanct' topics like grading, were considered sincerely.

Even though informal communication was acceptable there was an underlying expectation that students will behave 'professionally'. This implies an expectation of a certain professional level of courtesy and respect for the knowledge of staff and for other students. One academic commented that it is important to model a relatively formal communication style when interacting with students on student forums to demonstrate the expected form of communication and help students develop an understanding of professional behaviour. Another student support staff member commented that she was dismayed at the lack of respect sometimes shown to academics by students, saying "Some of these people are at the peak of their profession and they deserve appropriate respect".

7.5.7 Mathematical competency

Students are expected to be, or to become, mathematically competent. The engineering curriculum relies on the use of mathematics as a tool for many of the design and analysis courses that form part of the program. Students without the required mathematical background prior to entering USQ have alternative pathways

by which they can enter engineering. Diploma of Engineering and Associate Degree programs are offered, and begin at a lower level of maths and physics, and scaffold student progression through to a level at which they can articulate into a full Bachelor of Engineering. Students can also access a free Tertiary Preparation Program which gives intensive support for students to study subjects including the equivalent of the highest level of secondary school maths.

Students who are mathematically fluent prior to entering the Bachelor of Engineering program manage their coursework more easily and it is generally perceived by academic staff that maths presents the greatest academic barrier for many students. Historically, a high level of maths in high school was required for entry into an engineering program. Academics regularly express frustration with perceived lower levels of mathematical competence in seen in the classroom.

7.6 Conclusion

Given the diverse nature of the student body studying engineering it is critical to ensure that optimal support exists in order to enable their success. The cultural dimensions of empowered academics who see their teaching of students as a critical part of both the institutional and their individual mission, together with a constant focus on the ways in which policy and practice decisions will ultimately affect students, appear to be key features of an enabling institutional culture.

The particular Faculty examined in this study appears to have developed this approach through its historical grounding in, and association with industry, together with long experience with diverse cohorts. Although the Faculty had adopted a proactive approach to student engagement through the formation of an Engineering Education Research Group (EERG), there was no deliberate program to foster student engagement. The diversity of the student cohort is accepted as 'normal' and practices which support students from diverse backgrounds are seen as part of good teaching practice. To continue to enable the success of this diverse student cohort it is important that the student focused elements of McNay's enterprise cultural typology are maintained, together with the inclusion of student support as intrinsic to the curriculum. The importance of these features of field to student success become

apparent with the concurrent analysis of successful student habitus as presented in Chapter 8.

8 STUDENT CULTURE AND HABITUS

Students as individuals bring a unique variety of experiences, values, attitudes, and perceptions to their studies. Each will experience their tertiary studies in a unique and very personal way. There will also be commonalities between students' experiences based on their program, the institution and common backgrounds.

Education was seen by Bourdieu as a means of perpetuating the status quo of social class but also as a mechanism by which individuals can change the direction of their lives relative to peers from their socio-economic background (Bourdieu 1999). The struggle for and accumulation of capital helps to define any particular field. The way in which any individual (actor) participates in this struggle is driven by their habitus. Successful accumulation of capital within a field demonstrates an actor's intrinsic understanding of the 'rules of the game' for that particular field. Conversely, the strategies and processes used to play the game successfully can be examined in order to expose those tacit rules that can otherwise act to bar successful participation by unskilled actors. Likewise, the dispositions, attitudes and skills possessed by successful protagonists, which can be traded on in the accumulation of institutional capital, can be also identified.

Students who are able to successfully progress through their program of study can be thought to possess sufficient quantities of appropriate types of capital, and the dispositions to use it effectively in this field. They must also possess, or quickly develop, an adequate understanding of the rules of the game. Examination of the strategies and processes used by students to accumulate institutional capital within this case study field is used to develop an understanding of the capital being employed and the dispositions exhibited by these students. The demonstrated value to this field of the capital and dispositions employed by students successfully accumulating institutional capital, suggests a socio-cultural congruence between student and institution. Examination of this socio-cultural congruence is used to uncover some of the enabling institutional values and mechanisms which support student academic progression.

The educational experiences of the diverse cohort of engineering students studying at USQ is the focus of this chapter. The educational journeys of student participants are explored through a thematic analysis of a series of interviews in order to uncover the underlying dispositions of these students and the capital which they employ.

This chapter considers and explores the following:

- To what extent is socio-cultural congruence (or incongruence) evident in the students' experience of engineering study?
- What dispositions are evident in academically successful students at USQ?
- What types of capital are employed by students who progress effectively through their studies?

8.1 Approach to exploring student culture and habitus

A person's habitus is largely subconscious, and is formed through early childhood experiences (Bourdieu 1984). Although it influences a person's actions and beliefs in a particular situation, it is not easily described or even acknowledged by an individual. Uncovering a student's habitus requires an inquiry into their largely subconscious beliefs and values; it is not a question that can be asked directly or data that can be directly observed or measured against any standard (Swartz 1997, p 290). Clues to a student's habitus are found in the expression of their beliefs, values and viewpoints, and in the way in which they operationalize their cultural capital. In the case of this research it is situated in the 'Field' of engineering education.

Data for this chapter was drawn from twenty-seven semi-structured interviews with students representing two cohorts with differing levels of academic achievement in their engineering studies as indicated by their GPA. Purposive sampling (Oliver 2006) was used to invite participation from students who fit the profiles of interest.

Informal, semi-structured interviews are an effective means of uncovering large amounts of expansive and contextual data and discovering complex interconnections and relationships (Hughes 2002). Interviews with student participants were chosen as the most natural means of eliciting their unique perspectives. Semi-structured

interviews were used successfully by Nash (2002) when he investigated the relationship between elements of a student's habitus and their progress at secondary school. The interviews with students explored topics associated with their experience of secondary schooling. Asking participants to reflect on and speak about their own educational experiences puts them in the position of the 'expert witness' and situates their narrative in the educational environment. Relevant dispositions such as their aspirations, perception of education, academic preferences and understanding of the 'rules of the game' can then be uncovered.

8.1.1 Data collection

Twenty-seven semi-structured interviews with students were conducted for the purposes of this study. Two groups of students were represented; high achieving and struggling students as indicated by high and low GPA and discussed in detail in 8.1.2. It is recognised that success is not measured by academic achievement and the group labels were intended only to be descriptive indicators of academic achievement. Comparison of data from these two groups enable a classic 'method of differences' heuristic (Miles Huberman Saldana, p 284), which enables testing of the conclusions being drawn from the data.

The high achieving student interviews were used as the primary data, as the questions being asked in the study revolve around student academic success. A pilot study of five students, a size which is consistent with the initial generation of meta-themes (Guest et al. 2006), was conducted. The analysis of this data informed a refinement of research issues (Uwe Flick, p 3), and themes which were probed more deeply in subsequent interviews with this group. The second stage of twelve interviews was conducted with an additional ten high achieving student participants and included follow up interviews with two of the original students. Comparative data was drawn from a series of ten interviews conducted with students identified as struggling academically.

The objective of the interviews was to acquire naturalistic data in a narrative form pertaining to student perceptions of their studies that would reveal their subconscious dispositions. Naturalistic data is required in order to reduce as much as possible the

influence of the researcher on the data being gathered, ensuring that it represents the outlook and opinions of the participant. This was achieved through a semi-structured interview format where the participant was invited to tell their own story. To minimise the influence of the interviewer, a conversational tone was adopted as far as possible and interviewer input was restricted to the introduction of educational related topics and requests for clarification or more information.

The interview protocol (see Appendix E) included an informal setting and approach, aimed at achieving expansive data from the participants. A series of prompts and open queries regarding the student's experience of and attitudes to their early and higher education, and their reasons for choosing engineering studies, were used to elicit a narrative from each participant.

8.1.2 Participants

Academically high achieving interview participants

Participants were invited from amongst Bachelor of Engineering (four year program) students who had completed at least eight courses (one year full-time equivalent) and had a grade point average of above five, out of a possible maximum of seven. Students achieving a grade point averages of five and above are the top 35% of all students in the Faculty and are Honours level students. Students were excluded from the invitation if there was any potential of conflict related to the researcher's teaching and administrative duties.

Targeted invitations to participate in the initial pilot were sent to the students identified as high achievers and the remaining participants were invited via email following the demographics survey (Chapter 6). The final question of that survey invited respondents to indicate whether they would be interested in participating in a follow up interview. Respondents who answered in the affirmative and who met the GPA criteria described above, were sent an email invitation to participate. Interviews with external students were conducted while they were on the campus for one of the residential practice courses which make up part of the USQ distance engineering program.

Student participants were not specifically selected for their ‘diversity’, though they did represent the diverse nature of the engineering student cohort. Academic and demographic metadata associated with each of the participants in the high achieving group are shown in Table 8-1. The engineering major for each participant is shown in order to indicate the coverage of program offerings represented by these participants. Students from each major disciplinary group within the Faculty participated. It should be noted that some participants had changed majors at some point during their study program. The majors reported are those that were current at the time of the interview. Students’ part-time and on-campus/distance education status also changes for Gerard, Justine and Katrina. They are listed in Table 8-1 as external because they are able to speak to that experience. Pseudonyms have been used to refer to these students throughout this chapter in order to preserve confidentiality and comply with USQ ethics approval.

Table 8-1 Demographic metadata for high achieving Bachelor of Engineering interview participants.

Participant	Study Major	Part-Time Study	External Mode	Low-SES	Rural/ Regional	NESB	Female	Age > 25 years	Dependents	First in Family
David	Civil	✓	✓	✓				✓		✓
Gerard	Mech	✓	✓		✓			✓		✓
Harry	Civil				✓					✓
James	Civil				✓	✓		✓	✓	✓
Sonia	Enviro				✓		✓	✓	✓	
Ned	Mech	✓	✓	✓						✓
Justine	Civil		✓	✓		✓	✓	✓		✓
John	Mech	✓	✓	✓	✓			✓		
Peter	Elec	✓	✓		✓			✓	✓	✓
Andrew	Inst/Ctrl	✓	✓		✓			✓	✓	✓
Kevin	Power	✓	✓					✓	✓	✓
Adrian	Civil	✓	✓					✓	✓	✓
Matt	Civil	✓	✓					✓	✓	✓
Riley	Civil				✓					✓
Katrina	Mech		✓		✓		✓			

Struggling student interview participants

Ten interviews were also conducted with students who were deemed to be struggling with their studies. These students were identified as students who had failed a core first year engineering course, Engineering Statics and had a GPA of below 4.5. The interviews with this group of students centred around their difficulties with first year, and the Engineering Statics course in particular, and are not as wide ranging as the primary interviews with high achieving students. The data from these interviews is included in the following discussion where it provides a counterpoint and contrast with the data from the primary student interviews.

Since the author teaches into the Engineering Statics course, which these students were preparing to repeat, interviews with the “struggling students” were conducted by a specialist research assistant. The interviewer, who was not associated with course or program delivery, managed invitations to participate and made contact with students who agreed to participate. Student identities were kept confidential and were not revealed to the author. Since they were not part of the key student focus for this study, detailed demographic data was not specifically collected for these students.

8.1.3 Method of analysis

The students’ narratives were analysed, using the constant comparative method, to uncover themes related to Bourdieu’s triad of theoretical concepts. Open coding was used to induce initial codes from the textual data (Uwe Flick, p 45) to draw explanations from the data rather than imposing an interpretation based on a pre-existing theory. The codes were then iteratively refined into categories and interpreted for their meaning until the data was distilled to key themes. Emergent themes were analysed in the context of Bourdieu’s triad of theoretical concepts, habitus, capital and field, as they relate to the student participants’ educational journey. This allowed the final development of themes from the data categories. These key themes are reported in the discussion in Section 8.2. While not all participants echoed every theme, data collection was sufficient to reach saturation, as no new themes emerged from later datasets.

The discussion of themes is illustrated by direct quotes from the student participants. These quotes have been “smoothed [by omitting] certain add-on developments, certain confused phrases, verbal expletives or linguistic tics” (Bourdieu, 1999 pp.622-623), however the grammar in the quotes is uncorrected.

An individual’s habitus and the capital they bring to their studies are largely subconscious, so the identification and description of these features in terms of themes are reliant on interpretation of perceptions and practices. This interpretation rests on an understanding of the key properties of these concepts, which are reiterated here.

Habitus is a system of embodied dispositions or long lasting structures of perception, conception and action (Bourdieu, 2005, p. 43) that are embodied in a person’s manner of being, seeing, acting or thinking. In the following discussion participants’ perceptions, attitudes, understandings and practices with respect to their engineering education are discussed as a means of describing aspects of habitus.

Exploration of these dispositions also uncovers the capital which is both leveraged and accumulated by students. Capital is contested in any field in which it has value. It can be identified by a participant’s struggles (whether difficult or naturally conducted) to acquire it and by competitive behaviours or attitudes towards it. Instances of competition and suggestions of value within the data indicate capital which is relevant to the engineering educationa discussion at hand.

Within the following discussion of results emergent themes relating to dispositions, capital (both acquired and leveraged) and the logic of the particular field in which they operate are elaborated. These concepts are so closely entwined that they have not been separately labelled for every theme. The discussion focusses on the interaction of this triad of concepts and the way in which this interaction occurs within the case study. From this analysis conclusions were drawn about factors that are important to student success.

8.2 Discussion of results

Social and academic integration have been widely discussed in the literature as necessary for student progression and retention at university (Tinto, 1975). The

student experience of higher education is enhanced when socio-cultural congruence between student and institution, which supports successful integration, is achieved. This premise can be viewed through the lens of Bourdieu's concepts of habitus, capital and field. In order for a student to appreciate the rules of the game of engineering education, and to succeed in that field, they need to possess sufficient quantities of the appropriate capital.

The high achieving students participating in this study were all succeeding in their engineering studies. Their experiences are investigated with a view to identifying the aspects of their habitus that are congruent with the particular position in the field occupied by their institution of study. Such congruence would serve to expedite students' progression, and would result from an understanding of the logic of the field coupled with possession of appropriate capital.

The key themes that emerged from the data are arranged, for the purposes of this discussion, in a progressively focussed series of topics. First the students' perceptions and understanding of engineering as a profession are explored, followed by discussion of the choice and experience of their institution of study (USQ). The focus then narrows to the student themselves and themes that emerged in relation to their engagement with their studies. This part of the discussion addresses Tinto's (1975) twin concepts of social and academic integration, or engagement, using a Bourdieuan interpretation. Finally the discussion turns to specific qualities and factors relating to the students themselves which appear to support their successful progression.

8.2.1 Engineering – the profession

The perceptions and expectations of the student participants regarding engineering as a profession and the reasons that they were attracted to it were explored. This section relates to perceptions and apperceptions held by students with regard to professional engineering.

Engineering as extension of technical work

Undertaking study in engineering in order to acquire professional credentials was seen by most external students as a deliberate career progression strategy. For mature students, it was viewed as a natural progression of previous or current employment in a trade or technician role. For others like Harry and Ned, who both had very practical, hands on experiences with machinery and tools while growing up, exposure to engineering through work experience programs at school was also an important factor in bringing an engineering career to their attention. The vocational nature of engineering studies and the clear employment prospects associated with a professional engineering degree positions engineering education as a desirable pursuit. A clear economic return on an investment of time and effort can be seen by participants. For these participants viewing professional engineering in the context of their past experiences, either on-the-job or through pastimes, their studies were imbued with a sense of familiarity despite the unfamiliar higher education context.

Identification with the profession

Most participants indicated a sense of belonging to, and identification with, their various communities of practice that encompass engineering in the workplace. Many were already working in the field, had exposure through parental involvement at a technician level or saw professional engineering as a natural extension of manual activities they undertook as hobbies. Lave and Wenger's (1991) theory of situated learning suggests that, when students are learning for a specific occupation, then immersion in the social, cultural and emotional aspects of the workplace are central to the learning process. Lave and Wenger (1991) advanced the concept of learning as participation rather than cognitive acquisition.

Most of the external students were already working in the industry where they expected to continue and progress after graduation. They were immersed in the relevant workplace and had work colleagues or associates who were already professional engineers. These students were already participating in authentic vocational learning situations, sometimes in a more central than peripheral engineering role. Kevin described being in charge of the electronics lab and providing technical engineering support to professional engineers. He has been able

to put into practice much of the theory he has learned during his electrical engineering studies. Working closely with professional engineers, he could see the relevance of his own studies to his future work:

“They’re very intelligent, the people that I work for and there’s a lot of mathematical modelling going on and all that. I can see the level of ...- I can see what they do and the relevance of the work that I’m doing here, leading towards that.” (Kevin)

Gerard and Ned both expressed an opinion that, having observed the practices and dynamics of an industrial workplace, they were capable of improving operations and that, given the opportunity, they could outperform some of the professional engineers and managers they had observed.

“I always believed that yeah I’d be able to do a heck of a lot better job than - managing that sort of turnout than what was being done.” (Gerard)

These participants were confident in their own abilities and not overly awed by the formal qualifications held by the professional engineers that they worked with. Their own practical experience and aptitudes appeared to them to be more applicable to some of the workplace practices than the theoretical knowledge that came with a professional qualification. Gerard told a story, almost contemptuously, of a graduate engineer who was unsure about which way to turn a shifting spanner while working on site with Gerard. Nevertheless these students recognised that in order to move into that role they would need professional engineering qualifications. The need to acquire professional credentials in the form of a degree, in order to advance their career, was the key reason for commencing an engineering degree given by all of the mature age students.

External students in an engineering related workplace did not need to struggle to find the implicit context or to understand the social or cultural environment in which their professional lives would unfold. They already had a feel for the logic of practice within the workplace. Rather than grappling with the implicit culture of the

engineering profession, their preoccupation and energies could be directed towards the acquisition of cognitive knowledge, on which the grading and program progression within higher education or overtly based.

Altruistic views on the profession of engineering

A second motivation for pursuing engineering that emerged was the coupling of a career, and secure employment prospects, with more altruistic or creative aspirations. Engineering was seen by some as a practical occupation that produces results which can influence the world for the better.

Sonia initially described her choice of engineering as being very practical and underpinned by the desire for security for her family. Later she described a more altruistic desire to ‘help the environment’ through her work.

“I’ve got two kids so I need money - I do believe I could have looked up the salaries of environmental engineers and that may have been a part of it [choosing engineering]... I can make money helping the environment...” (Sonia)

She went on to describe her desire to join Engineers Without Borders (EWB), once her career was established, in order to “fight poverty” and “make a difference to global warming” by addressing clean water issues in developing countries.

David also expressed a desire to have a positive impact on the world around him through technological expertise and also saw engineering as an opportunity to be creative.

[I considered studying] “either engineering or architecture - I’m going mmm yeah, both very creative, both mould the world around them.

But from my experience as a draftsman, it turned me off architecture [laughs]. Architects have the dream, engineers have the reality. So, and architects want to create these weird

and wonderful, completely unrealistic designs. But engineers are the ones that make it happen.” (David)

This comparison with architecture was echoed by Riley, who reiterated the attraction of the practical aspects of engineering coupled with the creation process.

“my perception of architecture is that it's more coming up with concept designs and, they not so much have to work structurally, but they have to look good and have to be sold to an owner. You have to sell a concept to an owner...

I worked in it [engineering drafting] for four or five years, so you kind of know that you're doing structural designs and you're making the building work and stand and have a life span. You're looking at - I guess design and make things work rather design to make things look beautiful. (Riley)

Both of these students had considered studying architecture at some point and had a background in drafting that had informed their perceptions of the two different professions.

8.2.2 Choice and experience of institution

The factors affecting student success are to some extent variable for different institutions (Berger 2000). Berger (2000) developed four propositions concerning student persistence in higher education based on the concepts of congruence between the level of student capital and the organisational capital held by the institutions at which they study. Non-traditional students tend to be found in regional and less prestigious universities (Forsyth and Furlong 2003, James et al. 2004, Reay et al. 2009, King et al. 2011) as discussed in Chapter 2.

The academic norms and expectations of a less prestigious university may be more accessible for non-traditional students, enabling them to profitably leverage their existing capital for academic gain. Institutional culture, and the capital held by an Engineering Faculty in particular, is subject to the influences of not only higher education academic culture but geographic location, employer/industry expectations,

accrediting body requirements, institutional values and strategies and the collective habituses of the academic staff.

The initial choice of institution may be influenced by the public identity of the university but the subsequent educational experience of the student is affected by the intersection of institutional culture and student habitus.

When asked why he chose to study at USQ, David summed up his choice by saying,

“It all came down to gut feeling and what seemed right for me. - just from also what I’d heard in the media, not from any experiences from people I know - but the impression I got and the knowledge I had of which university would be more supportive of me”

Public positioning of USQ as a supportive institution appears to have influenced David’s perceptions and decisions about enrolment. His explanation of institutional choice seems indicative of a habitus that subconsciously recognises a position in the field with which it would be compatible. However, David had prefaced this comment by saying that for practical reasons he was looking for a distance program in engineering. This was echoed by many of the other participants who articulated the practical attraction of distance mode while they were working and the suitability of distance study mode to personal lifestyles. As Andrew explained:

“I’ve got financial commitments so I have to work full-time. So the options for external engineering were USQ and Deakin in Melbourne. I guess I chose USQ because they had the Instrumentation Control Major, which I was interested in, control engineering, so that’s why I chose this one.”

Other external students discussed the value of the flexibility offered by distance education when compared to face to face delivery, in terms of managing work and family commitments. Kevin had enrolled in engineering in on-campus mode at a university close to where he lived but found that this made study too “inflexible” when juggling studies, work and family commitments.

Katrina had also begun engineering at another institution before enrolling at USQ. She explained that she had started university at a Go8 university as a school leaver but had come from a regional background and felt isolated and a little overwhelmed by the size of the on-campus classes. She explained that “I just never really *felt* happy or like I fitted in at (the Go8)”, she left after a year to travel and work, returning to study engineering at USQ after several years. Katrina spent her second semester studying engineering on-campus at USQ. When asked to contrast her experiences at the different institutions, she immediately described a more personalised experience on the smaller campus, which suited her:

“I loved USQ and I loved the campus. It's nice and quaint and you're a student and the lecturers talk to you like a person not like a number, which a lot of the time at (the Go8) you don't feel like really anything but a number there. I mean, in a class of 1000 there's hardly a chance to talk. It's like everyone can go up and talk to the lecturer [at USQ] if you have a problem or something. So that difference was major for me. It was a lot more personal at USQ.”

This description is strongly reminiscent of the public positioning of USQ as a supportive institution providing a personalised education experience.

8.2.3 Student engagement

Tinto's (1975) concept of integration has been further developed to encompass the current concept of student engagement (Tinto, 2006). Student engagement, and the consequent desirable outcomes of productive learning and university retention, is dependent on a student's total experience of university (Scott, 2006), which has both academic and social dimensions.

Social engagement

Social engagement occurs through students developing networks and relationships with fellow students (Tinto, 1975). The more homogenous cohorts of students studying in face to face mode at traditional universities, were likely to connect with

their fellow students simply due to shared and similar backgrounds and experiences, leading to the natural development of social networks and relationships (G. M. Crosling et al., 2008, p3). With the advent of greater diversity in student cohorts, accompanied by changing patterns in university attendance (such as part-time, and external modes) the development of a social network within the educational environment can be more challenging.

All on campus participants had formed small study groups with other high achieving students. They spoke of competition within these groups for grades and subsequently for jobs. The members of each study group (the study groups of the participants did not intersect) would engage in friendly rivalry to outdo one another in terms of marks for individual assignments or courses. This competition is the classic competitive struggle described by Bourdieu (1997) which identifies institutional capital.

Sonia and Harry both had strong study groups but resisted the idea that these were 'friends'. Sonia and James prioritised their family as commitments over socialising, Sonia reiterated several times "*I have no (social) life*". Harry gave a specific example about why his university friends were not people he would socialise with

"Different pastimes, a lot of them like playing computer games and that sort of thing whereas I never do that at all."

Instead, he maintained strong sporting and social connections with his rural, pre-university network. Likewise Gerard's social network, while studying on campus, was predominantly formed outside university through his sporting involvements.

All of these on-campus students had a social focus outside university and a limited network with fellow students. Relations with fellow students were primarily focussed around study, rather than socialising. Students were not accessing social gratification through university studies however much they may have been enjoying incidental socialising with other students. This indicates that, for these students, university was not central to their lives, entering university appeared to represent an addition to their existing life rather than a transition to a new lifestyle.

External students have far fewer opportunities for developing networks with fellow students. The nature of distance study, where the majority of interactions are conducted online, inhibits the formation of ongoing relationships. The external students interviewed described the isolated nature of their study as one of the greatest challenges. They tended to suggest that study is a solitary occupation and that they were demonstrably self-sufficient when it came to accessing resources and completing their studies. They did not express any significant need or desire to have other students to work with, their pre-occupation in terms of isolation tended to revolve around access to academic staff.

Interestingly, they were all able to describe relationships that they had developed and maintained with other students. Some had lasted only for the duration of a course, others had endured for several years. The initial development of these relationships was mostly attributed to the ‘group work’ they undertook in their first year. This is a reference to the ‘Problem Solving’ courses that are core courses for all disciplines, where students must work in cross disciplinary teams. In most cases relationships had been consolidated by subsequent face to face meeting with former team members at one of the compulsory week long on-campus residential courses that engineering students attend. The consistency of this theme was unexpected and suggests that the problem solving courses and residential courses are more important to the social integration of external students than has been previously identified.

While these interactions meet the Tinto’s 1975 definition of social integration, it suggests a far lower significance than may have been observed for the traditional on-campus students around whom his theory was developed.

Academic engagement and approach to study

Academic engagement is reflected by students’ attending classes, their active involvement with staff and fellow students and with learning resources (Scott, 2006; Tinto, 1975). An educational environment that involves students and provides feedback on their study efforts means that they are more likely to study successfully (G. M. Crosling et al., 2008; Tinto, 2006).

All the successful students interviewed were able to articulate a very organised approach to their program of study. They typically took some time to plan at the beginning of semester; identifying key dates and the various course assessment requirements, together with personal commitments.

Assignments during semester were planned for and completed on time or early. Ned specifically mentioned that he was looking forward to submitting his final year project thesis early so that he could concentrate on preparing for his final exams. A sampling of electronic assignment submission data for a first year course undertaken by the majority of the student participants supported their verbal reporting of on-time or early submission practices. These students recognised and were aware of the course expectations, but there was also a willingness to operate strategically when planning their studies.

Harry described a strategy he had employed when faced with the coincidence of a number of assignment submission dates for different courses. He accepted that he would not be able to complete all of them to a high standard by the due date but had chosen to submit one of the assignments late, calculating that he would be able to complete to a higher standard, which would offset the automatic late submission penalty that this would incur (a standard penalty of 5% of total marks is deducted for every Monday to Friday working day late an assignment is submitted). He was also aware that as the 'due date' fell on a Friday he could submit any time on Monday and only incur a penalty for one day, while 'buying' himself up to three additional days to complete the assignment. This anecdote not only displayed a pragmatic and strategic approach to completing work for the best possible academic outcome but also a detailed understanding of the 'rules' associated with assessment.

Weekly study habits varied between students but they had in common regular weekly periods set aside for focussed study, assignments and revision. Some of these times and locations seemed, on the surface, to be less than ideal in terms of study concentration, but were aimed at balancing personal commitments with study. Sonia, a single mother, described taking her study materials with her to the waiting rooms of various hospital and doctors' waiting rooms, during a period when her daughter required intensive medical treatment. Kevin and Adrian described studying in the

living room at times in order to be near their wives and children while studying. They would however ‘retreat’ to a quieter spot during critical periods of semester. The regularity of these study habits, rather than the environment, seemed to be sufficient to overcome drawbacks in study circumstances and contribute to subsequent academic success in assessments. These approaches indicate a certain perseverance and determination on the part of the student, as well as an understanding of the necessity for sustained effort during most courses.

The need for sustained effort in some cases appeared to come from an insecurity on the part of the student, particularly early in their programs, about their preparation and readiness for study, together with an uncertainty about exactly what effort was required. They tended to address these uncertainties by ‘over-compensating’ in terms of the effort applied to their studies. Several students described being pleasantly surprised to find that their grades in early courses were so high and were then afraid of letting them slip. They seemed to be not entirely sure about how they had achieved grades beyond their expectations, other than knowing that their sustained effort had paid off. They did not want to reduce their effort or approach substantially in case their results swung unexpectedly in the other direction and they found themselves failing or struggling with courses. Their uncertainty about how to calibrate their effort, together with the intrinsic reward associated with their achievement, tended to act as a driver to maintain their initial effort. Indeed the rewards for early academic achievement were not only intrinsic; Sonia described her surprise, and some relief, when she found that she could access a bursary based on her high academic achievements in first year. This unexpected but rewarding conversion of academic capital into financial capital acted as a great motivator for Sonia.

As they progressed through their studies, some students felt that their early success meant that they had more to lose if they could not continue to sustain their grades, David talked about how he was “vigorously defending” his GPA of 6.5. For these students, uncertainty of program requirements was addressed through additional study commitment and effort, which ultimately proved to be a successful match to the expectations of the course staff.

Interactions with staff

The accessibility of academic staff was a theme that recurred for all participants as being important to them. Some participants, such as John and Matt, pointed to instances when individual staff were not readily accessible and expressed frustration at this. They agreed however that these were the exceptions and that most lecturers were easy to approach and responded appropriately. The negative experiences, together with some other resource issues, coloured John's perceptions of his overall experience significantly. He had become quite disillusioned about his overall experience of studying engineering by distance and was pro-actively using the interview to voice these concerns. This was in stark contrast to Katrina's perception. However, it should be noted that although both these students had had previous experience studying on-campus at another institution, Katrina had a period of on-campus study at USQ that had informed her views on the accessibility of staff. This contrasts with John's experience, who found the change to external study quite confronting;

“face to face ... is significantly different to saying, here's the materials, read, do the assignments and get through it by yourself”

The on-campus students at USQ have face to face access to both course and support staff during class times and office hours. Students who study externally have access to course staff primarily through the Learning Management System, which is used by course staff to provide study materials and resources, as well as a mechanism for interaction with both the external and on-campus student cohorts. Discussion forums are used in most courses to facilitate question asking by students and responses by staff. The Faculty has a set a minimum standard for staff response times of two working days. In practice most teaching focused staff monitor the forums daily and provide a response to students within a day where appropriate. This arguably makes for far greater accessibility to staff than the traditional on-campus model, where students would have to wait until their next class time, or scheduled academic consultation hours, to ask their question, which could take up to a week.

Several of the students gave examples of instances or particular courses when reasonable response times were not met. John described several occasions when he had travelled to campus to meet with lecturers or met with them while on the campus for residential schools, in order to resolve important problems. Sometimes the reason for this was a lack of clarity when trying to resolve problems through online communications. John described online responses as being often difficult to interpret:

“I found a lot of it was too hard and when I tried, it came back in riddles. That was just off-putting to keep trying to get what I want.”

Some of the students were more comfortable with face to face communications. Gerard was very active during his period of on-campus study, in communicating with lecturers and asking them questions or for clarification. However, during periods when he was studying externally (the majority of his program) he admits that he did not even consider using online forums or the Learning Management System for these functions. He was not familiar with online forums, other than through his study, yet he considered them as a tool for socialising rather than studying or answering questions.

The immediacy of a face to face conversation for clarification of content was appealing to most external students. Even when admitting that online communication provided a relatively accessible mechanism for accessing course staff, Matt described his preference for face to face communication because of the body language:

“I go into someone else's office and I ask him about a problem - if they don't want to tell me I can still read their body language and know if I'm on the right track or not. So that makes a big difference.”

He felt that visual clues enabled him to immediately re-word his question if necessary, in order to get a response that satisfied him. This ability is less readily available when having an asynchronous online discussion. His reference to the possibility that the staff member might withhold information or be unwilling to answer fully is intriguing. It probably refers to the mandate applying to most

assessable items that they be the student's own work, and the subsequent refusal of most lecturers to discuss the fine details of assessment questions with students.

Another possible reason for teaching staff to prevaricate is that they are attempting to lead students to formulate their own answers to the problem rather than giving a full solution to the problem. This approach has been observed to cause frustration on the part of students, a response which was alluded to in the earlier quote about online replies coming back in 'riddles'.

Communication protocols

Appropriate forms of communication are one of the implicit cultural expectations of the academic environment. Engineering academics consider students to be emergent professionals and generally expect 'professional' communications from students. While the exact form of this expectation varies between staff, the use of inappropriate forms of communication was noted by the high achieving student participants.

Several times the idea of 'respect' for academic staff and fellow students was expressed by participants, who spoke of the overly aggressive or familiar tone that they had observed other students using towards both academic staff and other students on the forums. They saw more value in polite enquiries and were disparaging of other students who seemed to them to be overly critical of course content, material or staff. David expressed his feelings on this topic as follows:

“all these people do not know how to communicate. They either don't think before they write something - failing to give the due respect to the person to whom they're sending it to - and then other times it seems like they assume that they know more than the person they're sending it to”

Those students like David who intuitively understand the expected forms of address have an advantage over those who don't. This was illustrated by the comments made to the author by one of the teaching staff:

“I got a nice email from a student... It’s funny how some students can ask you something and make it all ‘warm and fuzzy’ and you respond to them completely differently. Some students just don’t know how to put things to you politely.”

Academic staff regularly discuss their feelings of annoyance when an email from a student addressing them as “Hey” (no name) arrives in their inbox, considering them inappropriately informal. It is unlikely that these students are being deliberately disrespectful and more likely an example of differing cultural norms between students and staff. Nevertheless an appreciation of more formal modes of address and tacit acknowledgement of staff expertise by a student, could be an advantage when seeking assistance from staff.

8.2.4 Aspects of self

Some of the dispositions which emerged as students talked about their studies give particular insight into their success. These are discussed below.

Intrinsic satisfaction from study

Most participants indicated an intrinsic satisfaction associated with learning new things. David described his disappointment with his academic performance in the immediately preceding semester. His personal circumstances had negatively affected his study performance and he had not adequately (in his opinion) covered the last few modules of a particular course. Despite grades being finalised, and having passed with an ‘A’ grade, he still felt a need to understand the material:

“I will go back and I will study in my own time, because I don’t care that it’s not part of the course now, this is stuff that I want to be able to understand”.

Elsewhere he described his “joy” when he made a connection between a mathematical model and the “real world” phenomena it was describing. To then be able to apply these principles to influencing the physical world, was part of the great attraction of engineering for David.

Ned also directly recognised his enjoyment of learning. He rejected the notion that engineering might be attractive to him due to his background in maintenance and physical construction work by saying:

“I really like to engage myself learning new things in general... - if I'm interested in it, it's easy to learn. I can pick it up and read it and do it and talk with someone else about it. I've never pushed myself to be like - okay I need to get a six or a seven for this. It's always - I gave it my best.”

Kevin spoke about his dislike of assessments and contrasted this with the enjoyment he received from study and learning:

“I really enjoy the study side of it, I really enjoy the learning, I don't enjoy the assessment. So, if I could just basically pick up on the courses and learn the content at my own pace and just get there and basically absorb the knowledge, I think I'd be in my prime. I'd really enjoy doing that.”

His comments about preferring to learn at his own pace belie his organised approach to study. He described his preparation for semester as beginning by checking on assessment due dates and comparing them to his other commitments and those of his wife (who was also studying). He perceived his own study pattern as “very unregulated”, but without prompting he then went on to describe a highly regulated study routine where he would use the quiet time between 5.00 and 6.00am each morning to do concentrated study and then return to less focused tasks like watching lecture recordings and searching for further information in the evenings.

Kevin's comment about his study pattern being unregulated may relate to his approach to the course material, which mirrored that of several of the other participants. He described starting a new course by forming an overview of what it contained, as well as determining what the assessment requirements would be. He would then read the first few chapters of course material prior to the first lecture to “get a feel for where the course is going and what's going on”. He described a holistic approach whereby he developed an an overview of the subject as a whole

before moving on to the detail in sequence, rather than reading the course material sequentially chapter by chapter.

The organisation and structure required to study consistently and effectively over a semester and sustained through many years appeared to be satisfying to some of these students. In her second interview, conducted as she neared the completion of her program, Sonia discussed a sense of loss she was experiencing as she realised she would soon lose the structure of studying, commenting “I love structure”. In her earlier interview, two years earlier, she had talked about the importance of process to her:

“whilst the results are very important, this course kind of like reminded me that the process - how you get there - can be just as important or sometimes more important.”

Confidence in ability

As described in the participant selection process, the participants had already successfully partially completed their degrees. This success would have increased their belief that they would achieve a meritorious graduation. Those who were returning to study after a hiatus seemed to believe that they were fulfilling the academic potential that they had not shown adequately in high school and that their poor school grades did not reflect their true ability. One participant who performed poorly in high school suggested that academic improvement was attributable to a change in their own attitude:

“Well, I didn't want to be there and I understand what it means when I didn't apply myself. It makes complete sense now. I didn't apply myself in school [laughs]. I didn't want to be there so... But here it's completely different because I do want to be here” (Sonia)

All participants were comfortable with the idea that they could successfully complete their degree and that it was quite acceptable, or normal, for someone of their background to study engineering. They did not express any trepidation, but rather

enthusiasm, about their potential careers and the positive influence it was likely to have on their status and the fortunes of their dependents.

Attitude to grades

The purposive sampling approach taken ensured that all students in the study had excellent academic records in terms of grades. Students tended to talk in terms of 'passing' being necessary for their progression through their program but seemed to take a deliberately nonchalant stance about their pursuit of 'high' grades. Ned went so far as to claim that he did not bother to look at his grades when they were released, saying "I've given it my best, what's checking my marks going to do? It's not going to change it".

This nonchalance was belied at another point in the interview when in response to a question about his external student status and part-time work he blurted out "I got a '5' for statics". This was one of the lower grades that Ned had received during his program and occurred during his initial period of external study. His sudden volunteering of this information suggests that grades and grade point average were more important to him than first suggested. His awareness of the courses where his grades were lower may have been particularly acute at the time of the interview where he was nearing the end of his program and had reviewed his grades and GPA to work out the grades he would need to achieve in his final courses to achieve a first class honours degree.

This growing of concern about the grades over the period of the program was expressed by other students. Sonia, David, Gerard and Ned, all mentioned their desire to maintain a high GPA after their initial success in attaining high grades. They gave a sense of not wanting to 'let themselves down' by settling for a lower GPA. While high academic achievement may not have been one of their goals on entering university, they had come to recognise the capital, and associated power, which was conferred by their status as high GPA students.

The way in which students spoke of their individual course results in terms of the numerical value also belies a preoccupation amongst these students with their GPA. Course grades at USQ are given as an alphabetic grade code, Table 8-2 below shows

the grading codes which are used at USQ for academic courses in an engineering program. Other compulsory ‘practice courses’ are also undertaken but these are zero credit courses, do not contribute to GPA calculation, and are graded as either an ungraded pass (P) or a fail (F). Temporary and administrative grades are also used in particular circumstances. A conceded pass or ‘D’ grade may be given once during a student’s program of study at the Dean’s discretion.

Table 8-2 Final Grades available in engineering academic courses

Final Grades	Final Mark	GPA value
HD - High Distinction	At least 85	7
A - Distinction	At least 75 but less than 85	6
B - Credit	At least 65 but less than 75	5
C - Pass	At least 50 but less than 65	4
D – Conceded Pass	At least 45 but less than 50	3
F - Fail	Less than 50	1.5

A numerical value is assigned to each final grade in order to calculate the student’s GPA for their program. The numerical value assignment used for this calculation is shown in the final column of Table 8-2. A student’s Grade Point Average is the average of all the final grades for courses within their program, weighted by the unit value of each of these courses.

Information about grade points and grade point average is readily available on the USQ website, and appears as a value against completed courses on the students’ academic transcript, but is not presented to them as part of their individual course results. Academic staff talk in terms of final grades as shown in Table 8-2, never in terms of the grade point value. A student is not referred to as receiving for example, “a 7” for a course and a staff member would typically speak of the student having achieved “an HD” for the course.

With this background in mind it is notable that the students interviewed consistently referred to their grades in this alternative manner; that is by reference to its grade point value. It suggests that there is a preoccupation with their overall academic status that is unadmitted.

Students who had formed study groups with peers also spoke of rivalry around assessment marks and course grades between members, albeit couched in terms of

friendly comparison and discussion. Being able to benchmark their performance against that of other students' was of importance to many of the students.

Students also competed with themselves; several expressed their disappointment in their high school grades (they 'could have done better') and spoke about their ongoing desire to maintain their good grades. One student expressed the expectations they put on themselves to maintain their grades as follows:

"Now, I'm just - I don't know how to not put pressure on myself so I just keep doing really well because I don't know how to go backwards now" (Sonia)

Information seeking

The process of finding their way through the academic system was not daunting to any of the participants. Perhaps this can be partially attributed to the additional maturity that comes with age, since most were mature age students. They were generally well informed about administrative matters and knew how to seek out additional academic information.

Students were generally undaunted by the task of asking questions of academics or university support staff. If they did not immediately know how the system worked they remained confident of being able to find out. They were quite dismissive of other students who in their opinion were looking to be 'spoon fed'. They all spoke about how all the information that was needed (academic course content as well as administrative information) was freely available if you were prepared to look for it.

Sonia explained:

I go on study desk and study desk tells me what to do but there are so many people who don't - don't understand their study desk: it'll give you information." (Sonia)

When talking about difficulties they had encountered, the student invariably focussed on academic matters and seeking advice from teaching staff. Very little mention was made about administrative difficulties. This is in stark contrast to the struggling

students who spoke a lot about enrolment issues and accessing course materials. When prompted, the high achieving students would agree that they had probably contacted student support staff at one or more points in their studies but they seemed more likely to seek out the information they required through the materials provided for courses or through information on the USQ website.

It seemed that the administrative aspects of their courses were not a significant part of their experience. Their focus was on accessing academic support if needed rather than administrative support. It is not clear whether this is because the administrative system was easily navigable for them - their backgrounds did not suggest any particular advantage in terms of experience finding information online. It seems more likely that they were generally confident that information was available and they were prepared to seek it out.

Perseverance and resilience

Students demonstrated perseverance and resilience not only in maintaining their study habits and motivation while under pressure from their other commitments but also when faced with aspects of their program or course that they did not like. John was particularly unhappy with his USQ experience and felt that there was “plenty of room for improvement” in the way that the programs are delivered. He gave several examples of courses that had not run smoothly or where he felt he had not been given adequate support during his studies. Matt also felt that lecturers sometimes “just don’t appreciate external students and the pressures they are under” and that the course organisation privileges on-campus students, a sentiment echoed strongly by Andrew, Matt and John.

Despite these difficulties and the occasional significant associated resentment, the students concerned were able to put these incidents aside and successfully persevere with their studies. There even seemed to be an element of defiance in the way Matt and John described their “just get on with it” attitude; they were determined that they were going to going to succeed despite their frustrations.

Matt described the challenges in his work environment as being more significant than those arising from study. Despite voicing frustration with inconsistent course

delivery and identifying the difficulties of external study as being significant, Matt concluded:

“I can't change any of that ... But that's the choice I've made.”

He was acknowledging that although on-campus study would have provided additional opportunities for face to face support and the use of on-campus facilities, he did not allow himself to “dwell” on these problems. He felt he had made a choice about studying externally, which suited his family and work situation, and would not lose sight of the benefits his choice brought him. He described it in terms of a trade-off that he was willing to make.

Validation through study

Rising to the challenge of study and dealing with the challenges presented by study and other aspects of their life was mentioned by several students. Extending themselves and seeing what they could achieve was particularly important for Ned and John, who both described their decision to study engineering in terms of “challenging” themselves.

Nearly all of the participants were juggling significant other commitments with their studies and regularly encountered challenges in relation to their studies. Satisfaction with what they had achieved, despite the challenges presented, seemed to add to the satisfaction of study.

Sonia’s satisfaction at nearing the completion of her course and the capital that this academic success represented for her was illustrated clearly by her competitive comment regarding her brothers:

“I'm feeling good that I've finally done it and I am the first child in my family to get a degree and I'm the dumbest child in the family. Believe it or not, I know that sounds bad, but I am, my brothers are way smarter than me and I beat them.”

Some participants sought affirmation directly from academics and wanted to be recognised for their own merits and efforts. James referred directly to this:

“You feel sometimes you're being recognised, [by academic staff] sometimes you're being prized for your hard work and sometimes people they show you their trust which give... keep you going”

Academics' perceptions of him were also very important to David. He was very active online, asking questions of lecturers and assisting other students. During one course he suddenly gained insight into a phenomenon, which was an extension of understanding about a concept beyond what had been presented in the course. He discussed his nervousness about contacting the lecturer to confirm his new understanding as follows:

“we had built up like a good lecturer-student relationship and I didn't want to damage that with having thought I'd made my own discovery and then have [the lecturer] think oh, well no, he's not quite as astute as I thought he was”

When his understanding was confirmed and the lecturer commended him on his insight he described it as having a big impact on him:

“receiving it [praise] from someone who I look up to and respect as an academic and as an engineer, yeah that's really hard for me to accept”

Peter was also looking forward to celebrating his graduation with his family, several of whom were coming from Western Australia for the ceremony. He was also proud that his younger sister had been inspired by his success to return to her own university study that had previously been abandoned.

These comments suggest that for these students the recognition that accompanied their academic success represented capital, which could be acquired through study efforts.

Family and social network

Although most participants were the first in their family to attend university they generally spoke of the support that they had received from their families, particularly spouses. None of them alluded to negative reactions from their social network as a result of their studies. Attending university was seen as taking up an opportunity that had not been available to previous generations:

“Dad always used to tell us that if you don’t do well (at school) you will end up farming like him.” (Harry)

“I felt like he (father) was pressuring me because he didn’t have the option to go to university. ... - and he was pushing me.” (David)

It was viewed as a means of securing future employment and securing, or increasing, socio-economic status; an admirable undertaking according to close family and friends.

Previous research (see for example Reay 2002) has pointed to the conflict and inner-turmoil that can be created when a student wishes to ‘better themselves’ through education or move out of the socio-economic sphere in which they have grown up. This did not seem to be the case for any of the participants in this study, who all reported strong support and encouragement from their families and friends.

Ned, who was an external student, also described a productive and supportive study group but socialised with friends from his local area, none of whom were studying at university. Acceptance by peers from before university study was not cited as an issue with any of the participants, Ned described his friends’ attitude to his study as “I’m their Sheldon” (a highly intelligent but slightly eccentric character from a current television program, ‘The Big Bang Theory’). Indicating that his friends regarded him as slightly eccentric but accepted him.

Spouses were particularly important in supporting study as they were the most directly affected by students’ study commitments. Several spouses were also studying, or had studied for a degree and were also the first in their family to do so.

Their support often took a very practical approach when study deadlines approached by taking on extra domestic load.

Other external students such as Andrew and Kevin had moved away from their hometowns prior to commencing their engineering studies. They maintained a long distance relationship with immediate family but suggested that their extended family, and peer network from their formative years, were part of their past rather than present. They indicated that geographical and temporal distance had led to past connections being virtually unaware of their study.

Kevin commented:

“It’s funny that both me and my wife are the most educated people in our whole extended family, to the point where my parents probably didn’t get past Year 10. My brothers and my sisters only went to Year 12 and not even any training after that. So not even any TAFE training, any trades, or anything like that.”

Matt spoke about his wife joking about having to be a single parent during the years he had studied and how much she was looking forward to him graduating.

The students in this study did not report the disconnection from their pre-university background friends and family observed in other studies (Thomas 2002, Reay 2005, Jetten et al. 2008). They did not appear to experience a dissonance between their current status as engineering students and previous relationships, or express any disquiet about their choice to study and its implications for past social relationships. Indeed, without exception they described their social activities, such as they were, as revolving around sporting activities, friends and family from their non-university backgrounds. They described immediate families as being their main source of support and motivation and more distant acquaintances as being ambivalent about their choice.

Bourdieu’s concept of reflexive habitus is one that is influenced by any new field it enters, where transformation occurs rather than any wholesale escape or refashioning

of habitus. The maintenance of previous social networks and the perception of university as an addition to an existing lifestyle seems to support a gentle transformation for the students in this study.

8.3 Findings

The pursuit of higher education by the participant students was for vocational purposes rather than the pursuit of learning for learning's sake. The choice to study was presented in pragmatic terms as a rational choice which would contribute to occupational advancement and security. Those students who had been encouraged by parents to pursue university in order to take up opportunities not available to earlier generations also expressed their 'choice' in terms of enhanced vocational opportunity. There was no evidence of an expectation of university attendance as an automatic 'rite of passage', as was often the case in previous eras of elite higher education.

Despite the framing of choice of higher education as a rational decision, the underlying dispositions contributing to that choice can be inferred. Perceptions of engineering study as a practical, vocationally oriented program, grounded in industrial practice contributed to the choice of engineering as a program. The pursuit of knowledge through higher education was not an esoteric quest but a path with direct practical applications such as the attainment of a degree, which in turn promised vocational opportunity.

Students also displayed a belief that engineering was an appropriate career for them, sometimes informed by perceptions of the value of practical experience in engineering industries gained from prior vocational experience. Ambition in terms of seeking improved economic outcomes and career progression were expressions of disposition. The support that students received from their intimate social groups seems to indicate that these were acceptable ambitions within those circles. This belief in the possibility of economic mobility through education may contribute to student success by reinforcing their belief that they are able and are suited to engineering studies, thereby underpinning determination and persistence.

The choice of institutional provider was also presented in terms of a rational choice, driven by considerations of convenience, or opportunity, and compatibility with other commitments such as family and work. Geographic accessibility, alternate or flexible entry requirements, and opportunity offered by distance mode were offered as part of the choice rationale. The option to study in distance mode and part-time, enabling connection to family and established work opportunities, was cited as important. These students did not value education above economic security. Quite the reverse – they were seeking economic security through education. So to relinquish secure employment and subject their dependents to geographical relocation for the sake of education, by undertaking full-time on-campus study, was not an option.

The positioning of USQ as accessible appeared to resonate subconsciously with non-traditional students. Some participants were able to express that enrolling at USQ ‘felt right’ or they knew of others who had studied at USQ. Knowing of other students who had studied successfully is a powerful contributor to a sense of possibility for students with no familial higher education background.

There was evidence of situated learning being a contributor to success in engineering studies. Where students were embedded in industry, they were able to see direct application of their studies and had also absorbed many of the ‘professional characteristics’ found in their workplaces, such as an orientation to problem solving and an understanding of the profession of engineering (its opportunities, practices and language).

Social integration into campus life was not necessary for student success. There was little evidence of any ‘connection’ to the physical manifestations of university life. Campus was a place of study, which was visited when necessary (only during residential schools for distance students). While students felt comfortable on campus and had established rapport with other students, they did not see it as a source of socialisation. Sufficient social interaction for external students was achieved through problem solving courses (involving group-work by distance) and one week on-campus residential schools. These interactions enabled connection with the student

cohort without the need for informal ‘social’ activity with their peers. Social functions for students were filled outside campus life.

Wholesale transformation of habitus, as described in previous studies discussed earlier, was not required for academic success. This was probably facilitated because geographic and social location are not disrupted by study. In addition, dispositions that mark students as ‘other’ than from a traditional cohort, such as grammar and speech affectation, do not prevent academic progression through this program. It was notable that the speech patterns exhibited by some of the participants (and evident in some of the quotes) identified them with social groups who are disadvantaged in terms of higher education. Whether this is an inhibitor of career progression subsequent to obtaining engineering qualifications would be an interesting area of further study.

8.4 Conclusion

According to Bourdieu (1997), institutionalised cultural capital refers to educational credentials and the credentialing system. To develop institutional capital a student must embody cultural capital and successfully convert it, via the educational system, into enhanced educational credentials (grades/completed courses). Each of the participants of this study is in the process of successfully accumulating institutional capital, the question of interest is how they came to embody the cultural capital required (attitudes to study, presentation of work, academic language, beneficial interactions with peers and institutional staff) to acquire the high grades that represent their accumulated institutional capital.

The students in this study expressed no difficulties in conforming to the educational norms required to succeed academically. They each described their success in terms of determination, motivation and hard work. They seemed to see their academic success as unsurprising, even when juxtaposed against an indifferent prior academic record.

There was no evidence of participants in this study undertaking the “wholesale escaping of habitus” as described by Friedmann (2005) in relation to upward social mobility. These students were not disappearing into a new world (Friedmann 2002).

Rather, as Reay et al. (2009) found in their study, the students interviewed appeared to be keeping a definite hold on the former aspects of self even as they gained new ones through education. Rather than an on-going struggle to reconcile conflicting aspects of habitus, the participants were committed and comfortable in the field and expressed no downside or personal conflict as a result of their decision to study engineering.

The participants all had significant commitments outside their studies, both financial and emotional, however these acted as motivators rather than pulling them away from their studies. Unlike the UK study by Thomas (2002) where non-traditional students reported isolation from their childhood peers who were not studying, these students did not report any conflict of this nature. Perhaps this ability to maintain links with their past is a factor in the success of these students.

The factors affecting student success are to some extent variable for different institutions (Berger 2000). Tinto (1975) recognised in his theory of integration that a good fit between the institution and students enabled academic success. As already noted the faculty at which all participants were studying has a history of servicing non-traditional students and so may already be partially providing aspects of field conducive to their performance. Berger (2000) developed four propositions concerning student persistence in higher education. Proposition four was that “students with access to lower levels of cultural capital are most likely to persist at institutions with correspondingly low levels of organizational cultural capital”. The students interviewed for this study all attend a teaching intensive, regional university. It is not a research intensive or elite university, although it has a solid reputation, particularly for distance education and engineering. In this context the results lend weight to Berger’s proposition and would suggest that it could be expanded to include not only student persistence but student success.

Comments and the inferences from the interviews in this study indicated that the participants felt entitled to be studying engineering, they are comfortable in their study environment and expect to do well on the basis of their own merit. It is as if they are the ‘fish in water’ from Bourdieu’s most famous quote:

“when habitus encounters a social world of which it is the product, it is like a “fish in water”: it does not feel the weight of the water, and it takes the world about itself for granted” (Bourdieu and Wacquant 1992).

The challenge for universities who aim to attract and graduate non-traditional students is to identify and promote those institutional qualities that make for a relatively ‘weightless’ environment for the majority of their students.

9 CONCLUSIONS

The thesis describes research undertaken to investigate the dispositions of successful engineering students from diverse backgrounds in the context of a regional Australian university. The widening participation agenda in the Australian higher education sector suggests that students from increasingly diverse backgrounds will seek to access higher education. Supporting all students to, not only access higher education but also to succeed in their studies, is important if institutions are to maintain or increase not only participation but progression, retention and ultimately graduation rates. It is expected that insights gained from this study into the factors that are important contributors to engineering student success will be relevant both to the specific case of USQ and to the wider higher education sector.

9.1 Key Recommendations

All of the recommendations outlined in this chapter should be considered in the context of the two key recommendations around curriculum and teaching capital. These recommendations concern the alignment and embedding of intervention strategies within the curriculum and the institutional culture that is needed for this embedding to be achieved successfully so that it supports student success.

9.1.1 *Curriculum alignment*

Innovations and interventions aimed at enhancing student success must be embedded within the curriculum for them to be effective. The students in this study were generally time poor. They were dedicated but were focussed on the content of their program and had little interest in additional or extra-curricular university activities such as learning support activities.

For students who do not already possess the embodied dispositions needed for academic success, it may be necessary that they develop a skillset that can support their academic success. Skills such as communication and independent information seeking are important for academic success. Students do not have the time or interest available to participate in skill-building activities that are not embedded into the curriculum.

If non-content competencies can be explicitly developed within the curriculum, and in a context to which they can immediately relate, students will benefit. Such skills would essentially be mimicking dispositions seen in successful students and may eventually lead to an evolution of habitus. These skills cannot be acquired through completion of a single independent module or course, or ‘extra’ sessions such as library classes. They must be modelled, practiced and developed in authentic settings such as a disciplinary courses.

9.1.2 Institutional culture and teaching capital

The ethos of the university must align with undergraduate learning and teaching if diverse undergraduate student cohorts are to be successfully accommodated. High quality teaching and attention to socio-cultural student learning within a program, and embedded alongside disciplinary content, require the focussed and sustained attention of academics and their support staff. Learning and teaching activities must be valued not only by the university institution but be central to the culture and climate within which the student experience is generated. Such an ethos would locate the institution at a position in the field of higher education structured such that capital associated with learning and teaching is recognised and rewarded.

A traditional student cohort tends to include those students who have acquired significant academic capital (orientation to study and learning) prior to entering university. Such students have a habitus which immediately recognises the field of higher education and are thus equipped to succeed academically. These students are more suited, than non-traditional students, to a traditional university field, which tends to recognise research capital over teaching capital. Valorising research capital over teaching capital skews the practices within this field away from teaching. However, students who possess different types of capital may benefit from more pedagogically rigorous curricula adapted for accessibility to a wider range of habituses. Some aspects of such curricula are discussed in more detail in the other recommendations within this chapter.

The development, implementation and maintenance of such curricula would require resources (time allocation, funding, intellectual input), but more importantly, it

would require an institutional ethos that values and rewards learning and teaching as well as disciplinary knowledge. Individual teaching academics would need a holistic view of the program and understanding of the non-disciplinary teaching, and associated strategies, that were being delivered. A consistent approach to delivery of non-content learning throughout a program would be needed, and such interventions and allowances for non-traditional habituses could only be authentically embedded through disciplinary staff consultation and engagement.

9.2 Recommendations for practice

The following recommendations are complementary to the key recommendations, and are framed in general terms as it is recognised that specific mechanisms for implementation will be dependent on individual institutional contexts. Examples of potential applications are presented where they are illustrative; adoption or adaptation can only be considered in light of operational and socio-cultural imperatives at particular institutions.

Introducing new technologies, programs or support mechanisms will not be sufficient to improve student success without accompanying attention to the institutional ethos and thus cultural context within which they are delivered. This aspect of these recommendations (discussed above) is the least tangible and thus the most problematic aspect for an institution to address.

9.2.1 Quality curriculum delivery

There were instances, which emerged from the data, where course materials and delivery were seen as inadequate by students. These were recognised by students as being isolated instances rather than endemic of the whole program, suggesting an inconsistency in approach to course delivery. These inconsistencies coloured students' perceptions of their total learning experience and were a source of frustration. A consistently high quality approach to curriculum delivery would assist and support students who do not have the high determination and persistence dispositions that were demonstrated by the high achieving student group in this case.

The achievement of such a consistently high quality teaching approach would need to be actively pursued at an institutional level. It could not be achieved purely by implementation of interventions such as quality controls, teacher training and peer review, which are typically employed to ensure consistent practice. Rather, these measures must be deployed within an institutional ethos and culture that supports teaching practice such that curriculum delivery is expected to be, not only consistent, but of a consistently high quality, and an understanding of what this means (in terms of practice) embraced by academic staff.

9.2.2 Transparent administration practices

The research indicated a student desire to focus on the academic aspects of their study rather than the administrative necessities, such as enrolment. Students preferred to interact with academics regarding course material, rather than administration staff regarding course administration. This does not suggest that such staff and their functions are not an important part of student success but rather that they should not occupy significant proportions of students' time and energy. An analogy with Maslow's hierarchy of needs may be drawn; once the most basic needs are fulfilled for the student (e.g. course enrolment) they no longer become important, student energies can then be concentrated on higher order needs (e.g. academic pursuits).

Making program, subject, procedural and administrative information clear and accessible to students assists with their time management, focus on study and understanding of requirements. This last factor is particularly important for students whose habitus is unfamiliar with the university field and practical workings of the university system.

9.2.3 Delivering creative and altruistic value

Motivations for studying engineering varied from the pragmatic, such as career progression, to more creative and altruistic reasons. If the creative and altruistic ambitions of students are given validity within the engineering curriculum this could provide further satisfaction and underpin persistence by students. Validating engineering as a creative and altruistic undertaking could be addressed within

curriculum design but again must be authentic and embedded within the program. For example, engineering design courses in the curriculum provide opportunities for the inclusion of creativity through the use of technical theory in creative design projects.

9.2.4 Flexible delivery

A core finding of the research was that entering a program of university study was an addition to students' established lifestyles. While it may have been of high importance to them and have a large impact in terms of time allocation it was not central to the arrangement of their lives. Flexible curriculum delivery was important to students managing multiple commitments. In the case of USQ, this aligned with the provision of distance programs which allow students to more easily manage the time they spent studying alongside work, family and social commitments.

The advent of mobile technology and increases in online network access in Australia have seen many universities exploring a variety of curriculum delivery mechanisms, such as recorded lectures and online tutorials. These innovations provide an opportunity to offer increased flexibility to students. However, technology should be accompanied by considerations such as flexible attendance requirements, assessment practices, and access to materials.

9.2.5 Scaffolding a successful approach to study

Regularity and consistent application of study habits were a feature of successful student behaviour. While students valued the flexibility to organise their own patterns of study, they also recognised the need for a holistic and thorough application of effort to their study. This could only be achieved in a timeframe limited by semester patterns through diligent organisation and regular study practices.

Students who do not possess the organisational abilities or study skills to successfully adopt such an approach may need assistance to develop good study patterns. As discussed above, this scaffolding must be authentically embedded into the disciplinary curriculum rather than provided as an extra activity. Scaffolding

aimed at encouraging a holistic approach to study and consistent application of student effort throughout semester may be designed into individual disciplinary subjects. Such scaffolding might take the form of student progress checks through semester or tasks encouraging students to take an overview of the subject. Any such intervention risks a conflict with the need for study flexibility, discussed above, and should be designed with this in mind.

9.2.6 Development of independent information seeking

Successful students exhibited the ability to recognise the need for information and to seek it out, whether it was academic or administrative. Their approaches to finding information varied from asking questions, to returning to study materials and searching institutional or internet websites. Whatever their preferred method, successful students were able to identify the type of information they needed and take responsibility for seeking it. This not only set the successful students apart from the less successful group, but is also important in engineering practice. Assisting students to develop this skill has potential to give a sense of control over their own learning, which was not evident amongst the less successful student group.

Interventions and practices aimed at assisting students in this respect must be developed carefully so that they do not become a source of frustration. If students feel that they are not being sufficiently supported when they need information, their frustrations hinder learning and potentially undermine persistence rather than help. Conversely, providing too much support to find information undermines development of this skill and the credibility of higher education.

9.2.7 Accessible academic staff

Access to academic staff was seen as important by students. This included both the approachability of individual academic staff as well as the mechanisms and systems for communicating with academics.

For academic staff to be considered approachable by students, student learning needs to be central to staff values and sense of mission. For approachability to be a prevalent attitude within the Faculty it must align with and be supported by the

faculty culture, values and ethos. In a faculty culture where research capital is significantly more highly valued than teaching capital the staff culture will not be aligned to providing service to students. Mandating staff ‘approachability’ and ‘accessibility’ without alignment to Faculty values will not achieve a pervasive approachable attitude. Individual academic staff may provide this service if it aligns with their personal values but they would tend to be operating on the fringes of a research-centric faculty.

Communicating with staff in non-face to face mode was identified as problematic for some students. Problems relating to student dispositions that were reported included discomfort when body language was not apparent or reluctance to use electronic communications to ask questions. Technical considerations such as access to reliable, high speed internet access and student familiarity and comfort using electronic communication, could also hamper electronic access to academic staff.

For electronic communications systems to effectively facilitate access by diverse student groups, both the technical and student dispositional issues must be addressed in their design and management. Recognition of a dispositional preference for face to face communication may require innovations in communications technology and systems such as provision for video-conference calls or learning sessions with academic staff. Once again a consistent and wide-spread implementation of such a service across a Faculty would require attention to the culture supporting staff access and approachability.

9.2.8 Provide opportunities for validation

The students in this study found value in validation of themselves through study. For successful students, the acquisition of good grades or completion of their degree represented a validation to themselves and the world. The identification of opportunities for recognition, and thus validation, of diverse achievements within a curricula could serve to empower students. Passing a course is a large achievement and is dependent on a large body of effort by the student. If smaller achievements within the course can be recognised and validated it may encourage persistence through the larger achievements. For non-traditional students, this may mean

recognition of non-traditional academic achievements such as allowing opportunities for students with a trade background to display their skills.

9.3 Implications for theory

This study found that for the part-time, distance students in the study, full social integration into the university, as described by Tinto's (1975) theory, is not necessary for academic success. It appears to be irrelevant to these students because they differ substantially from the traditional model of US students, on whom Tinto based his study, in both their demography and attendance mode. The students in this study tended to be mature age, studying part-time and by distance mode. Their study does not necessitate a major change in lifestyle and does not mark a new phase in their lives, as it would a school leaver who moves to full-time on-campus study, and usually on-campus residence, at a US institution. For the students in this research, study was an addition to their established lifestyle. It was undertaken for pragmatic vocational reasons rather than as a 'rite of passage' for the privileged elite.

Those students who did study in on-campus mode reported that although social interaction occurred on campus, they also maintained existing social networks and spent minimal time on campus. While on campus they felt sufficiently comfortable within the social space to pursue their study related activities without undue stress but they were not reliant on that environment for social fulfilment. As a result they have a reduced potential for experiencing social isolation in the same way as traditional full-time on campus school leaver students, around whom Tinto's theory was developed.

9.4 Further research

Socio-cultural investigations of student success within the context of engineering education are few. This research was an exploratory study in the area and there are many avenues of further investigation that could be pursued. Some key avenues identified through the research are briefly discussed below.

Additional cases

This research was undertaken using a single instrumental case. The findings would be strengthened and could be expanded if case studies at other comparable and contrasting institutions, and within other disciplines, were conducted. Such studies could test the transferability of the findings of this case and determine whether different themes applied in differing contexts.

Shifting the structure of the field

A key recommendation of this study is that learning and teaching needs to be central to an institution's ethos to effectively support diverse student cohorts. An investigation into the socio-political conditions under which this could occur is suggested. Such an investigation would consider under what conditions could the structure of the field of higher education, or disciplines within that field, be shifted such that learning and teaching practices are recognised as capital. Within this inquiry, an analysis of the extent to which research and teaching capital can co-exist in the same field, and under what circumstances, would be required.

Fostering successful student behaviours

The findings of this study relate to the behaviours and attitudes of successful students which were not always evident in the less successful students. Research into how successful behaviours, such as independent information seeking and structured holistic approaches to study, can be fostered amongst all students is indicated. This work would be complimented by evaluation of any interventions aimed at scaffolding development of these skills.

Developing a framework for socio-cultural analysis of institutions

The development of an analytical framework, or set of tools, which could be used to investigate the socio-cultural environment (logic of the field) in different institutional and disciplinary contexts would be beneficial for institutions wanting to understand and enhance the effect of their particular environment on student success.

9.5 Summary

The social and financial rewards of a university education are well documented and students perceive that an engineering degree brings with it attractive work opportunities and career security. However, completing an engineering degree is not an easy task. The successful students in this study demonstrated that it takes commitment, persistence and resilience. Successful students organise their study methodically and take a holistic approach to their coursework. They expect that the basic information that they need is contained in course materials and they seek further clarification or detail as needed. They take responsibility for seeking out the information or support that they need. Channels of communication with academic staff are varied depending on students' preferences, but they have the confidence to pursue a query if they feel it is important.

Institutions can support these behaviours through, not only good teaching practice, but a genuine, institutionally driven, focus on student learning and teaching that supports a culture of attention to program design and a commitment to embedding non-content learning opportunities into a content driven curriculum.

REFERENCES

- Alloway, N., Gilbert, P., Gilbert, R., & Muspratt, S. (2004). Factors impacting on student aspirations and expectations in regional Australia: Commonwealth of Australia.
- Archer, L., & Hutchings, M. (2000). 'Bettering Yourself'? Discourses of risk, cost and benefit in ethnically diverse, young working-class non-participants' constructions of higher education. *British Journal of Sociology of Education*, 21(4), 555-574. doi: 10.1080/713655373
- ATN. (2015a). Australian Technology Network History. Retrieved 8 April 2015, from <https://www.atn.edu.au/About-ATN/History/>
- ATN. (2015b). Australian Technology Network of Universities. Retrieved 8 April 2015, from <https://www.atn.edu.au/>
- Australian Bureau of Statistics. (2014). Australian Standard Geographical Classification (ASGC). Retrieved August 2014, from <http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Standard+Geographical+Classification+%28ASGC%29>
- Australian Curriculum Assessment and Reporting Authority. (2013). NAPLAN Achievement in Reading, Persuasive Writing, Language Conventions and Numeracy: National Report for 2013. Sydney: ACARA.
- Australian Education Network. (2015). Australian Universities .com.au - Australian University NGU. Retrieved Oct 2014, from <http://www.australianuniversities.com.au/directory/new-generation-universities/>
- Ball, S. J. (1993). What is policy? Texts, trajectories and toolboxes. *Discourse: Studies in the Cultural Politics of Education*, 13(2), 10-17. doi: 10.1080/0159630930130203
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122-147.
- Benseman, J., Coxon, E., Anderson, H., & Anae, M. (2006). Retaining non-traditional students: lessons learnt from Pasifika students in New Zealand. *Higher Education Research & Development*, 25(2), 147-162. doi: 10.1080/07294360600610388
- Berger, J. B. (2000). Part I: Revising Tinto's Theory: Optimizing Capital, Social Reproduction, and Undergraduate Persistence (pp. 95-124): Vanderbilt University Press.
- Bourdieu, P. (1977). *Reproduction in education, society and culture*. London: Sage Publications.
- Bourdieu, P. (1984). *Distinction : a social critique of the judgement of taste*: Routledge.
- Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). New York: Greenwood Press.
- Bourdieu, P. (1988). *Homo academicus*. Stanford Calif: Stanford University Press.
- Bourdieu, P. (1989). Social Space and Symbolic Power. *Sociological Theory*, 7(1), 14-25.

- Bourdieu, P. (1990a). *In other words: Essays towards a reflexive sociology*: Stanford University Press.
- Bourdieu, P. (1990b). *The logic of practice*. Stanford Calif: Stanford University Press.
- Bourdieu, P. (1997). The forms of capital. In A. S. Wells, A. H. Halsey & P. Brown (Eds.), *Education : culture, economy, and society*. Oxford: Oxford University Press.
- Bourdieu, P. (1999). *The weight of the world : social suffering in contemporary society*. Oxford: Polity Press.
- Bourdieu, P. (2000). *Pascalian Meditations*. Cambridge: Polity Press.
- Bourdieu, P. (2003). Participant Objectivation*. *Journal of the Royal Anthropological Institute*, 9(2), 281-294. doi: 10.1111/1467-9655.00150
- Bourdieu, P. (2005). Habitus. In J. Hillier & E. Rooksby (Eds.), *Habitus : a sense of place* (2nd ed., pp. 43 - 49). Aldershot: Ashgate.
- Bourdieu, P., & Wacquant, L. (1992). *An invitation to reflexive sociology* (P. Collier, Trans.). Chicago: University of Chicago Press.
- Bowie, S. L., & Hancock, H. (2000). African Americans and graduate social work education. *Journal of Social Work Education*, 36(3), 429-448.
- Bowser, D., Danaher, P. A., & Somasundaram, J. (2006). Decreasing attrition while increasing diversity: connections and contradictions in transforming marginalisation in an Australian contemporary university. In J. McConachie, R. E. Harreveld, J. Luck, F. Nouwens & P. A. Danaher (Eds.), *Doctrina perpetua: brokering change, promoting innovation and transforming marginalisation in university learning and teaching* (pp. 220-243). Teneriffe, Qld: Post Pressed.
- Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). Review of Australian Higher Education Final Report. Canberra: Department of Education, Employment and Workplace Relations.
- Brennan, J. (2004). The social role of the contemporary university: contradictions, boundaries and change Ten years on: changing higher education in a changing world. Milton Keynes: The Open University: Center for Higher Education Research and Information. Retrieved from <http://www.open.ac.uk/cheri/documents/ten-years-on.pdf>.
- Brodie, L., & Porter, M. (2009). Transitions to First Year Engineering – Diversity as an Asset. *Studies in learning, evaluation innovation and development*, 6(2), 1-15.
- Brubaker, R. (1985). Rethinking Classical Theory: The Sociological Vision of Pierre Bourdieu. *Theory and Society*, 14(6), 745-775.
- Clark, B. R. (1983). *The higher education system: Academic organisation in cross national perspective*. Berkeley: University of California Press.
- Coates, H. (2005). The value of student engagement for higher education quality assurance. *Quality in Higher Education*, 11(1), 25-36. doi: 10.1080/13538320500074915
- Coates, H. (2010). Development of the Australasian survey of student engagement (AUSSE). *Higher Education*, 60(1), 1-17. doi: 10.1007/s10734-009-9281-2
- Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, 94(ArticleType: research-article / Issue Title: Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure / Full publication date: 1988 /

Copyright © 1988 The University of Chicago Press), S95-S120. doi: 10.2307/2780243

- Collier, P., & Morgan, D. (2008). "Is that paper really due today?": differences in first-generation and traditional college students' understandings of faculty expectations. *Higher Education*, 55(4), 425-446. doi: 10.1007/s10734-007-9065-5
- Corver, M. (2005). Young participation in higher education Bristol: Higher Education Funding Council for England.
- Council of Europe Committee of Ministers. (1998). Recommendation No. R(98)3 of the committee of ministers to member states on access to higher education.
- Creswell, J. W. (2009). *Research design : qualitative, quantitative, and mixed methods approaches* (3rd ed. ed.). Thousand Oaks: Sage Publications.
- Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. *Theory Into Practice*, 39(3), 124-130. doi: 10.1207/s15430421tip3903_2
- Crosling, G., Heagney, M., & Thomas, L. (2009). Improving student retention in higher education. *Australian Universities' Review*, 51(2), 10.
- Crosling, G. M., Thomas, L., & Heagney, M. (2008). Introduction: Student success and retention. In G. M. Crosling, L. Thomas & M. Heagney (Eds.), *Improving student retention in higher education : the role of teaching and learning* (pp. 188 p ;). London: Routledge.
- Cyrenne, P., & Grant, H. (2008). University decision making and prestige: An empirical study. *Economics of Education Review*, 28, 237-248.
- Czerniewicz, L., & Brown, C. (2009). A study of the relationship between institutional policy, organisational culture and e-learning use in four South African universities. *Computers & Education*, 53(1), 121-131.
- Department of Education. (2014a). *Higher education equity groups tables for the 2013 full year*. Retrieved from: <http://docs.education.gov.au/documents/2013-appendix-2-equity-groups>
- Department of Education. (2014b). *Higher education equity performance tables for 2012 full year*. Retrieved from: <http://docs.education.gov.au/documents/2012-appendix-5-equity-performance-data>
- Department of Education and Training. (2015, 26 March 2015). Higher Education Participation and Partnerships Programme (HEPPP). 2015, from <http://education.gov.au/higher-education-participation-and-partnerships-programme-heppp>
- Devine, J. (2016). Becoming an Engineer - are there particular dispositions which contribute to student success? *European Journal of Engineering Education*, *Accepted for publication*.
- Devine, J., & Wandel, A. P. (2014). *A statistical analysis of student backgrounds at a regional university*. Paper presented at the Australasian Association for Engineering Education Annual Conference, Wellington.
- Devlin, M. (2011). Bridging socio-cultural incongruity: conceptualising the success of students from low socio-economic status backgrounds in Australian higher education. *Studies in Higher Education*, 1-11. doi: 10.1080/03075079.2011.613991
- Devlin, M., & O'Shea, H. (2011). Effective university teaching: views of Australian university students from low socio-economic status backgrounds. *Teaching in Higher Education*, 17(4), 385-397. doi: 10.1080/13562517.2011.641006

- DiMaggio, P. (1979). On Pierre Bourdieu. *American Journal of Sociology*, 84(6), 1460-1474.
- DiMaggio, P. (1982). Cultural Capital and School Success: The Impact of Status Culture Participation on the Grades of U.S. High School Students. *American Sociological Review*, 47(2), 189-201.
- Dowling, D. (2010). *The career aspirations and other characteristics of Australian para-professional engineering students*. Paper presented at the Proceedings of the 2010 AaeE Conference, Sydney.
- Drummond, A., Halsey, R. J., & van Breda, M. (2011). The perceived importance of university presence in rural Australia. *Education in Rural Australia*, 21(2).
- Edgerton, J. D., & Roberts, L. W. (2014). Cultural capital or habitus? Bourdieu and beyond in the explanation of enduring educational inequality. *Theory and Research in Education*, 12(2), 193-220. doi: 10.1177/1477878514530231
- Ellis, R., & Allan, R. (2010). Raising aspiration and widening participation: diversity, science and learning styles in context. *Journal of Further and Higher Education*, 34(1), 23-33. doi: 10.1080/03098770903477078
- Erickson, B. (1996). Culture, class and connections. *American Journal of Sociology*, 102(1), 117-151.
- Felder, R., Mohr, P., Dietz, E. J., & Baker-Ward, L. (1998). A longitudinal study of engineering student performance and retention. II. Differences between students from rural and urban backgrounds. *Journal of Engineering Education*, 87(4).
- Ferlander, S. (2004). E-learning, marginalised communities and social capital: a mixed methods approach. In M. Osborne, J. Gallacher & B. Crossan (Eds.), *Researching widening access to lifelong learning: issues and approaches in international research* (pp. 180-194). New York: RoutledgeFalmer.
- Foley, P. (2007). The socio-economic status of vocational education and training students in Australia National Centre for Vocational Education Research (NCVER).
- Forsyth, A., & Furlong, A. (2003). Access to Higher Education and Disadvantaged Young People. *British Educational Research Journal*, 29(2), 205.
- Friedmann, J. (2005). Placemaking as Project? Habitus and Migration in Transnational Cities. In J. Hillier & E. Rooksby (Eds.), *Habitus : a sense of place* (2nd ed., pp. 315 - 333). Aldershot: Ashgate.
- Gale, T., & Parker, S. (2013). Widening participation in Australia in higher education. Leicester, England: Higher Education Funding Council for England.
- Gale, T., & Tranter, D. (2011). Social justice in Australian higher education policy: an historical and conceptual account of student participation. *Critical Studies in Education*, 52(1), 29-46. doi: 10.1080/17508487.2011.536511
- Gee, J. P. (1999). *An introduction to discourse analysis : theory and method*. London: Routledge.
- Gibbins, P., Godfrey, E., King, R., & Wandel, W. (2010). *Part Time Study Distorts Student Attrition Rates in Engineering Programs*. Paper presented at the Australasian Association of Engineering Education, Sydney. <http://www.aeee.com.au/conferences/2012/>
- Gilardi, S., & Guglielmetti, C. (2011). University Life of Non-Traditional Students: Engagement Styles and Impact on Attrition. *Journal of Higher Education*, 82(1), 33-53.

- Glaser, B. G. (1978). *Theoretical sensitivity : advances in the methodology of grounded theory*. Mill Valley Calif: Sociology Press.
- Go8. (2014). Policy Notes. Retrieved 7 April 2015, from <https://go8.edu.au/policy-tools/policy-notes>
- Go8. (2015a). Group of Eight Australia. Retrieved 7 April 2015, from <https://go8.edu.au/>
- Go8. (2015b). Group of Eight Australia Members. In G. o. E. Australia (Ed.).
- Gonski, D., Boston, K., Greiner, K., Lawrence, C., Scales, B., & Tannock, P. (2011). Review of Funding for Schooling—Final Report. Canberra: Department of Education, Employment and Workplace Relations.
- Granovetter, M. S. (1973). The strenght of weak ties. *American Journal of Sociology*, 78(6), 1360-1380.
- Groves, M., Bowd, B., & Smith, J. (2010). Facilitating experiential learning of study skills in sports students. *Journal of Further and Higher Education*, 34(1), 11-22. doi: 10.1080/03098770903477060
- Guba, E. G., & Lincoln, Y. S. (1994). *Competing paradigms in qualitative research* (Vol. 2).
- Guest, G., Bunce, A., & Johnson, L. (2006). How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field Methods*, 18(1), 59-82. doi: 10.1177/1525822x05279903
- Haines, V. A., Wallace, J. E., & Cannon, M. E. (2001). Exploring the Gender Gap in Engineering: A Re-Specification and Test of the Hypothesis of Cumulative Advantages and Disadvantages. *Journal of Engineering Education*, 90(4), 677-684.
- Handy, C. (1993). *Understanding organisations*. London: Penguin.
- Heagney, M. (2004). *Dropping out in Australia: Young students from low socio-economic backgrounds and non-completion*. Paper presented at the Leaving Early: International Perspectives on Working Class Students' Withdrawal Colloquium at Staffordshire University, Stoke-on-Trent, UK.
<http://www.staffs.ac.uk/access-studies/research/res20.htm>
- Hillier, J., & Rooksby, E. (2005). Introduction to first edition. In J. Hillier & E. Rooksby (Eds.), *Habitus : a sense of place* (2nd ed., pp. 19 - 42). Aldershot: Ashgate.
- Hughes, M. (2002). Interviewing. In T. Greenfield (Ed.), *Research methods for postgraduates* (2nd ed. ed., pp. xii, 370). London: Arnold.
- IBM. (2013). SPSS Statistics (Version 22.0.0.0).
- IRU. (2015a). Innovative Research Universities. Retrieved 8 April 2015, 20`5, from <http://www.iru.edu.au/>
- IRU. (2015b). IRU Statistics: Staff, Students, Research. Retrieved 8 April 2015, 20`5, from <http://iru.edu.au/media/49898/iru%20statistics%20book%20-%20content%20-%20march%202014.pdf>
- James, R. (2001). Participation disadvantage in Australian higher education: An analysis of some effects of geographical location and socioeconomic status. *Higher Education*, 42(4), 455-472. doi: 10.1023/a:1012264010667
- James, R. (2002). Socioeconomic background and higher education participation: An analysis of high school students' aspirations and expectations. Canberra: Department of Education, Science and Training.

- James, R. (2008a). Achieving Social Inclusion and Universal Participation: Towards New Conceptions of Higher Education. *The New Zealand Annual Review of Education*(18), 47-63.
- James, R. (2008b). Participation and equity, A review of the participation in higher education of people from low socioeconomic backgrounds and Indigenous people: Centre for the Study of Higher Education, University of Melbourne.
- James, R., Baldwin, G., Coates, H., Krause, K.-L., & McInnis, C. (2004). Analysis of equity groups in higher education. *Canberra, Commonwealth of Australia*.
- James, R., Krause, K.-L., & Jennings, C. (2010). The First Year Experience in Australian Universities: Findings from 1994 to 2009: Centre for the Study of Higher Education, The University of Melbourne.
- Jesiek, B. K., & Beddoes, K. (2013). Diversity in Engineering (DinE) Bibliography Research Brief. *Engineering Studies*, 5(1), 90-92. doi: 10.1080/19378629.2012.746807
- Jetten, J., Iyer, A., Tsivrikos, D., & Young, B. M. (2008). When is individual mobility costly? The role of economic and social identity factors. *European Journal of Social Psychology*, 38(5), 866-879. doi: 10.1002/ejsp.471
- Johansson, R. (2003). *Case Study Methodology*. Paper presented at the Methodologies in Housing Research, Stockholm.
- Johnston, B. (2010). *The first year at university: teaching students in transition*. Maidenhead: Society for Research into Higher Education & Open University Press.
- Jones, B. D., Paretti, M. C., Hein, S. F., & Knott, T. W. (2010). An Analysis of Motivation Constructs with First-Year Engineering Students: Relationships Among Expectancies, Values, Achievement, and Career Plans. *Journal of Engineering Education*, 99(4), 319-336.
- Jones, R. (2004). Geolocation Questions and Coding Index. In P. M. a. R. Taskforce (Ed.): Ministerial Council on Education, Employment, Training and Youth Affairs
- Kaspura, A. (2014). Skilled migration and the supply of engineers 2014: Engineers Australia.
- King, C., & James, R. (2014). Increasing participation and attainment in higher education in Australia: The early effects of a "demand-driven" system. *Higher Education Management and Policy*, 24(3).
- King, R. (2008). Engineers for the future: addressing the supply and quality of Australian engineering graduates for the 21st century (pp. vii, 131 p). Sydney.
- King, R., Dowling, D., & Godfrey, E. (2011). Pathways from VET Awards to Engineering Degrees: a higher education perspective *A commissioned report for the Australian National Engineering Taskforce*: The Australian Council of Engineering Deans.
- Krause, K.-L. (2005). *The Changing Face of the First Year: Challenges for Policy and Practice in Research-Led Universities*. Paper presented at the First Year Experience Workshop 2005, University of Queensland
<http://www.uq.edu.au/teaching-learning/docs/FYEUQKeynote2005.doc>
- Lave, J., & Wenger, E. (1991). *Situated learning : legitimate peripheral participation*. Cambridge England: Cambridge University Press.

- Lawrence, J. (2005). *Addressing diversity in higher education: Two models for facilitating student engagement and mastery*. Paper presented at the 28th HERDSA Annual Conference, Sydney.
- Leslie, L. L., McClure, G. T., & Oaxaca, R. L. (1998). Women and Minorities in Science and Engineering: A Life Sequence Analysis. *The Journal of Higher Education*, 69(3), 239-276. doi: 10.2307/2649188
- Lichtman, M. (2013). *Qualitative Research in Education* (3rd ed.): SAGE Publications.
- Lillis, T. (1997). New Voices in Academia? The Regulative Nature of Academic Writing Conventions. *Language and Education*, 11(3), 182-199. doi: 10.1080/09500789708666727
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Newbury Park Sage.
- Malicky, D. (2003). *A Literature Review on the Under-representation of Women in Undergraduate Engineering: Ability, Self-Efficacy, and the "Chilly Climate"*. Paper presented at the American Society for Engineering Education Annual Conference & Exposition, Nashville, Tennessee.
- Marks, G. N. (2007). Completing university: characteristics and outcomes of completing and non-completing students. Camberwell: Australian Council for Educational Research.
- Marks, G. N. (2009). Accounting for school-sector differences in university entrance performance. *Australian Journal of Education*, 53(1), 453-471.
- Marra, R. M., Rodgers, K. A., Shen, D., & Bogue, B. (2012). Leaving Engineering: A Multi-Year Single Institution Study. *Journal of Engineering Education*, 101(1), 6-27.
- Matusovich, H., Streveler, R., Loshbaugh, H., Miller, R., & Olds, B. (2008). *Will I succeed in engineering? Using expectancy-value theory in a longitudinal investigation of students' beliefs*. Paper presented at the 2008 ASEE annual conference & exposition, Pittsburgh.
- McMillan, J. (2005). Course change and attrition from higher education *Longitudinal Surveys of Australian Youth, Research Report 39*. Melbourne: Longitudinal Surveys of Australian Youth, Research Report 39.
- McNay, I. (1995). From the Collegial Academy to the Corporate Enterprise: the Changing Cultures of Universities *The Changing University?* (pp. 105–115). Buckingham: Open University Press.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis : an expanded sourcebook* (2nd ed. ed.). Thousand Oaks: Sage Publications.
- Miller, J., & Glassner, B. (2004). The "inside" and the "outside", Finding realities in interviews. In D. Silverman (Ed.), *Qualitative research : theory, method and practice* (2nd ed. ed., pp. 125-139). London: Sage Publications.
- Mintzberg, H. (1989). *Mintzberg on management: Inside our strange world of organisations*. New York: Free Press.
- Moodie, G. (2009). Four Tiers. *Higher Education*, 58, 307-320.
- Moodie, G. (2014). Types of Australian universities. Retrieved 3rd December 2014, from <http://the-scan.com/2014/08/13/types-of-australian-universities/>
- Moore, R. (2004). Cultural capital: objective probability and the cultural arbitrary. *British Journal of Sociology of Education*, 25(4), 445-456. doi: 10.1080/0142569042000236943

- Naidoo, R. (2004). Fields and institutional strategy: Bourdieu on the relationship between higher education, inequality and society. *British Journal of Sociology of Education*, 25(4), 457-471. doi: 10.1080/0142569042000236952
- Nash, R. (2002). The Educated Habitus, Progress at School, and Real Knowledge. *Interchange*, 33(1), 27-48. doi: 10.1023/a:1016399826766
- Nelson, C. (2014). A society yearning for security divides along lines of liquid fear *The Conversation*, 12 March 2014. <https://theconversation.com/a-society-yearning-for-security-divides-along-lines-of-liquid-fear-23009>
- NSSE. (1998). NSSE-National Survey of Student Engagement. Retrieved February 2015, from <http://nsse.iub.edu/html/about.cfm>
- OECD. (2012a). How Are Countries Around the World Supporting Students in Higher Education? In O. Publishing (Ed.), *Education Indicators in Focus* (Vol. 2). Paris.
- OECD. (2012b). How Has the Global Economic Crisis Affected People with Different Levels of Education ? In OECD (Ed.), *Education Indicators in Focus* (Vol. 1). Paris: OECD Publishing.
- OECD. (2012c). How Is the Global Talent Pool Changing? In O. Publishing (Ed.), *Education Indicators in Focus* (Vol. 5). Paris.
- OECD. (2013). *How Are University Students Changing?* (Vol. 15). Paris: OECD Publishing.
- OECD. (2014). Australia *OECD, Education at a Glance 2014: OECD Indicators*. Paris: OECD Publishing.
- OECD. (2015). *How do differences in social and cultural background influence access to higher education and the completion of studies?* (Vol. 35). Paris: OECD Publishing.
- Oliver, P. (2006). *Purposive Sampling. The SAGE Dictionary of Social Research Methods.*: SAGE Publications, Ltd.
- Organisation for Economic Co-operation and Development (OECD). (2008). Tertiary Education for the Knowledge Society.
- Organisation for Economic Co-operation and Development (OECD). (2014). Do parents' occupations have an impact on student performance? (Vol. 36): PISA in Focus.
- Osborne, M., & Gallacher, J. (2004). An international perspective on researching widening access. In M. Osborne, J. Gallacher & B. Crossan (Eds.), *Researching widening access to lifelong learning: issues and approaches in international research* (pp. 239). New York: RoutledgeFalmer.
- Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-Generation College Students. *Journal of Higher Education*, 75(3), 249-284.
- Perry, W. G. (1970). *Forms of intellectual and ethical development in the college years*. New York: Holt, Rinehart & Winston.
- Pike, G. R., & Kuh, G. D. (2005). First- and Second-Generation College Students: A Comparison of Their Engagement and Intellectual Development. *Journal of Higher Education*, 76(3), 276-300.
- Pink, B. (2013). Technical Paper, Socio-economic Indexes for Areas (SEIFA) 2011. In A. B. o. Statistics (Ed.). Canberra: Australian Bureau of Statistics.
- Pokorny, M., & Pokorny, H. (2005). Widening participation in higher education: student quantitative skills and independent learning as impediments to progression. *International Journal of Mathematical Education in Science & Technology*, 36(5), 445-467. doi: 10.1080/00207390500062621

- QS University Rankings. (2015). QS Top Universities. Retrieved 7 April 2015, from <http://www.topuniversities.com/university-rankings/world-university-rankings/2014>
- Quinn, J., Thomas, L., Slack, K., Casey, L., Thexton, W., & Noble, J. (2005). *From Life Crisis to Lifelong Learning. rethinking working class 'drop out' from higher education*. York: Joseph Rowntree Foundation.
- QUT Equity Services. (2011). Attrition data by Equity Target Group, 2009 - 2010: Queensland University of Technology.
- Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed. ed.). London: RoutledgeFalmer.
- Read, B., Archer, L., & Leathwood, C. (2003). Challenging Cultures? Student Conceptions of 'Belonging' and 'Isolation' at a Post-1992 University. *Studies in Higher Education, 28*(3), 261.
- Reay, D. (2002). Shaun's Story: Troubling discourses of white working-class masculinities. *Gender and Education, 14*(3), 221-234. doi: 10.1080/0954025022000010695
- Reay, D. (2004). 'It's all becoming a habitus': beyond the habitual use of habitus in educational research. *British Journal of Sociology of Education, 25*(4), 431-444. doi: 10.1080/0142569042000236934
- Reay, D. (2005). Beyond Consciousness?: The Psychic Landscape of Social Class. *Sociology, 39*(5), 911-928. doi: 10.1177/0038038505058372
- Reay, D. (2006). The Zombie stalking english schools: social class and educational inequality. *British Journal of Educational Studies, 54*(3), 288-307. doi: 10.1111/j.1467-8527.2006.00351.x
- Reay, D., Arnot, M., David, M., Evans, J., & James, D. (2004). Editorial. *British Journal of Sociology of Education, 25*(4), 411-413. doi: 10.1080/0142569042000237005
- Reay, D., Crozier, G., & Clayton, J. (2009). 'Strangers in Paradise'? Working-class Students in Elite Universities. *Sociology, 43*(6), 1103 - 1121. doi: 10.1177/0038038509345700
- Reay, D., Davies, J., David, M., & Ball, S. J. (2001). Choices of Degree or Degrees of Choice? Class, 'Race' and the Higher Education Choice Process. *Sociology, 35*(4), 855-874. doi: 10.1177/0038038501035004004
- Richardson, J. T. E., Slater, J. B., & Wilson, J. (2007). The National Student Survey: development, findings and implications. *Studies in Higher Education, 32*(5), 557-580. doi: 10.1080/03075070701573757
- Riddle, S. (2014). Why poor kids continue to do poorly in the education game. *The Conversation, 4 March 2014*. <http://theconversation.com/why-poor-kids-continue-to-do-poorly-in-the-education-game-23500>
- Roberts, S. (2011). Traditional practice for non-traditional students? Examining the role of pedagogy in higher education retention. *Journal of Further & Higher Education, 35*(2), 183-199. doi: 10.1080/0309877x.2010.540320
- RUN. (2015). RUN Regional Universities Network. Retrieved 8 April 2015, from <http://www.run.edu.au/>
- Saldana, J. (2009). *The coding manual for qualitative researchers*. London: Sage Publications.
- Saljo, R. (1988). Learning in educational settings: Methods of inquiry. In P. Ramsden (Ed.), *Improving learning : new perspectives* (pp. 32-48). London: Kogan Page.

- Scanlon, C. (2014). Bogans and hipsters: we're talking the living language of class. *The Conversation*, 24 February 2014. <https://theconversation.com/bogans-and-hipsters-were-talking-the-living-language-of-class-23007>
- Scott, G. (2006). Accessing the student voice using CEQuery to identify what retains students and promotes engagement in productive learning in Australian higher education: final report. Department of Education, Science and Training, Canberra: Commonwealth of Australia.
- Silver, H. (2003). Does a University Have a Culture? *Studies in Higher Education*, 28(2), 157-169. doi: 10.1080/0307507032000058118
- Soria, K. M., & Stebleton, M. J. (2012). First-generation students' academic engagement and retention. *Teaching in Higher Education*, 17(6), 673-685. doi: 10.1080/13562517.2012.666735
- Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. *Interchange*, 1(1), 64-85. doi: 10.1007/bf02214313
- Spady, W. G. (1971). Dropouts from higher education: Toward an empirical model. *Interchange*, 2(3), 38-62. doi: 10.1007/bf02282469
- Spohrer, K. (2011). Deconstructing 'Aspiration': UK policy debates and European policy trends. *European Educational Research Journal*, 10(1), 55-63.
- Stake, R. E. (1995). *The art of case study research*. Thousand Oaks: Sage Publications.
- Stone, W. (2001). Measuring social capital: Towards a theoretically informed measurement framework for researching social capital in family and community life. Melbourne: Australian Institute of Family Studies.
- Sullivan, A. (2001). Cultural Capital and Educational Attainment. *Sociology*, 35(04), 893-912. doi: 10.1017/S0038038501008938
- Swartz, D. (1997). *Culture and Power*. Chicago: University of Chicago Press.
- Sweetman, P. (2003). Twenty-first century dis-ease? Habitual reflexivity or the reflexive habitus. *The Sociological Review*, 51(4), 528-549. doi: 10.1111/j.1467-954X.2003.00434.x
- Taylor, A. D. (2010). Multiple comparison procedures. *Biometry (Zool 631)*. Retrieved 26 May 2015, from <http://www2.hawaii.edu/~taylor/courses.htm>
- Tett, L. (2000). 'I'm Working Class and Proud of It'. Gendered experiences of non-traditional participants in higher education. *Gender and Education*, 12(2), 183-194. doi: 10.1080/09540250050009993
- Thomas, H. G. (1996). Resource Allocation in Higher Education: a cultural perspective. *Research in Post-Compulsory Education*, 1(1), 35-51. doi: 10.1080/1359674960010104
- Thomas, L. (2002). Student retention in higher education: the role of institutional habitus. *Journal of Education Policy*, 17(4), 423-442. doi: 10.1080/02680930210140257
- Thomas, L., & Quinn, J. (2007). *First generation entry into higher education an international study Society for research into higher education*. (pp. 150 p). Retrieved from <http://ezproxy.usq.edu.au/login?url=http://site.ebrary.com/lib/unisouthernqld/Doc?id=10197004>
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45, 89-125.
- Tinto, V. (2005). Epilogue. In A. Seidman (Ed.), *College student retention : formula for student success*

- (pp. xiv, 350 p). Westport CT: American Council on Education/Praeger series on higher education.
- Tinto, V. (2006). Research and practice of student retention: What next? *Journal of College Student Retention*, 8(1), 1-19.
- Tinto, V. (2012). Enhancing student success: Taking the classroom success seriously. *The International Journal of the First Year in Higher Education*, 3(1), 1-8. doi: 10.5204/intjfyhe.v2i1.119
- Tonso, K. L. (1996). The impact of cultural norms on women. *Journal of Engineering Education*, 85, 217-225.
- Trow, M. (1973). Problems in the Transition from Elite to Mass Higher Education. Berkeley, CA.: Carnegie Commission on Higher Education.
- Trowler, V. (2010). Student engagement literature review. *The Higher Education Academy*, 1-70.
- University of Sydney. (2014, Sept 2014). The University of Sydney: Our History. Retrieved March 2015, from www.sydney.edu.au/about/profile/history
- van der Velden, G. (2012). Institutional Level Student Engagement and Organisational Cultures. *Higher Education Quarterly*, 66(3), 227-247. doi: 10.1111/j.1468-2273.2012.00521.x
- Wacquant, L., J. D. (1989). Towards a Reflexive Sociology: A Workshop with Pierre Bourdieu. *Sociological Theory*, 7(1), 26-63. doi: 10.2307/202061
- Warburton, E. C., Bugarin, R., & Nunez, A.-M. (2001). Bridging the Gap: Academic Preparation and Postsecondary Success of First-Generation Students: National Centre for Education Statistics
- Webb, J., Schirato, T., & Danaher, G. (2002). *Understanding Bourdieu*. Crows Nest: Allen & Unwin.
- Weik, K. (1976). Educational organisations as loosely coupled systems. *Administrative science quarterly*, 21(1).
- Wigfield, A., & Eccles, J. (2000). Expectancy-Value Theory of Achievement Motivation. *Contemporary Educational Psychology*, 25, 68-81. doi: 10.1006/ceps.1999.1015
- Wingate, U. (2006). Doing away with 'study skills'. *Teaching in Higher Education*, 11(4), 457-469. doi: 10.1080/13562510600874268
- Yin, R. K. (2009). *Case study research : design and methods* (4th ed. ed.). Thousand Oaks Calif: Sage Publications.
- Yin, R. K. (2014). *Case study research : design and methods* (5th ed. ed.). Thousand Oaks California: Sage Publications.
- Zepke, N., & Leach, L. (2005). Integration and adaptation: Approaches to the student retention and achievement puzzle. *Active Learning in Higher Education*, 6(1), 46-59. doi: 10.1177/1469787405049946

Appendix A: Publications Arising from this Research

During the course of the research, a number of research papers were published. For all of these works, I was the sole author:

Devine, J. 2012, 'Digging deeper using 'habitus' – a fresh approach to understanding student behaviour', *Australasian Association of Engineering Education*, Melbourne

Devine, J. 2012, 'Work in Progress: Can Bourdieu's Habitus provide a theoretical framework for Engineering Education Research?', *2012 Frontiers in Education Conference*, Seattle, Washington

Devine, J. 2012, 'Exploring Bourdieu for engineering education research', *40th SEFI Annual Conference* Thessaloniki, Greece

Devine, J. 2013, 'Attitudes and perceptions of first year engineering students', *24th Annual Conference of the Australasian Association for Engineering Education (AAEE2013)*, Gold Coast, Queensland

Devine, J. 2016, 'Becoming an Engineer - are there particular dispositions which contribute to student success?', *European Journal of Engineering Education*, *Accepted for publication*.

In addition to the papers listed above, two papers were co-authored with my supervisors Professor Frank Bullen, Associate Professor Lyn Brodie and with Dr Andrew Wandel, my role was that of primary author:

Devine, J & Wandel, AP. 2014, 'A statistical analysis of student backgrounds at a regional university', *Australasian Association for Engineering Education Annual Conference*, Wellington

Devine, J, Bullen, F & Brodie, L. 2015, 'Mapping a supportive institutional culture for a diverse student cohort', *The 6th Research in Engineering Education Symposium*, Dublin, Ireland

Appendix B: Ethics Consent Documents

This appendix contains the formal Human Research Ethics Committee (HREC) approvals related to this research and the approved Participant Information sheets. These information sheets outline the HREC conditions under which the data was collected and were given to potential participants with their invitation to participate.



University of Southern Queensland

CRICOS: QLD 00244B NSW 02225M
TOOWOOMBA QUEENSLAND 4350
AUSTRALIA
TELEPHONE +61 7 4631 2100
www.usq.edu.au

OFFICE OF RESEARCH AND HIGHER DEGREES

Ethics Committee Support Officer
PHONE (07) 4631 2690 | FAX (07) 4631 1995
EMAIL ethics@usq.edu.au

25 June 2013

Ms Jo Devine
C/- Faculty of Engineering and Surveying
University of Southern Queensland

CC: A/ProfLyn Brodie - Supervisor

Dear Jo

The Chair of the USQ Human Research Ethics Committee (HREC) recently reviewed your responses to the HREC's conditions placed upon the ethical approval for the below project. Your proposal now meets the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethics approval has been granted.

Project Title	Becoming an engineer - Why do non-traditional students succeed? An investigation into factors influencing engineering student progression and success
Approval no.	H13REA111
Approval date	20 June 2013
Expiry date	20 June 2016
HREC Decision	Approved

The standard conditions of this approval are:

- (a) conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
- (b) advise (email: ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
- (c) make submission for approval of amendments to the approved project before implementing such changes
- (d) provide a 'progress report' for every year of approval
- (e) provide a 'final report' when the project is complete
- (f) advise in writing if the project has been discontinued.

For (c) to (e) forms are available on the USQ ethics website:
<http://www.usq.edu.au/research/ethicsbio/human>

For (d) to (e) please diarise the applicable dates now, to ensure that your reporting obligations are fulfilled.

Please note that failure to comply with the conditions of approval and the *National Statement (2007)* may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.



Annmaree Jackson
Ethics Committee Support Officer

Copies to: devinej@usq.edu.au
lyn.brodie@usq.edu.au



www.usq.edu.au

OFFICE OF RESEARCH AND HIGHER DEGREES

Ethics Committee Support Officer

PHONE (07) 4631 2690 | FAX (07) 4631 1995

EMAIL ethics@usq.edu.au

Wednesday, 2 May 2012

Jo Devine

Email: devinej@usq.edu.au

Dear Jo

The Chair of the USQ Fast Track Human Research Ethics Committee (FTHREC) recently reviewed your responses to the FTHREC's conditions placed upon the ethical approval for the below project. Your proposal now meets the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethics approval has been granted.

Project Title	Becoming an Engineer – what does it take to succeed?
Approval no.	H12REA089
Expiry date	31.10.2012
FTHREC Decision	Approved

The standard conditions of this approval are:

- (a) conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
- (b) advise (email: ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
- (c) make submission for approval of amendments to the approved project before implementing such changes
- (d) provide a 'progress report' for every year of approval
- (e) provide a 'final report' when the project is complete
- (f) advise in writing if the project has been discontinued.

For (c) to (e) forms are available on the USQ ethics website: <http://www.usq.edu.au/research/ethicsbio/human>

Please note that failure to comply with the conditions of approval and the *National Statement (2007)* may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.

Melissa McKain

Ethics Committee Support Officer

Office of Research and Higher Degrees



The University of Southern Queensland
Participant Information Sheet

HREC Approval Number: H13REA111

Full Project Title: Becoming an Engineer: An Investigation of factors influencing engineering student progression and success

Principal Researcher: Jo Devine

Other Researcher(s): n/a

I would like to invite you to take part in this research project.

1. Procedures

Participation in this project will involve:

- Participation in a recorded interview with the researcher. You will be asked to talk about your educational journey; the influences on your decision to study, difficulties encountered, motivations, approaches to study etc. The interview is expected to take about 30 - 45 minutes.

Possible follow up activities (strictly subject to participant availability and agreement):

- A follow up interview about the same themes about a year later.
- a follow up focus group discussion to explore any common themes that arise. A focus group would take approximately 45 - 60 minutes.

If you agree to participate in the first interview there will be no obligation to participate in subsequent interviews or focus groups. These would only be conducted by subsequent agreement.

Interviews and the focus group (if undertaken) would be audio recorded for subsequent transcription and analysis. However, if you agree to participate, any data, comments & opinions collected would remain anonymous.

This study aims to investigate the factors that are important influences on student success. In particular I want to document the experiences and insights of successful engineering students, like you. At USQ many students come from varying backgrounds; they come from rural and regional backgrounds, study part time and by distance, often work part or full time, are older than average and often have dependents to consider. This makes them different to many of the students studying at the larger, urban universities. For this reason it is important to consider how we can best support our students in their studies and understand what are the critical factors or issues that influence success or otherwise. Increasing this understanding would ultimately inform the future development and implementation of appropriate support systems, programs and teaching methodologies.

2. Voluntary Participation

Participation is entirely voluntary. **If you do not wish to take part you are not obliged to.** If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Any information already obtained from you will be destroyed if possible. However, if you choose to withdraw during or after a focus group, or after your data has been de-identified, it may not be possible to withdraw your data.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with the University of Southern Queensland.

Please notify the researcher if you decide to withdraw from this project.

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher:

Jo Devine
Faculty of Engineering and Surveying
University of Southern Queensland
Ph (07) 4631 2722
Email: devinej@usq.edu.au

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au



University of Southern Queensland

The University of Southern Queensland

Participant Information Sheet Staff Participants

HREC Approval Number: H13REEA111

Full Project Title: An Investigation of factors influencing engineering student progression and success

Principal Researcher: Jo Devine

Other Researcher(s): n/a

I would like to invite you to take part in this research project.

1. Procedures

Participation in this project will involve:

- Participation in a recorded interview with the researcher. You will be asked to talk about your expectations of engineering students, your general experiences of teaching or working with students and, if relevant, your teaching philosophy. The interview is expected to take about 30-45 minutes.

Interviews would be audio recorded for subsequent transcription and analysis. However, if you agree to participate, any data, comments & opinions collected would remain anonymous.

This study aims to investigate the factors that are important influences on student success. In particular I want to identify the unique ways that USQ staff interact with students. At USQ many students come from varying backgrounds; they come from rural and regional backgrounds, study part time and by distance, often work part or full time, are older than average and often have dependents to consider. This makes them different to many of the students studying at the larger, urban universities. For this reason it is important to consider how we can best support our students in their studies and understand what are the critical factors or issues that influence success or otherwise. Increasing this understanding would ultimately inform the future development and implementation of appropriate support systems, programs and teaching methodologies.

2. Voluntary Participation

Participation is entirely voluntary. **If you do not wish to take part you are not obliged to.** If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Any information already obtained from you will be destroyed if possible. However, if you choose to withdraw after your data has been de-identified, it may not be possible to withdraw your data.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with the University of Southern Queensland.

Please notify the researcher if you decide to withdraw from this project.

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher: (overleaf)

Jo Devine
Faculty of Engineering and Surveying
University of Southern Queensland
Ph (07) 4631 2722
Email: devinej@usq.edu.au

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au



The University of Southern Queensland

**Participant Information Sheet
Workshop Participants**

HREC Approval Number: H13REA111

Full Project Title: An Investigation of factors influencing engineering student progression and success

Principal Researcher: Jo Devine

Other Researcher(s): n/a

I would like to invite you to take part in this research project.

1. Procedures

Participation in this project will involve:

- Participation in the AAEE2014 workshop titled “Supporting diverse student cohorts through their engineering studies”, as described in the conference proceedings. Material and ideas generated during the workshop will be collected and used for subsequent analysis.

At the end of the workshop you will be asked to provide the materials you have generated to one of the workshop facilitators. As it will not be possible to match the anonymous data to consent forms your voluntary provision of your materials will be considered to indicate your consent. If you do not agree please take your materials with you at the end of the workshop.

If you agree to participate, any data, comments & opinions collected would remain anonymous. Institution specific information collected will be used only for categorising institutions and sorting data, after which institution names and identifying data will be removed prior to data analysis.

This study aims to investigate the factors that are important influences on student success. Many countries around the world, including Australia and New Zealand, have stated goals of increasing both access to and participation in higher education. This has led to increasingly diverse commencing engineering student cohorts and new dimensions to issues of first year transition and student support requirements.

The purpose of this workshop and subsequent data analysis is to explore a variety of institutional contexts and identify the ways in which they respond to the needs of under-represented groups within engineering student cohorts. It is part of a wider study on enabling the success of these groups, and by extension all students, through the identification of good practice in teaching and supporting students and the influence of context on practice efficacy.

2. Voluntary Participation

Providing the use of materials generated by you in this workshop for research purposes is entirely voluntary. **If you do not wish to make your data available for analysis you are not obliged to.** If you

decide to take part and later change your mind, you are free to withdraw from the project at any stage. Any identifiable information already obtained from you will be destroyed or returned to you. However, if you choose to withdraw after provision of your unidentified data to workshop facilitators, it may not be possible to withdraw your unidentifiable data.

Your decision whether to take part or not to take part, or to take part and then withdraw, by providing your materials for subsequent research analysis will not affect your participation in the workshop.

Please notify the researcher if you decide to withdraw your consent.

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher:

Jo Devine
School of Civil Engineering and Surveying
University of Southern Queensland
Ph (07) 4631 2722
Email: devinej@usq.edu.au

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au



TOOWOOMBA QUEENSLAND 4350
AUSTRALIA
TELEPHONE +61 7 4631 2300

CRICOS: QLD 00244B NSW 02225M

www.usq.edu.au

OFFICE OF RESEARCH AND HIGHER DEGREES

Helen Phillips
Ethics Officer
PHONE (07) 4631 2690 | FAX (07) 4631 1995
EMAIL ethics@usq.edu.au

Thursday, 16 June 2011

Ms Jo Devine
Faculty of Engineering and Surveying
Agricultural, Civil & Environmental Department
USQ Toowoomba Campus

Dear Ms Devine

The Chair of the USQ Fast Track Human Research Ethics Committee (FTHREC) recently reviewed your responses to the FTHREC's conditions placed upon the ethical approval for the below project. Your proposal now meets the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethics approval has been granted.

Project Title	Investigation into participation rates for CIV1501 students S2/S3 2010
Approval no.	H11REA013
Expiry date	31/08/2011
FTHREC Decision	Approved

The standard conditions of this approval are:

- (a) conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
- (b) advise (email: ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
- (c) make submission for approval of amendments to the approved project before implementing such changes
- (d) provide a 'progress report' for every year of approval
- (e) provide a 'final report' when the project is complete
- (f) advise in writing if the project has been discontinued.

For (c) to (e) forms are available on the USQ ethics website: <http://www.usq.edu.au/research/ethicsbio/human>

Please note that failure to comply with the conditions of approval and the *National Statement (2007)* may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.

Helen Phillips
Ethics Officer
Office of Research and Higher Degrees



The University of Southern Queensland
Participant Information Sheet

Full Project Title: Investigation into participation rates for CIV1501 students S2/S3 2010

Principal Researcher: Jo Devine

Other Researcher(s): Hannah Jolly

I would like to invite you to take part in this research project.

1. Procedures

Participation in this project will involve

- *Speaking to a research assistant who will contact you by phone to ask a series of questions regarding your experience of the course and gather any comments or suggestions you might have. This telephone interview is not expected to take any longer than 10-15 minutes and can be conducted at a time to suit you. The research assistant will not be in any way connected with the delivery of CIV1501 during 2010 or 2011.*
- *The telephone interview will be recorded so that we can accurately gather your comments but the recording will be deleted once data has been transcribed.*
- *Your participation will assist us in understanding the challenges being faced by engineering statics students and how we might best be able to assist them in the future.*
- *Confidentiality processes will be in place to maintain your privacy by maintaining the anonymity of your comments.*

2. Voluntary Participation

Participation is entirely voluntary. **If you do not wish to take part you are not obliged to.** If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Any information already obtained from you will be destroyed.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with the University of Southern Queensland.

Please notify the researcher if you decide to withdraw from this project.

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher:

Jo Devine
Faculty of Engineering & Surveying
University of Southern Queensland
West Street, Toowoomba, 4350
Email: jo.devine@usq.edu.au
Ph: +61 7 4631 2711 / 0408 226 645

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au



The University of Southern Queensland
Consent Details

TO: *Potential Interview Participants*

Full Project Title: **Investigation into participation rates for CIV1501 students S2/S3 2010**

Principal Researcher: **Jo Devine**

Associate Researcher: **Hannah Jolly**

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I confirm that I am over 18 years of age.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audio taped during the study interview.
- I understand that the tape will be destroyed after transcription of relevant comments

If you wish to take part in this study please reply to this email stating your name and 'I give my consent to participate'.

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au

Appendix C: Protocol for Student Diversity Workshop

Workshop held 8th December 2014, at the Australasian Association of Engineering Education Conference, Wellington, NZ.

Diversity Workshop: Running Sheet

Sign In

Introduction

- Purpose/aim of the workshop – also what benefit they will derive
- Format of the workshop – esp 'Ideas' stickies
- Research Consent
- Diversity and socio-cultural challenges for incoming students

10 minutes

Separate into Groups

- By Institution Type

5

Introductions around the table

- Facilitator led

5

Individual reflection

- Facilitator to provide questionnaire

10

Building a concept map (Group activity)

- Provide Butcher's paper (pre-marked?)

20

'The big question': (Grp discussion, Individual responses)

- "If you wanted to change the curriculum to better support diversity what would you prioritise?"
- (What are the current obstacles? If time permits???)

10

Table Reports

- Each table to share their map and favourite idea for enhancing diversity
- If time short : 1 big difference form previous table

20

Conclusion

- Is there something surprising or thought provoking you learned today?
- Thankyous
- Draw for thankyou prize

10

Workshop: Supporting diverse student cohorts through their engineering studies

Institution that you represent: _____

Go8 ATN NZ

Position: Lecturer Administrator L&T support Other

IRU Regional 'New Gen'

In your own words...

1. Describe what student diversity means to you:

2. How does diversity manifest itself in your "classroom"?

3. What do you do to support this diversity?

4. What does your institution do to foster/support diversity?

Workshop: Supporting diverse student cohorts through their engineering studies

Institution that you represent: _____

Go8 ATN NZ

Position: Lecturer Administrator L&T support Other

IRU Regional 'New Gen'

What is your opinion about how your institution is addressing diversity?

What changes would you prioritise to better support diversity through classroom and / or institutional practices?

Regional universities group (8 participants)

University of South Australia (2 participants)
Central Queensland University (2 participants)
University of Tasmania (2 participants)
University of the Sunshine Coast (1 participant)
University of Southern Queensland (1 participant)

Go8 universities group (8 participants)

University of Queensland (2 participants)
The University of New South Wales (1 participant)
Australian National University (1 participant)
Monash University (1 participant)
Texas A&M* (1 participant)
Singapore University of Technology and Design* (2 participants)

ATN-Like universities group (6 participants)

Queensland University of Technology 1
Curtin University of Technology (1 participant)
Newcastle University (1 participant)
Charles Sturt University (1 participant)
RMIT (Royal Melbourne Institute of Technology) (1 participant)
Southern Cross University (1 participant)

New Zealand Universities group (7 participants)

Victoria University (2 participants)
University of Waikato (2 participants)
Massey University (1 participant)
University of Auckland (1 participant)
University of Canterbury (1 participant)

*International participants were included in the group most representative of their institution type, as determined on the day

Appendix D: Faculty Culture Survey Questions

The following is the survey instrument used to initially explore Faculty culture.

Mapping institutional values

This survey is seeking to identify the ethos & culture that was present in the former FoES, from the perspective of staff who engaged with students during that period. Results will be aggregated and fed back into an established model of Higher Education institutional cultures to map the position occupied by the former FoES.

For each question, rank each of the four options on a scale of 0 - 5 (where, 0= never, 5=always), consider the relative prevalence of each option when weighting them.

Question	Four Options for weighting	Weighting Never...Always
What was valued within FoES?	<p>Academic freedom & autonomy</p> <p>Equity: Equal opportunity and fairness in distribution of resources (time, funding, information)</p> <p>Centralised power</p> <p>Professional competence and Student focus</p>	0-1-2-3-4-5
How would you describe the attitude of the FoES management, with respect to USQ and FoES procedures and guidelines?	<p>Permissive – “follow these general guidelines as you interpret them”</p> <p>Regulatory - “Here is the procedure; we will check that you are following procedure”</p> <p>Directive – “you shall do <i>this</i>, and you will do it <i>this way</i>! No discussion will be entered into!”</p> <p>Supportive – “There are good reasons why we want it done this way, which you can understand, so tell us what you need to make it happen”</p>	0-1-2-3-4-5

		Weighting Never...Always
<p>What was the main operational unit; setting the operational direction within FoES?</p> <p>e.g.</p> <ul style="list-style-type: none"> -who was able to initiate course/program changes? -who determined how courses/programs were delivered (within the pre-existing parameters)? -Who was responsible for course delivery? 	0-1-2-3-4-5	
	Individual academics / staff	
	Discipline & its committees – tightly coordinated	
	Faculty & its senior management team	
	Project teams (e.g. working together on course or program delivery or enhancement)	
<hr/>		
<p>In what sort of arenas were decisions made?</p>	0-1-2-3-4-5	
	Informal groups/networks, who work through issues and adopt a position based on consensus amongst peers.	
	Committees, subjected to administrative briefings re relevant data	
	Working parties, where members are appointed by senior mgmt., and senior management teams. Bargaining & negotiation amongst senior staff can occur outside formal decision arenas & affect outcomes	
	Project teams, made up of relevant specialists, work closely with stakeholders (e.g. students) who will be affected by decisions	
<hr/>		
<p>Management style of decision making:</p>	0-1-2-3-4-5	
	Consensual – all voices have an input, decisions are discussed and debated in an iterative fashion before reaching decision	
	Formal/“rational” – decisions & arguments are based mainly on statistical bases or other relevant data	
	Political/tactical – decisions are made at senior levels; bargaining & negotiating between senior staff outside formal decision making arenas can affect outcomes.	
	Devolved leadership – decision making is delegated to, or otherwise influenced by input from, key staff working ‘at the coalface’	

		Weighting Never...Always
Describe the nature of any change and innovation that occurred (eg change in processes / systems/ method...):		0-1-2-3-4-5
	Organic innovation; continuous/incremental improvement resulting from activities and experiences associated with student admin, teaching & research	
	Reactive; previous ideas/methods were adapted to meet new needs	
	Transformation – driven from ‘above’, often in response to an environment of perceived potential crisis	
	Proactive Flexibility – changes were made in anticipation of student needs/desires	

What were the External referents: (for decision making)		0-1-2-3-4-5
	National & international peer scholars	
	Regulatory bodies (E.g. EA)	
	Political (esp. funding) environment	
	Clients (students) & sponsors (employers)	

What were the Internal referents: (for decision making)		0-1-2-3-4-5
	The relevant discipline (e.g. discipline of engineering, specifically civil)	
	The rules (as laid down by FoES management)	
	The plans (based on management-set goals)	
	The students	

Basis for evaluation of effectiveness (of individual performance)		0-1-2-3-4-5
	Peer (i.e. other academics’) assessment	
	Formal Audit of individual procedures and practices	
	Performance indicators	
	Client (student) satisfaction indicators	

		Weighting Never...Always
Student status; students generally viewed as:		0-1-2-3-4-5
	Apprentice academic (ie future post-grads and academics)	
	Statistic (Headcounts and progression statistics)	
	Unit of resource (ie sources of funding / income)	
	Client (to be provided with a service)	
Administration activities within FoES served the needs of...		0-1-2-3-4-5
	The community (of FoES); by enabling continuous course development, delivery/assessment/finalisation and distributing resources (funds, research time, information...)	
	The management committee(s) (FoES and USQ)	
	The chief executive (The Dean; esp. for upwards reporting outside the faculty)	
	Students and external funding bodies	
Information provision to students was:		0-1-2-3-4-5
	Largely under control of disciplines (& individual academics)	
	Centrally scrutinised information (prepared with coalface input), which was mostly static (handbooks, website)	
	Mostly centrally managed communications	
	Specialised student communications: dynamic information provision, by those working most closely with the student	

		Weighting Never...Always
The 'Student voice' (regarding student issues, needs or feedback) in FoES was 'heard' most often in ...		0-1-2-3-4-5
	Staff-Student liaison (direct discussion)	
	Through reports to formal committees on evaluation & monitoring processes (eg retention, admission, destination stats)	
	As performance indicators in planning processes	
	Satisfaction Surveys, focus groups	
<hr/>		
Most active information flow from students to the institution:		0-1-2-3-4-5
	Department level – direct communication between staff & students	
	Reporting on student evaluation & monitoring instruments to committees, no direct discussion	
	Centrally managed communications; formally gathered student opinion, or via student reps in formal settings	
	Multiple mechanisms for students to communicate; occurs formally & informally at many levels of the organisation.	
<hr/>		
Role of students in program and delivery enhancement activity		0-1-2-3-4-5
	Students routinely involved in enhancement/development projects	
	Student views, from surveys, or student data inform planned enhancements (no direct involvement)	
	No direct involvement. Enhancement is instigated from 'above' as a result of management's strategic imperatives	
	Project teams work with students as clients /users to develop enhancements	

		Weighting Never...Always
Role of student union / student representatives	Partnership with the uni	0-1-2-3-4-5
	Representation of students	
	Student empowerment – looks out for student entitlements	
	Stakeholder – works with uni on behalf of students	

Academic Staff status; Within FoES, Staff are generally viewed as: (particularly w.r.t. Learning & Teaching)	0-1-2-3-4-5
Individual, autonomous; free to pursue own academic inclinations in both L&T & research	
The focus is on meeting expected minimum teaching standards, they can influence direction of teaching practice by participation in relevant committees.	
Narrowly Defined roles: 'teachers teach & managers manage', (academics isolated from FoES policymakers)	
Professionals, who use their professional skills to provide a service to students.	
END – THANKYOU!	

Appendix E: Interview Protocols

The following interview protocols were used for interviews with high-achieving students, Faculty staff and struggling students

STUDENT INTERVIEW PROTOCOL

High-achieving students

Criteria for invitation:

YES IF:

- Indicated interest in possible interview in their survey responses
- Have completed at least 8 courses (at USQ)
- GPA > 5
- Program is an undergraduate Bachelor of Engineering (any major)

NOT IF:

- Student is in researcher's current teaching classes
- Student was previously assessed by researcher as part of her Program Coordinator role
- Student was previously interviewed

Location:

Neutral on-campus location as agreed with student. Most commonly a meeting room outside the engineering building.

Introduction:

Explain the purpose of the study; to better understand student experience and to hear individual stories about student learning journeys.

Reiterate confidentiality and \voluntary nature of interview- (participant can end it at any time and should not feel obliged to answer any question that makes them feel uncomfortable.

I want to hear *your* views and opinions, there are no right or wrong answers, just tell your story.

Interview topics

Commence with 'easy' factual questions, topics are indicative only and the interview will follow the direction of the participant's responses.

Why study engineering?

What originally interested you in studying engineering?

- What field of engineering are you studying? Why?

Did you consider engineering (or university study) as a career while at school or did a subsequent experience inspire you to take it on?

Have you had a lot of family support for your decision to study engineering?

High school

Tell me about your high school experience....e.g.

- Did you complete year 12? Where?
- What subjects did you study
- Did you enjoy school?
- Is there any critical incident that stands out for you regarding your school years?

Choosing an institution & fitting in

How did you decide where you were going to study?

Interactions with class-mates / staff / online facilities / administration

Difficulty determining what was required of you? ...

Sources of support / inspiration

Student's experience of studying engineering so far

Have you enjoyed studying engineering so far? ... Explain why

Are there any particular skills that you brought to your studies that you think have helped you? – Where did they come from?

How is engineering different to what you did before?

What have you found easy / difficult about studying? About engineering?

Tell me about any obstacles or difficulties you have encountered during your studies.
How did you overcome these?

Do you have to fit study in amongst other commitments? If so, how do you manage that?

Approach to study

Why do you think that you have made such a success of your studies so far?

Do you think your approach to your studies is different to that of your fellow students who are less successful?

What are you hoping to 'get out' of your study?

Final

Are there any questions you would like to ask?

STAFF INTERVIEWS

Interview research investigation topics:

- How do staff perceive the values, ethos and mission of the institution?
- Is there evidence of an empathetic institution in operation?
- What do staff perceive as necessary for student success?
 - How do successful/unsuccessful students act?

Criteria for invitation:

Staff identified by researcher as predominantly teaching academic or as experienced student support officer.

Location:

Participant's office or neutral meeting room, as agreed with participant

Introduction:

Explain the context of the study – Purpose of the study: I want to better understand the institution that is USQ and how it operates on a day to day basis, particularly with respect to engineering students. I want to understand what that means the people 'at the coalface'.

Interview Topics:

- Explain briefly to me what your role at the university is...
- Have you worked at other universities or Faculties before? If so, do you see any major differences about the way that we (at this Faculty) interact with our students?

Institutional practices:

- As an institution we talk about 'flexibility' for student learning – what does this mean to you in your day to day role?
- If you were to compare USQ to 'other universities', what do you think it is that makes USQ different?
- What do you think are the strengths of the university – the engineering schools/program in particular?

- You have seen a lot of change over the years, what do you think we have done particularly well / particularly badly for students either now or in the past? (long-serving staff only)
- Where do you think USQ should be focussing its efforts?

Individual staff practices:

- How do you feel that you fit into the picture in terms of supporting students in their learning journey?
- In terms of supporting students what do you think we do well and what could be improved?

Perceptions of student practices:

- What do you think makes a 'good student'?
 - What sort of behaviour differentiates a 'successful student' from an unsuccessful one, from your perspective?
 - (How is 'success' perceived?)
- In your job you see / have seen many different types of student, have you come across any really inappropriate behaviour from a student?
 - Explain / tell me about it
 - How did you handle that?
 - How should the student have handled it?
- Anything else you want to tell me about our students?

For academic staff:

How have you set up your course in terms of how students should approach their studies?

How do you manage:

- requests for extensions
- students requiring additional help

In your experience what do you think that students find most problematic about their studies?

What particular strategies do you employ for teaching and/or supporting students from diverse backgrounds?

Could you tell me about your approach to assessment?

- How do you design assessment to accommodate the needs of the students from diverse backgrounds?

What advice would you provide for colleagues about how they could enhance their practice in teaching and supporting students?

Can you identify any particular assistance you need to enhance your teaching and/or support practices?

STUDENT INTERVIEWS

Struggling Students – Telephone Interview protocol

Criteria for invitation:

- Failed key first year course, Engineering statics
- Has a GPA < 5

Ethics conditions

- Invitation and initial of contact initiated per ethics approved process.
- Interviews conducted by external research assistant, unrelated to the course, after student has responded in the affirmative to an email invitation
- Interview time restricted to approximately 10-15 minutes

Introduction by interviewer:

The aim of this project is to identify the difficulties which students may have with the course, the reasons for these difficulties and ultimately how the course can be improved to better cater for students' needs.

We can see from your records that you were enrolled in the course last year, but did not complete it, so we would like to talk to you about your experience of the course and any problems you encountered. The interview should take around ten minutes.

I am recording the interview so that all of your comments can be transcribed, however you will be de-identified in the transcripts. Are you happy to proceed?

Interview Questions

Introduction/Background:

- Which degree are you studying?
- Have you worked in an engineering related industry prior to enrolling in your current program?

Study practices during the course:

- Did you have an expectation of how difficult the course would be or how much weekly study it would require?
- How did the course compare to your expectations?
 - Did it get harder or easier as the weeks went by? Why?
- What did you spend your study time doing?
Did you study the course materials in the recommended order?

Did you spend more of your time doing practice problems or reading the theory in the text?

Non-completion:

Our records show that you did not complete all of the assessment pieces (either you did not submit both of your assignments or you did not sit the exam).

- Can you tell me the reasons/background behind that situation?
- Do you intend to re-enroll in engineering statics in semester two or three next year?
Do you intend to enroll in additional courses before trying statics again? If so, what

courses?

Program experience

- If you decided not to continue with your program of study, do you plan to enroll in another USQ program?
- Is the engineering program what you thought it would be?

Support during the course:

There are a number of tools that are available during the statics course which are designed to help you get through the course. Can you tell me if you were aware of each of these or if you found any of them useful to you:

- study desk discussion forums (one per module)
- study desk worked examples
- recorded lectures
- online tutorials (Mastering Engineering quizzes)
- the 'Meet-Up' program - peer assisted learning
- email messages or phone to contact the course staff
- additional maths/ physics revision material
- any other supports you were aware of or used?

- Is there something more that you think could be done to make any of these resources more helpful or accessible?
- Are there any other forms of support that you would like to see the course provide?

Peer and staff support:

- During the semester, did you have contact with any of the other students that were going through the course?
If so, what did you talk about and how often?
- Would you have liked to have more contact with other students in the course?
If so, what do you see as the key barriers to this?
- Would you have liked to have more contact with staff in the course?
If so, what form would you have liked this to take?

General comments:

- Is there anything you would like to add, or anything that you would like to ask me?

Thank you for taking the time to talk to us.