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Changing the culture of teaching and learning in ICT and engineering: facilitating research professors to be teaching and learning leaders

FINAL REPORT 2012

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Contents

Executive Summary

This project aimed to build teaching leadership within the higher education sector by working with established leadership in the higher degree research domain, namely the professoriate. The project was situated within the disciplines of Engineering and ICT at three different universities QUT (Queensland University of Technology), Monash University and UTS (University of Technology, Sydney).

The development of teaching and learning (T & L) leadership "from scratch" is problematic and it is more promising to transfer skills that already exist in an existing context. In Australian universities there are many professors who have been promoted because of their leadership in research (rather than teaching) and these professors have developed valuable leadership skills in their roles. The professors have much to offer in T & L leadership, and this project set out to tap this potential. Because this project focused on increasing the engagement of the Australian professoriate in T & L leadership, it gave much needed attention to the "research-teaching nexus". In so doing it promoted more balanced and effective leadership within the higher educational sector.

Specific project objectives were to:

- To build leadership capacity in teaching and learning, and to improve teaching quality in ICT and Engineering disciplines at three leading Australian universities.

- To facilitate the transference of research leadership to T&L leadership, and disseminate this transference model developed through the project within the Engineering and ICT domains to other disciplines and universities.

The project was carried out in three phases. The three phases, or Three Bridges, were completed over three years. The first phase (Bridge One) during Year 1 involved engaging the professors in the leadership of postgraduate supervision. This stage had a strong research component and therefore had a significant natural appeal and acted as a good initiation into the project for most research oriented professors. At the same time, the bridge was structured so that the professors were also required to consider the *pedagogical* aspects of supervision.

The second phase (Bridge Two) in Year 2 addressed the issue of how to lead improvement in undergraduate education so that students were better prepared for research. Again, this bridge had some natural appeal for research oriented professors, but the professors were also prompted to consider pedagogical issues within undergraduate education.

The final stage (Bridge Three) in Year 3 was designed to have the professors consider the improvement of undergraduate teaching for its own sake, without any reference to research or postgraduate supervision. The three bridges were spaced well apart, so that engagement in the area that the professors might be less comfortable with was achieved *gradually.* This slow rollout was important, because attitudinal and cultural changes are typically necessary when one embraces new and uncomfortable areas, and time, apart from a sense of ownership through participation, is needed for these changes to occur.

A number of positive outcomes were observed within the participating institutions during the period of this project, some as a direct result of the project workshops, and some as a result of the increased awareness created by the project. Written outputs and workshop feedback also confirmed the effectiveness of the bridging strategy adopted by the project team. From the workshop discussions conducted as part of the project, it emerged that some of the research professors are more than willing to engage with undergraduate education and a number of them have been doing so within their own spheres of influence in various ways.

One of the main takeaways from this project is that it pays off to provide such opportunities for professors to come together for the specific purpose of discussing T & L matters. Although the workshops such as the ones we facilitated may not generate big ideas or bring about cultural change on their own, they do provide a forum for information exchange on the subject of T & L (as opposed to research meetings), but later, when one or more of the participants do propose any initiatives for change, the others are more amenable and open to the idea, for they understand where the idea originates from – and have more ownership of it.

Within the organisations that are part of this project, we have noted that such an exchange of information facilitated by the workshops has indeed led to some specific T & L initiatives being more welcome within our faculties because the professoriate was open-minded and willing to consider them later because they had participated in some of our congenial workshops. We consider these changes as a successful outcome for this project.

The recommendations arising from the project are in section 5.2.

Acronyms

ALTC	Australian Learning and Teaching Council Ltd.
FaST	Faculty of Science and Technology
FBEE	Faculty of Built Environment and Engineering
FEIT	Faculty of Engineering and Information Technology
FIT	Faculty of Information Technology
Monash	Monash University
PL	Project Leader
QUT	Queensland University of Technology
STEM	Science Technology Engineering and Mathematics
T & L	Teaching and Learning
UTS	University of Technology, Sydney

1 Introduction

This document provides a final report on the Leadership Project LE8-785 "Changing the culture of teaching and learning in ICT and Engineering: facilitating research professors to be T & L Leaders."
This was a collaborative project conducted in the areas of leadership and research within the faculties of ICT and Engineering within three Australian universities (QUT, Monash, and UTS) from October 2009 to July 2011, supported by a grant from the Australian Learning and Teaching Council (ALTC).
The project addressed the ALTC program priority of enhancing learning and teaching through leadership capacity-building in the ICT and Engineering disciplines by building a community of practice.

1.1 Background and ongoing challenges

Australia is facing a significant teaching leadership succession challenge in higher education along with a future crisis in research leadership (Scott et al., 2008; Bradley Report 2008) that have implications for both the quality of research and the quality of teaching. Furthermore, since 2003, Information and Communication Technology (ICT) faculties have experienced an unprecedented downturn in student numbers, despite strong employer demand (ACS, 2008). Consequently, there have been significant redundancies throughout the ICT higher education sector in Australia. Similarly, the Engineering sector has also failed to attract enough students to meet employer demand (TAD, 2005). Historically both disciplines also experience low CEQ scores. Leadership competency in T&L is particularly low in IT, Engineering, and Technology (Scott et al., 2008). This has partly been due to the interesting dichotomy created by institutions that hire faculty primarily to teach but give them promotion and salary advancement based primarily on their research and scholarship. When such professors enter into positions of academic leadership, however, they are required to lead their staff in the area of teaching and learning (as well as in research). Both disciplines were critically aware of the need for action and so were ripe for cultural change. These issues have implications for Australian research, and for higher education – in students' pathways to research from within undergraduate studies, and in recruiting and mentoring potential researchers, teachers, and leaders.

The literature on leadership in higher education is predominantly concerned with formally designated senior managers such as heads of department and deans of faculty. By contrast, relatively little attention has focused on those encouraging informal and distributed forms of leadership, especially amongst (full) university professors (McFarlane, 2010). The research professors already have leadership skills and capabilities within their faculties, and yet, they aren't often considered in the literature related to T&L leadership. This project addressed this gap by engaging research professors in matters of T & L within an action research project through discussions and workshops based within the three participating universities.

1.2 Aims of the project

The project took an evidence-based approach based on a combination of pedagogical bridging and discursive strategy techniques in order to build teaching leadership within the three universities, namely QUT, Monash, and UTS, initially in the disciplines of Engineering and ICT at QUT and UTS, and in ICT in Monash. This was done through a combination of methods: gathering evidence from the professoriate and other academics through a survey, disseminating this evidence within the faculties, conducting group workshops for the exchange of ideas and suggestions, and generally engaging the professoriate in considering both the micro and macro T&L involved in overcoming the challenges faced by the Australian higher education sector in regard to the future.

The two specific aims for this project were:

1. To build leadership capacity in teaching and learning, and to improve teaching quality in ICT and Engineering disciplines at three leading Australian universities
2. To facilitate the transference of research leadership to T&L leadership, and disseminate this transference model developed through the project within the Engineering and ICT domains to other disciplines and universities.

The first key objective of this project was to build leadership capacity in T&L through gradual cultural change. Improvement of teaching quality requires work at several levels of an organisation, through its mechanisms, policy, procedures and its behaviours/culture. This project focused on the behaviours and culture. This cultural change was achieved through the development of a new model that involves assisting the professoriate in Engineering and ICT to transfer their existing research leadership skills into the area of T&L. The project used bridging mechanisms to achieve this change (see section 6.2). Existing work, such as the cultural change journey which commenced in 2005 in QUT's Faculty of Information Technology (Q:FIT), its merger into the Faculty of Science and Technology (Q:FaST) in 2009, and the merging of UTS's Faculty of Engineering and the Faculty of Information Technology to form the Faculty of Engineering and Information Technology (U:FEIT) as of 1st July 2008, were ongoing throughout this project. This work will continue into yet another merger within QUT, when Q:FaST and Q:FBEE, both part of this project, merge to form a Faculty of Science Technology Engineering and Mathematics at QUT (Q:STEM) beginning January 1, 2012.This institutional context helped us include a wider variety of disciplines and to include the Science professoriate and other science academics at QUT. This complemented the project's approach as it sought to make changes to policy, procedures, systems and behaviour/culture at the broader level of each of the faculties. This also helped ensure some systemic changes in each university.

The second key objective was dissemination of the Research-to-Teaching transference facilitation model we develop within the Engineering and ICT domains to other disciplines and universities. As the proposed "transference approach" originates from outside the ICT and Engineering disciplines, this method has high applicability to other disciplines and the higher education sector in general. This was done mainly through the dissemination of the project methods and outcomes to other disciplines through workshops and seminars at

conferences and also through a nationwide webinar. This will continue through the publication of journal articles and other publications based on this project.

1.3 Institutional Context

Given the larger issues discussed in section 1.1, the leadership within both disciplines were critically aware of the need for action and were ripe for cultural change.

The published literature contains only a few studies that examine the relationship between faculty research activity and student outcomes as distinct from student evaluations of teaching quality. Halsea, Deane, Hobson & Jones (2007) found that outstanding university teachers are also active researchers, but are unlikely to publish about their teaching or about improving teaching practice in universities. Caplow and McGee (1954) were among the first to study the interesting dichotomy created by institutions that hire faculty primarily to teach but give them promotion and salary advancement based primarily on their research and scholarship. This project strategically addressed this identified need and attempted to build a community of practice. Within QUT and UTS, we also aimed to serve as a model for attracting more undergraduate students into research while nurturing postgraduate students to completion.

1.4 The project team

The project team was made up of academic leaders from three participating institutions: Queensland University of Technology, University of Technology Sydney, and Monash University. The project had an independent external evaluator who provided two formative evaluations during the project and also evaluated the final project outcomes. The project involved also an advisory team of academic leaders with individual expertise in various aspects of research and T & L, who provided input at various times during the project and also participated in a focus group with the external evaluator towards the end of the project.

1.4.1 Project leaders

Professor Sylvia L. Edwards (Project Leader)	Queensland University of Technology
Professor Peter O'Shea	Queensland University of Technology
Dr. Judithe Sheard	Monash University
Dr. John Hurst	Monash University
Dr. Wayne Brookes	University of Technology Sydney
Dr. Tim Aubrey	University of Technology Sydney

1.4.2 Project coordinators

Dr. Bhuva Narayan (2010-2011)	Queensland University of Technology
Dr. Kathy Egea (2010-2011)	University of Technology Sydney
Christine O'Connor (2010)	Monash University
Dr. Patricia Cretchley (2009)	Queensland University of Technology

1.4.3 Project evaluation focus group

Professor Wageeh Boles	Queensland University of Technology
Professor Christine Bruce	Queensland University of Technology
Professor Doug Hargreaves	Queensland University of Technology
Professor Christian Langton	Queensland University of Technology
Professor Kerry Raymond	Queensland University of Technology
Associate Professor Schlomo Geva	Queensland University of Technology

1.4.4 External evaluator

Associate Professor Catherine Manathunga (at Victoria University of Wellington, Aotearoa/New Zealand since 2011, and previously at The University of Queensland) was appointed as the project's external evaluator for the period of the project. She interacted regularly with the project team, provided formative evaluations at the end of Year One and Year Two, and visited QUT at the end of Year Three to meet with and interview project members and also members of the focus group as part of the evaluation.

1.4.5 Acknowledgement of support

The project team would like to thank staff from the three universities who made a valuable contribution through their support. In particular, Associate Professor Dann Mallet, Paul Comiskey, and Dr. Margot Duncan from the Queensland University of Technology for facilitating the QUT: FaST Bridge 3 workshops.

1.5 Project participants

A total of 404 academics participated in the 20 different workshops held over three years at the three universities across four faculties – many of them participated in more than one workshop. The project team acknowledges the contributions of each one of these participants in making this project successful. Additionally, 152 academics participated in a pre-test survey and 30 academics participated in a post-test survey. As part of the project, discursive workshops and round-table seminars were held also in major conferences, where we engaged with a further 350+ academics, along with a webinar held in August 2011 for academics across Australia with 17 participants from 7 different universities.

1.6 The significance of the project

The purpose of this project was to build teaching leadership, initially in the disciplines of Engineering and ICT at three different universities QUT (Queensland University of Technology), Monash University and UTS (University of Technology Sydney). The development of T & L leadership "from scratch" is problematic. Social science research indicates that it is more promising to transfer skills that already exist in a different context (Boden 2006; Perkins & Salomon 1992). Evidence provided by learning theorists points to the importance of exploiting linkages between different domains of knowledge and expertise in order to enhance outcomes (Ormrod 2004). As role models for postgraduate students, undergraduate students and more junior staff, there is a need for the professoriate to demonstrate these kinds of linkages. There is thus a responsibility for them to transfer capabilities and skills between the areas of research and T & L. Those who have been traditionally research oriented have much to offer the T & L community, for example, about peer review, rigor, resilience to negative reviews/feedback, collaboration, and industry engagement. There is also much to be gained in research supervision outcomes with greater attentiveness to evidence on effective learning approaches.

2 Literature Review

The review of the literature in this area of the complicated connections between teaching and research, along with leadership development informed the development of a leadership model of teaching and teaching-mentoring along with providing the different factors used to develop survey questionnaires and workshop guidelines, questions, and discussion points.

2.1 Research and teaching are complementary

The relationship between research and teaching in tertiary education is a long and contentious one. It dates back to the origin of the modern research university structure in the 19th century in Germany (Neumann 1992; Healey 2005; Clement, Lindblom-Ylänne & 2007; Robertson 2007; Visser-Wijnveen et al 2010). The relationship was further influenced by the rise of professionalism in degree programs (Enders 2005). It is likely that tensions between the need to further knowledge by doing research and the need to disseminate that knowledge by teaching will always be with us, for they both lay claim to a limited amount of resources within any university. Individual academics have been previously surveyed in other studies (Gottlieb & Keith 1997, 404; Griffiths 2004) to determine whether they have a "research orientation" or a "teaching orientation", and models have been developed suggesting that the relationship between the two pursuits is based on scarcity and that resources devoted to research cannot be spent on teaching, and vice versa (Hattie & Marsh 1996; Halse et al 2007). Discussion about the value of research in a teaching institution and the value of teaching in a research institution has implications for teaching and learning quality, research calibre and student and faculty satisfaction and retention (Griffiths 2004). Reward and promotional schemes for academics that are based on research qualifications, regular publication and other tangible research-related deliverables might compromise the development of high quality teaching and learning related performance (Harry & Goldner 1972; Halse et al 2007). Teaching performance continues to be measured by student evaluation despite inherent shortcomings (Onwuegbuzie 2007). Time devoted to teaching reduces available time for research (Engbretson 2008). Several approaches to managing the research-teaching nexus are explored in this review of the literature.

2.1.1 Conventional wisdom

Despite empirical evidence suggesting that there may be an inverse relationship between research and teaching, qualitative research suggests that most academics see a link between research and teaching as "obvious" (Coate, Barnett & Williams 2001, p. 159; Hattie & Marsh 1996, p. 511; Neumann 1992). Teaching and research are frequently described as complementary activities (Ramsden & Moses 1992; Fox 1992). Many academics believe that you cannot separate teaching and research to the point where they are being funded separately (Coate et al 2001). They are described as two sides of the same coin, "complementary and grounded in common goals" (Fox 1992, p. 293).

2.1.2 Teaching can enhance research

The act of disseminating knowledge through teaching often spurs new developments in the researcher's theories and ideas. Discussion with students can be stimulating and thought provoking in ways that are different than peer review or other interaction among academics (Ramsden & Moses 1992; Prince, Felder & Brent 2007). The university professor engaged in teaching can be described as a researcher engaged in disseminating, testing, and communicating his or her ideas to an audience who may bring fresh insights, criticisms and explorations (Robertson

2007). The act of explaining theories may in fact provoke the researcher into the kinds of elaboration or explanation that assist in the working out of research ideas or the development of new avenues of investigation (Robertson 2007). This is especially true in the graduate seminar or laboratory experience rather than undergraduate lecture halls (Clark 1997; Healey et al 2010). Supervising graduate students was also seen to correlate positively with research productivity among academic staff (Kyvik & Smeby 1994).

2.1.3 Research as a teaching resource

Teaching performed by someone actively engaged in research can be fresh and based on the latest data and information (Robertson & Bond 2001; Prince, Felder & Brent 2007; Visser-Wijnveen 2009; Healey et al 2010). Interaction with research practitioners can inspire students to further their education and to enter research careers (Robertson & Bond 2005; Prince, Felder & Brent 2007). Student awareness of the university as a research institution can lead to greater integration of academic research into the classroom, especially where there is flexibility in the curriculum (Brew 2010). It has been suggested that research and teaching are completely complementary, to the point of being inseparable, with the student as the third point on the triangle (Clark, 1997):

> A construct that points to research-based learning as well as research-based teaching is called for, a three-way conception that includes students' learning outcomes as a primary element. As an ideal type, the concept of a "research-teaching-study nexus" highlights a complete blending of research activities, teaching activities, and study activities, an intermingling so thorough that it is hard to tell where one ends and the other begins. In this form of education, research activity is the glue that holds together teaching and learning. Through research the professor teaches and, simultaneously, the student studies and learns. Research integrates teaching and learning (Clark, 1997, p. 244).

A research-based curriculum, or one that teaches students about research by having them engage in it, is desirable to many students, although this finding tended to be more applicable for students in their final years working on independent projects or dissertations (Holbrook & Devonshire 2005; Healey et al 2010). Students value being in proximity to research and value their awareness of it (MacLean & Barker 2004; Robertson & Blackler 2006).

2.2 Research and teaching are competitive

2.2.1 Separate endeavours

The idea that research and teaching are engaged in a competitive relationship is also a common one (Fox 1992). The traditional view of the complementary relationship has been challenged numerous times (Fox 1992; Gottlieb & Keith 1997; Verburgh et al 2007). Teaching and research are described by Ramsden & Moses (1992) as "essentially separate endeavours that just happen to occur in the same place" (p. 274).

2.2.2 Time spent in research vs. time spent in the classroom

In many countries including Australia, tenured academic positions require prerequisite research merit and an extensive publications record but do not necessarily require any teaching awards. In some studies, it has been shown that academics think time spent pursuing research activities or writing for publication is time spent as "teaching relief", out of the classroom and out of direct interaction with students (Ramsden & Moses 1997; Verburgh et al 2007). Time is the most notable

scarce commodity but other resources that are significant in the scarcity model are energy and commitment (Moore 1963; Hattie & Marsh 1996). Assuming institutions have budgets and not an unlimited supply of funds, money spent on research is money not spent on teaching or curriculum development. On the other hand, it was also found that time spent on research was often time that would otherwise be devoted to leisure or family (Harry & Goldner 1972; Coate et al 2001). In other words, the motivations for research were intrinsic and spanned an academic's whole life, whereas the motivations for teaching were not always intrinsic and were often externally imposed by the university. This finding in the literature was reconfirmed in the surveys that were undertaken as part of this project.

2.2.3 Good researchers vs. good teachers

According to some, the skills that make someone a good researcher do not necessarily make a good teacher. As Fox states, "Those whose publication productivity is high are not strongly invested in *both* research and teaching. Rather, they appear to trade off one set of investments against another" (Fox, 1992), although it has been suggested that there are personality differences between individuals who prefer research and those who prefer teaching (Hattie & Marsh 1996; Marsh & Hattie 2001). Just as researchers attained their expert skills during years of education and situations approximating an apprenticeship, excellent teachers have learned skills in the classroom that make them good communicators, empathetic, sensitive and open (Prince, Felder & Brent 2007). They have an in-depth knowledge of cognitive development and how to present knowledge to make it an appropriate foundation for further knowledge attainment, something that some "subject expert novice teachers" find difficult (Kinchin & Hay 2007, p. 45).

On the other hand, McAlpine and Weston (2002) in their study of six mathematics teachers – three of them researchers, and three of them trained teachers – found that their teaching rationales, decisions, and actions all revealed equally principled knowledge about teaching, as those without pedagogical training had developed knowledge about teaching largely through experience and reflection. In fact, they also found that even the trained teachers drew upon their experience to respond to students' cues, for such knowledge cannot be acquired by pedagogical training alone, but through reflection, which researchers routinely engage in already (McAlpine & Weston 2002)

Healey, Jordan, Pell & Short (2010), in a case study of students, found that some question the need for undergraduates to be educated in research institutions as research gets prioritized over teaching (Healey et al 2010).

2.3 Research and teaching are unrelated

An oft-cited article by Marsh and Hattie (1996) proposed that there was in fact a net zero relationship between teaching and research (Robertson 2007). While the article provoked an incredible response and questioned traditional assumptions, the statistical work done by Hattie and Marsh brought to light important facts regarding aspects of university work (Robertson 2007). Their research suggested that while there were both positive and negative correlations between perceptions of research and teaching activities among academics, the net result was that they cancelled each other out (Hattie & Marsh 1996). This net zero relationship raised many hackles but produced a spate of new research into the research-teaching nexus (Robertson 2007; Healey 2005). The methodology of the Hattie and Marsh study, as well as some others who sought to replicate their findings, measured research in terms of publication output and teaching in terms of student evaluations (Robertson & Blackler 2006; Robertson 2007). Other studies have sought to engage faculty and students in in-depth interviews to provide a more qualitative analysis (Robertson & Blackler 2006). As Marsh and Hattie state in their 2002 article, "Another claim is that

the two activities require different preparation, are different tasks, involve different personality characteristics, and are funded separately by governments. Hence, the relationship is, or should be, zero." (Marsh & Hattie, 2001). While Hattie and Marsh first delineated the concept of the net zero relationship between teaching and research, they concluded that their results called for universities to investigate further how to strengthen the bond of the research-teaching nexus (Hattie & Marsh 1996; Marsh & Hattie 2001; Healey 2005).

2.4 Research and teaching have a complex relationship

Lack of clarity is a central characteristic of the relationship between teaching and research in today's universities (Robertson & Bond 2001). There are benefits to having research and teaching together, and there are benefits to having them separate (Coate et al 2001). There seems to be little disagreement that introductory classes filled with younger students could be taught by dedicated instructors with no research component to their duties (Robertson 2007). Studies of the relationship between teaching and research are numerous but study methodologies are varying and often qualitative and based on individual reflections (Verburgh et al 2007). While many set out to characterize the nature of the relationship, some end up with a depiction of many different iterations or combinations of relationship characteristics (Visser-Wijnveen et al 2010). Visser-Wijnveen et al came up with five ideal profiles of the research-teaching nexus:

1. Teach research results
2. Make students aware of research and its value
3. Show what it means to be a researcher
4. Help to conduct research
5. Provide research experience.

These five profiles, compiled from a review of the existing literature and from interviews, illustrate the multi-faceted nature of the relationship in a university setting (Visser-Wijnveen et al 2010). While the relationship between research and teaching may be complex, profiling or characterising different aspects of the nexus may help institutions or departments focus on particular aspects in order to strengthen it in their own unique situations (Samuelowicz & Bain 2001; Visser-Wijnveen et al 2010). Understanding that the research-teaching nexus is complex assists those engaged in the issue comprehend why empirical research may say one thing while scores of academics insist on another (Robertson & Bond 2001). The nature of the research and teaching has an impact on the strength of the connection between research and teaching as well, with the humanities and social sciences having a stronger bond than natural sciences (Griffiths 2004). Belief systems, assumptions, and irrational behaviour all contribute to an already complex relationship (Samuelowicz & Bain 2001; Kane, Sandretto & Heath 2002; Halse et al 2007; Firth & Martens 2008).

2.5 The role of job satisfaction and resource allocation

Central to any discussion of research and teaching in academia is that of job satisfaction. According to some, job satisfaction for academics can directly relate to the strength of the teaching-research relationship (Visser-Wijnveen et al 2009), for current job conditions in some markets mean that academics can spend years in low-paid part time situations in teaching-only or teaching-research positions before ever attaining tenure, and hence, unless they enjoy teaching as much as they enjoy research, they are not likely to have job satisfaction (Coates et al 2010). Lack of rewarding pay, micromanaging by administrators, heavy workloads and low status are all negatives associated with undesirable academic positions (Coates et al 2001; Coates et al 2010). Academics who express having a lack of time have said that they would not reduce their teaching or research hours but would like to reduce the hours they spend on things like marking or administrative work (Warton 1995; Hattie

& Marsh 1996). Academics may end up feeling stretched between their teaching requirements, supervisory duties and their responsibility to university administration (Firth & Martens 2008). Academics are also seen as arbiters of students' development, sometimes in ways that are impossible to define (White 2007). This nebulous role in which the student is perceived as a customer and wanting to get their money's worth puts the teacher in a different position than if the student is viewed as a learner attempting to acquire knowledge or be trained in new ways of thinking or behaving (Griffiths 2004; White 2007). Many universities structure their faculty workloads to ensure that all their teaching staff will have time to pursue their own research projects (Coate et al 2001). In this way, the ability to pursue research is presented as a benefit to an academic career. This can be a considerable benefit considering that in addition to scheduled classroom teaching, academic staff supervise graduate students, many of whom need to be shepherded through university requirements for degree fulfilment (Engebretson et al 2008).

2.6 Characteristics of excellent teaching

The ability to teach is not innate (Kane, Sandretto, and Heath 2004). The importance of good teaching is highlighted by research that suggests that learning happens at a deeper and more sustainable level when teaching is of a high calibre (Dunkin & Precians 1992). Knowledge acquired at an expert level by a seasoned researcher must be translated into a form appropriate for undergraduate or graduate acquisition (Kinchin & Hay 2007). Mishandling this translation can affect the way that students learn, in some cases making them less likely to progress to an expert level of knowledge themselves. According to Kane et al.'s (2004) analysis of the research literature on the components of tertiary teaching, some characteristics of good teaching include:

1. Command of the subject
2. Clarity
3. Instructor-group interaction
4. Instructor-individual student interaction
5. Enthusiasm
6. Attention to preparation/organisation
7. Ability to stimulate interest and thinking about the subject matter
8. Love of knowledge
9. Motivation of students.

Kane et al (2004) distilled these attributes from the literature into five dimensions of tertiary teaching:

1. Subject knowledge
2. Skills (including communication skills and preparation)
3. Interpersonal relationships (respect, caring for students' needs, and mentoring)
4. Research/teaching nexus (research and the pursuit of excellence) and
5. Personality (characterized by enthusiasm, enjoyment, sense of humour, approachability, and passion for their work).

These five dimensions are arranged like spokes of a wheel with reflective practice as the hub (Kane et al 2004, p. 284). The practice of engaging in reflection in order to integrate the various dimensions of quality teaching was validated through the results of one study (Kate et al 2004).

Universities have a history of rewarding excellence in teaching with teaching awards, which can be prestigious but have also been referred to as "the kiss of death" because of their implication that the individual academic is not a productive researcher (Van Note Chism 2006, p. 589).

2.7 Developing the skills of researchers

Creating a situation in which research academics can develop their teaching and learning skills and abilities requires good management (Coate et al 2001; Coates et al 2010). Bringing research into the classroom is one way of using researchers' existing skills to build their teaching repertoire. As Prince, Felder and Brent propose in their 2007 article:

> For example, skilled faculty researchers could take the methods they use in their scholarly activities and translate them into an inductive teaching environment by borrowing elements of their own research or choosing challenges more appropriate to the subjects and levels of the courses they are teaching. The faculty's research knowledge and experience, including their knowledge of the relevant literature, familiarity with current information-finding strategies, knowledge of modem laboratory techniques, experience supervising research students, awareness of colleagues doing related work in the field or simply their intimate familiarity with the research process itself, could all be brought into their teaching and thereby enrich student instruction in this classroom environment (p. 285).

Angela Brew has documented a university-wide effort to integrate teaching and learning at the research-intensive University of Sydney where using inductive, research-enhanced teaching methods were found to increase student learning in positive ways (Brew 2010). Preserving a relationship in which research and teaching are mutually beneficial elements of one individual's job description is a helpful way to explore increasing teaching and learning, student satisfaction and retention, and job satisfaction among academics (Coates et al 2010). While subject experts may not be inherently excellent teachers, teaching is a skill that can be taught and Kinchin and Hay suggest that concept mapping is a useful way to structure knowledge transmission that can be acquired at any point in an academic's career (2007). University leadership can encourage excellent teaching by establishing strategic vision, arranging departments to facilitate meeting strategic goals, being considerate and trustworthy as well as trusting of staff and faculty, engaging faculty in decision-making and encouraging open communication (Bryman 2007). Expert researchers have a lot to offer, not the least is a holistic view of their subject that can be communicated to students (Prosser et al 2008).

McFarlane (2010), in a survey and interview study of 233 professors in the UK found that professors feel that there is a mismatch between their priorities and those of their employing institutions and that their expertise is under-utilised. McFarlane (2010) further identified a number of qualities associated with the role of a professor as an intellectual leader: role model, mentor, advocate (for one's discipline), guardian (of academic standards), acquirer (of grant monies) and ambassador (of the university).

The question of whether researchers should be teaching is at present a moot one. Universities have an increasing need to utilise their academic work force efficiently – that is, encourage staff to both teach and research (Schapper & Mayson, 2010). Departments therefore should look to strengthening the bond between research and teaching by providing time for teaching staff to pursue their research interests, but also for researchers to develop their teaching abilities. These goals can be met through academic and administrative leadership and support to provide a common direction and purpose. Institutional and individual performance-based expectations (and funding structures) are reshaping the role of the professoriate, and institutions need to do more to develop their leadership capacity.

2.8 Leadership within the ICT/engineering domains

One of the key enabling conditions for leadership in T & L identified in the Carrick Leadership Project of Southwell, Scoufis & West (2008) is a "*Strongly supportive organisational culture and conditions".* This finding aligns with that of Feidler:

> Leadership performance depends as much upon the organisation as it depends upon the leader's own abilities. Except perhaps for the unusual case, it is simply not meaningful to speak of an effective leader or an ineffective leader; we can only speak of a leader who tends to be effective in one situation and ineffective in another. If we wish to increase organizational and group effectiveness we must learn not only how to train leaders more effectively but also how we build an organizational environment in which the leader can perform well. (1967, p.261).

Professors represent a valuable intellectual asset to institutions, but their work as intellectual leaders (who can also lead in teaching) needs to be acknowledged more explicitly by institutions in terms of both its functional value and its potential for mentoring future researchers.

2.8.1 Teaching-research connection at QUT

Under a regime of effective leadership, a more positive teaching culture can prosper in the ICT/ engineering domains. QUT has such a culture (Southwell *et al.*, 2008). In 2008, the Vice-Chancellor at QUT called for the professoriate to become more involved in teaching, and to engage especially in the vital first year of undergraduate (UG) teaching. QUT had the capacity to take advantage of the opportunity provided by this project through its T & L champions who have developed and led continual T & L improvement and change through QUT's T & L Large Grant scheme. QUT had also systematically dealt with change arising from large scale T & L grant projects for a number of years. At QUT, the DVC (Academic), the DVC (Teaching Quality), the Dean of Q:FBEE and the Dean of Q:FIT all endorsed this project.

2.8.2 The culture within QUT's Faculty of Information Technology (Q:FIT)

A unique opportunity for the implementation of this project was also afforded by a desire to reshape the culture in both of QUT's participating faculties, namely the Faculty of Information Technology (Q:FIT) and the Faculty of Built Environment & Engineering (Q:FBEE).
Q:FIT, currently the Faculty of Science and Technology or Q: FaST and to become the Faculty of Science, Technology, Engineering, and Maths (Q:STEM) beginning January 2012, and:

- had undergone significant recent changes in its structure and workforce
- had been undertaking an excavation of all aspects of its culture, with the aim of embarking on significant organisational and cultural change
- had instigated cultural change process in 2005 which facilitated the implementation of this project
- professoriate, by their own choice, were accepting **leadership responsibility** across the full spectrum of academic activities, including facilitating **teaching quality** and **performance improvements**
- had formalised the leadership responsibility through their **annual performance appraisal** and review process undertaken by the professors as part of the supervision of their academic staff
- now included Science professors who participated in our project.
- had been awarded two ALTC Associate Fellowships before the start of the project, and one of them was directly related to the postgraduate supervision aspects of this project (Bruce 2010)
- in early 2011 began preparing for a further merger with Q:FBEE for 2012.

2.8.3 The culture within QUT's Faculty of Built Environment & Engineering (Q:FBEE)

Q:FBEE had a similar desire for its professoriate (which is very heavily involved in research) to engage more in T & L. The Dean of Q:FBEE , in 2008, stated that the key goal of the Faculty for 2008 was teaching quality improvement. In order to achieve this:

- 'Discipline Leaders' were appointed from among the professoriate to provide leadership in T & L. as was done in Q:FIT,
- the Discipline Leaders were responsible for performing the annual performance appraisal and review process for staff that they lead.

At that time also, O'Shea (a project leader) was leading pilot work related to this project in Q:FBEE. He conducted a sequence of interactive workshops on improving teaching by encouraging the academics (and the professoriate in particular) to engage more effectively with sound learning models. In early Q:FBEE 2011 began preparing for a further merger with Q:FaST for 2012 to be part of Q: STEM.

2.8.4 The culture within Monash: Faculty of Information Technology (M:FIT)

Monash demonstrated its readiness to embark on this project through its previous Carrick Leadership grant that involved both their ICT and Engineering faculties (Bennett 2007). This project was also timely for T & L leadership in Monash's Faculty of Information Technology (M:FIT). M:FIT underwent a massive restructure of their undergraduate degree programs in 2005 and instituted a common core of foundational units delivered across four Victorian and two overseas campuses. Within this climate of organisational and cultural change, members of the Monash Computing Education Research Group (CERG) were exploring means of achieving quality in T & L through encouraging peer review practices and innovation in the use of educational technology. They have published works on identifying student perceptions of ICT study and their influence on learning outcomes (Sheard et al 2008). These issues were central to the interests of the CERG group. CERG has led a number of key projects on aspects of undergraduate teaching and learning in ICT. In 2001 the group conducted an AUTC funded project that investigated innovation in teaching and learning in Australian ICT disciplines (Hurst et al 2001). The Deputy Vice-Chancellor (Education) and the Dean of M:FIT have both endorsed the project.

2.8.5 The culture within UTS: Faculty of Engineering and Information Science (U:FEIT)

Prior to this project, UTS had completed an academic structure review which resulted in the Faculty of Engineering and the Faculty of Information Technology being merged to form the Faculty of Engineering and Information Technology (U:FEIT) on 1st July 2008. This merging of two distinct and separate academic cultures meant that the project contributed directly to the success of these significant organisational and cultural changes, while at times also being overshadowed by greater priorities. UTS has in place a formal annual performance appraisal and review process and both the existing faculties have invested heavily in projects to facilitate teaching quality and performance improvements; however, these have been separate initiatives informed by the different cultural and priority drivers in each of the existing faculties – this project offered an opportunity to harmonise them.
At the commencement of the project, UTS had been ranked in the top band of the ´Science, Computing, Engineering, Architecture and Agriculture´ cluster in the Learning and Teaching Performance Fund and thereby the top in engineering and information technology for two years running; the UTS: Engineering remotely accessible laboratories were awarded a grant from the Australian Learning and Teaching Council (ALTC, formerly known as the Carrick Institute), and another grant was awarded for Shaping Engineering Education; UTS:IT has been awarded three priority and one competitive ALTC grants plus an Associate Fellowship. To continue

this record of success, this project was supported by the DVC Teaching, Learning and Equity, Professor Shirley Alexander, and the Dean of U:FEIT, Professor Archie Johnston.

2.8.6 Contextualisation of the current project

This project also built on work already undertaken in recent leadership projects. Monash has sought to identify leadership drivers such as policies, systems, strategies and resources … to support systematic improvement (Bennett 2007). RMIT were developing a multi-level system of leadership in the use of student evaluations and feedback (Barber, Carrick 2007). QUT and its partners have implemented a teaching leadership development program for Associate Deans (T & L) (Southwell et al 2008). Edwards (PL1) was a participant in the Southwell project and had a clear understanding of the outcomes. Models from each of these three projects were leveraged in this project. Christine Bruce from QUT also commenced an ALTC (Carrick) Associate Fellowship on 'The Pedagogy of Supervision', and her work fed directly into the cultural environment at Q:FaST and Q:FBEE.

Additionally, evidence provided by learning theorists (as described in section 1.6) pointed to the critical importance of exploiting linkages between different domains of knowledge and expertise in order to enhance outcomes. Recognition of this linkage was appearing in a number of Australian universities. At Monash University, for example, the role that technology would play in the future academic world had been recognised through the establishment of two key centres, the eResearch Centre, and the eEducation Centre. It was expected that these centres would identify processes whereby the synergy of research-led teaching, and teaching-led research, will enhance both domains, leading to improved outcomes all round. The Australian Learning & Teaching Council (ALTC) had also recognised the importance of the research-teaching nexus with its sponsoring of the "Achieving Teaching Research Connections Seminar" in 2008.

3 Project Approach

The task of eliciting leadership in T & L from professors who are traditionally research leaders involves facilitating transfer of learning and knowledge from one context to another. Research shows that there tends to be relatively little transfer without intervention (or facilitation). Very substantial transfer can occur, however, if intervention *does* occur (Perkins & Salomon 1998). Sections 3.1 and 3.2 describe the intervention mechanisms we proposed and the theoretical basis behind these interventions.

Strategies for motivating the participation of professoriate members: The professors are typically busy and there is a need to find ways to motivate them to commit to the project. Several strategies were used, as listed below.

1. Materials were designed with a heavy emphasis on motivating the professoriate. To motivate initial engagement of the professoriate these materials initially outlined the potential benefits (to research) of staff engaging more fully in issues related to learning as it could also improve the outcomes of their HDR supervision. Pilot materials were created and trialled in postgraduate supervisor training sessions within Q:FBEE and feedback was very encouraging. We were encouraged by comments we received, such as "the talk on expanding learning capacity was truly inspiring". The Assistant Dean Research also responded to these materials by stating that he wishes the bulk of future supervision training to be based on these materials.
2. Significant amounts of support from key leadership stakeholders in both research and T & L was sought and won at all institutions. At QUT, the Assistant Dean Research in Q:FBEE made it a requirement that all supervisors and postgraduate students attend

workshops on how to effectively promote student learning and how to promote good supervision practices. Peter O'Shea ran these workshops. There are analogous practices occurring in Q:FaST, and the two faculties are set to merge in 2012. The Associate Dean Research Training at Monash:ICT was also supportive of this project and collaborated with the Computing Education Research Group (CERG) group at Monash and the project leaders at QUT. The Deans and Assistant Deans T & L at all institutions were very supportive of the project as well.

3. The project targeted not only current but also future research leaders. At QUT the Dean of Graduate Studies requested that schools in Q:FBEE and Q:FaST provide T & L training to postgraduate students involved in sessional teaching. This is now being done through a community of practice (CoP) approach. Within these CoPs, postgraduate students and academics share ideas and strategies on T & L. This project both informed and was informed by these CoPs.
4. In Q:FaST and Q: BEE regular meetings were being organised for the professoriate, with 60-70% regularly attending. The workshops were incorporated into this process.

3.1 Theoretical Framework

Research has shown that deliberate strategies must be put into place for substantial transfer of skills to reliably occur across different domains (Boden 2006; Perkins & Salomon 1992). In particular, "bridging mechanisms" need to be used. These are structures that elicit a gradual cultural change and which therefore help to ease the transition from one context to the other. Bridges are also designed to encourage the mechanisms that facilitate transfer. These mechanisms are vision and mindfulness, reflection on thinking [and leadership], thorough and diverse practice, engagement with analogies/metaphors and systematic abstraction of key underlying principles (Bransford et al 1999). This project used bridging mechanisms to foster an accelerated prototyping of leadership skills in the T & L domain. O'Shea (PL2) had had substantial success in using bridges to promote skills transfer (O'Shea 2006). The mechanisms needed to promote deep learning and foster lifelong learning (as required in undergraduate T & L) are the same mechanisms needed to promote the ability to solve new and unseen problems such as researcher are trained to do (Ormrod 2004). They are also the same mechanisms needed for promoting skills transfer (including leadership skills transfer) (Ormrod 2004). Accordingly, engagement with the strategies proposed in this project would have benefits for T & L, research and leadership development. These strategies were a response to the 'interlocking relationship' that exists between 'individual capabilities for leadership' and 'the reshaping of the higher education context to be more change capable' (Scott et al 2008, p. xiv), thereby modelling and building organisational leadership capabilities and values (Scott et al 2008).

The work of social theorists Lave and Wenger on Communities of Practice (CoPs) will also inform the project (Lave & Wenger 1991; Wenger 1998). It was intended that the CoPs would engage students and academics and be formed around learning, teaching, postgraduate supervision, and leadership.

3.2 Research Question

Can leadership skills in research be rapidly transferred to the T & L domain using the mechanisms known to be effective in learning transference; namely, intervention, bridging, and facilitation?

3.3 Research Design

In helping the professoriate to transfer research leadership skills and their culture of rigor, peer review, quality, industry engagement and love of discovery to the area of T & L it was proposed to use a fabric of bridging mechanisms which were mirrored

at all project institutions (See Table 1).

3.3.1 Facilitating the transfer of leadership skills from research to teaching

It was important to address the issue of how to go about assisting successful research-oriented professors to develop good leadership skills in the area of teaching. These professors have, of course, been highly successful in their chosen fields, and have frequently demonstrated good leadership skills already, albeit in a different domain. It was therefore advantageous to facilitate *transfer of these leadership skills* to the new area, rather than fostering the required skills development entirely 'from scratch'.

To facilitate the transfer process it was proposed that a pedagogical 'bridging' approach be used (Perkins & Salomon 1992). Bridges are structures that are designed to facilitate *gradual* engagement with areas that might initially be quite daunting. The first part of the bridge would engage the participants in an area where they were comfortable and where they would have significant confidence. The participants would then be prompted to gradually 'across to the other side of the bridge' and engage with a new and less comfortable area.

The bridges were designed according to a cognitive strategy based learning (CSBL) paradigm. This type of paradigm emerged out of research studies into how best to develop complex non-algorithmic (i.e. ill-defined higher order) skills (Gagne 1977). Leadership skills are of course, ill defined, and so lend themselves well to the CSBL approach.

3.3.2 The CSBL approach

The Cognitive Strategy Based Learning (CSBL) approach arose out of investigations into the research question, "How can one effectively and efficiently foster an ill-defined (higher order) thinking skill in learners?" (Gagne, 1997). The CSBL methodology involves:

1. articulating the cognitive strategies used by experts as they exercise the required skill
2. setting up a strong and extensive network of scaffolds which facilitates the acquisition of the pertinent cognitive strategies
3. encouraging learners to practice the pertinent cognitive strategies using the available scaffolds
4. monitoring the performance of the practice and providing feedback.

Note that ill-defined higher order skills tend to be much more difficult to develop than well-defined algorithmic skills, and so the scaffolding network needs to be strongly developed. Typical scaffolds include the provision of simplified problems along with model solutions, thinking aloud by the teacher/facilitator as they exercise the skill, provision of procedural prompts and checklists, concept maps, and finally guidance as the learners attempt to exercise the skill (Rosenshine 1997).
One of the most widely cited examples of the CSBL approach is the intervention commonly referred to as reciprocal teaching (Palincsar and Brown 1984). The goal of this intervention was to try and improve the comprehension of students as they read. Annemarie Palincsar and Ann Brown (1984) had concluded from their research that the difference between expert and non-expert readers was that the experts engaged in reflection even while reading. If they did not understand something the experts would slow down, reflect and take steps to acquire the necessary understanding. Non-experts did not tend to reflect during reading, and tended not to slow down when they could not comprehend a passage. Palincsar and Brown (1984) decided to trial an intervention in which low achieving students were prompted to reflect with the CSBL approach as they read. Investigations revealed

that the key cognitive strategies in comprehension were:

1. summarising
2. question generating
3. clarifying (i.e. checking if the new material was consistent with existing understanding and trying to get clarification if it was not)
4. prediction.

Palincsar and Brown (1984) set about trying to teach students to learn and practice the above four strategies. To do this for say, summarising, the teacher modelled summarising with an example and then got the students to do some summarising. The students were also required to work in pairs and took turns to supervise one another. Initially many students were quite bad at summarising but as the teacher gave more examples and as the students got more practice in summarising and in supervising one another they started to improve. Similar strategies were used for question generating, clarifying and prediction. The approach became known as 'reciprocal teaching' because of the use of student pairs who supervised one another.

The results from reciprocal teaching were stunning. A meta-meta-study was published in 2009, based on the analysis of over 50,000 educational studies encompassing more than 200 million students (Hattie 2009). That meta-meta-study found that reciprocal teaching had a very high average effect size (of 0.74). This high effect size was all the more remarkable, given that reciprocal teaching consumed very little in the way of teaching resources. More important still, the acquired skills in reflection transferred very effectively to other areas. After the students had engaged in reciprocal teaching for some time they not only improved in reading but also in other subjects such as Science. This transference effect is unusual for educational interventions (Perkins and Salomon 1992).

The CSBL approach has been applied successfully in a number of different scenarios such as comprehension, mathematical problem solving, physics problem solving and writing (Palincsar & Brown 1984; Schoenfeld 1985; Pressley et al 1995, Rosenshine 1997). It has not previously, however, been explicitly applied to the task of developing teaching leadership in research oriented academics. An important part of the CSBL approach is the extraction of the expert cognitive strategies. The subsection below considers the cognitive strategies of eminent scholars (or communities of scholars) who have led effectively in both research and teaching.

3.3.3 Determining the cognitive strategies of expert leaders in teaching

A key step in the CSBL approach is to abstract the relevant strategies from experts. For the purposes of this work, that involved investigating the cognitive strategies of high achieving researchers who have also led effectively in teaching and learning. Several exemplars were investigated and two of these are presented below.

Example 1: Thomas Edison

In the 1850s, a young man called Thomas started school in Milan, Ohio. Thomas's teacher was quick to notice that the boy's mind tended to wander, and described him as muddle-headed. Thomas's mother, Nancy was alarmed when she learned of the teacher's attitude towards her son. She knew that it was not only the student who was important in the learning process, but also the teacher. She therefore decided to take Thomas out of school and teach him herself. The son went on to become enormously successful. He invented the first device for recording sound, he co-invented the first motion picture camera and he was granted more US patents than anyone else in history. The son was, in fact, Thomas Edison (Josephson, 1992).

Edison had his first major success as an inventor with the quadruplex telegraph, for which he received about US$10,000. He used this money to set up an innovation factory at Menlo Park, New Jersey, where he started to teach others how to invent.

In the early days of Menlo Park, Edison drove his employees hard, but at the same time, gave them a lot of attention and feedback. This guidance bore fruit in the ground-breaking development of i) the first commercially viable electric light bulb, ii) the first large-scale electrical power distribution system, and iii) the Edison Electrical Company which distributed electrical motors widely. These three innovations sparked a revolution in the way people lived, and caused widespread uptake of electrical devices by households and industry.

Although he was well known as a research scientist, Edison also served as a prominent educational leader. Through his efforts at Menlo Park, he showed that the process of teaching and mentoring others greatly added to research productivity. Edison believed in his employees, he drove them hard to push technology forward, he regularly monitored their performance, he gave them plentiful feedback and he invested much of himself in their work. The Menlo Park laboratories were prolifically successful and became models that many others would try to emulate.

In addition to teaching adults how to invent, Edison invested heavily in the education of children. It was in fact he (along with Alexander Graham Bell and Woodrow Wilson) who invited the renowned Italian educator, Maria Montessori, to come to America and progress the education of American children. Edison not only provided her with encouragement, but also financially supported the schools she set up (in conjunction with Bell).

It is instructive at this point to ask what strategies Edison used to lead in teaching (as well as research). In answering this question, Edison's own verbalisations provide some important insights. In the latter part of his life he declared: "My mother [also my teacher] was the making of me. She was so true and so sure of me, and I felt I had something to live for, someone I could not disappoint".

Clearly, Edison understood the power of his mother's belief and care. Eventually, he even began to replicate the skills he learned from her – skills of believing in others, of investing time and effort in others, and of helping to teach others. He realised that his own education (at the hands of his mother) was what had empowered him as a researcher. He spent much of his life teaching and empowering others as well.
In summary, the 'expert strategies' Edison used in the area of teaching and learning were:

1. he acted out his belief in others by investing his time (and even his own money) in them
2. he motivated others to achieve by challenging them
3. he gave others constructive feedback
4. he used personalised teaching and mentoring where possible.

Example 2: Cambridge University

Cambridge University is one of the most successful research institutes in the world. It has witnessed, among other things, the discovery of the three laws of physical motion, universal gravitation, calculus, the electron, and the structure of DNA. Cambridge is a highly selective university that is best known for its research accomplishments. Interestingly, though, it invests a huge amount of effort into the teaching of its undergraduates. Studies have shown that if one teaches with

personal tutors one can improve the achievement levels of students by about two standard deviations (Cohen 1977). This finding is heeded at Cambridge, where students are taught core material on an individual basis, via so-called “supervisions”. These supervisions are an extraordinary investment of resources, and one might wonder whether they really are necessary for a group of very high-ability undergraduates. Cambridge’s system of education really does seem to produce results, though, with 88 of its affiliates having won Nobel prizes (as of 2010).

Cambridge also has a strong emphasis on challenging its students through inter-disciplinary integration of the liberal arts and sciences. It even requires its students in arts and science, for example, to sit for a very stringent and highly competitive sequence of mathematical courses and exams known as the TRIPOS. The strategies Cambridge University uses in fostering learning are surprisingly similar to those of Edison. These strategies are that Cambridge University:

1. accepts and works with students that it believes in
2. acts out its belief in the potential of its undergraduates by investing a large amount of time and resources in them
3. challenges its students strongly
4. uses personalised teaching and mentoring.

These strategies were instantiated into the context of teaching leadership development, and implemented as part of this project. Hence, the professoriate was encouraged to engage in ongoing practice of some form of teaching leadership (either in the area of postgraduate supervision or in undergraduate teaching or both). At QUT: FaST and QUT: BEE many of the professoriate have been formally assigned roles of ‘Discipline Leader’ and had to take responsibility for improving the quality of both teaching and research within their groups. To inform and guide their practice the professoriate were regularly and systematically fed quantitative and qualitative data on student evaluation of units and postgraduate supervision. The Discipline leaders were also required to regularly convene discipline team meetings to reflect on performance and plan improvement strategies.

The strategies of experts who have led well in both research and teaching were researched by Peter O’Shea, and the key strategies as described in the two examples above were used by him during the workshops that were part of the project.

3.4 Research stages

In accordance with the pedagogical bridging and discursive strategy techniques as outlined in the previous sections, the project was executed in a phased manner.

3.4.1 Pre-test: Assessing the perceptions of T & L through a survey

The aim of the pre-test survey was to capture data from professoriate staff from ICT (information Communication and Technology) Engineering & Science across the three domains of: feelings, behaviours and beliefs. To capture data across these domains, the following three areas were targeted for investigation: *job satisfaction*, *leadership behaviour,* and *perceptions of professional importance*. Items were developed to describe each of sixteen research-matched activities and sixteen matched T & L activities. (A sample survey is appended in Appendix 1) Respondents were invited to rank each of the thirty-two items from each of the following three perspectives:

A. *To what extent do you **gain personal job satisfaction** from each of the following?*

B. *To what extent do you* ***try to be a role model*** *for each of the following?*
C. *How* ***important*** *are the following for* ***advancement in the academic profession****?*

Likert-style responses were invited on a *continuum* from 1 to 5, where 1 indicated a low level of satisfaction, commitment or importance, 3 a medium level, and 5 a high level.

The questionnaire also included matched pairs of open questions inviting academics to comment on the degree to which research efforts and T & L efforts were encouraged and supported by their seniors. Demographic information on gender, age, professional level, area of research focus, and leadership responsibilities was requested. To preserve anonymity, however, respondents were free to omit answers.

After gathering data from the professoriate at each institution, a similar survey was also conducted of non-professoriate academics to determine whether the views of job satisfaction, role model behaviour and career advancement were shared across all levels of academics. The same 32 items were used for the quantitative component of the survey, with only minor changes to the wording of questions to reflect the expectations of different academic levels. For example, rather than asking the non-professoriate about to what extent they try to be role models, they were instead asked to what extent the senior academics in their area are supportive role models.

3.4.2 Bridge I

The first bridge focused on a domain familiar to the research professoriate, namely postgraduate research supervision. This stage involved a series of interactive workshops exploring pedagogical strategies for enhancing supervision, and thereby achieving better HDR outcomes. The familiarity of the postgraduate research setting and the potential research benefits were chosen to provide some level of comfort for the research professoriate, but the need to explore pedagogical issues also provided a provocation to facilitate transference of their skills to the T & L domain.

3.4.3 Bridge II

It was also proposed to establish cell groups of discipline connected academics, who would review each other's work through various means: attendance at lectures, tutorials, supervisor-student meetings, working through both formative and summative assessment tools, and generally auditing the teaching activity. In this way, a two-way transfer of skills could be established: from the supervisor to the student, with a set of research skills; and from student to supervisor, with a set of teaching skills. The latter transfer of skills would need to be facilitated by the project, by supporting the students to articulate feedback on what teaching skills are most effective. A QUT Teaching Fellowship program already exists at QUT wherein participants engage in a university-wide project relating to peer review of teaching and peer partnering in teaching. The expertise from this group of academics was used at the faculty level to support and train members of each cell group, mainly at QUT FaST and BEE. Discipline alignment, while not strictly being an essential component of instructor and presentational issues, is necessary for the professor engaging in review to have confidence in the process. While it is true that pedagogy can certainly be improved without such discipline alignment, discipline alignment is better able to create an atmosphere of mutual trust, which allows a more ready assimilation of issues raised. The analogy with peer review of research is very apt: a research paper can be reviewed for presentational structure, grammar, ease of explanation, and the like, but if the content is not reviewed, it may lead to a very different outcome.

At UTS, cell groups of discipline-connected academics were established, but were more curriculum-oriented: groups of academics, led by a professor, who collaborated on setting curricula for undergraduate education.
The first two bridges had scaffolding created by the teaching-research nexus. Essential to this nexus was the understanding that both research-led teaching, and teaching-led research (as described in section 2.1.2 of the literature review), have a part to play in these frameworks. Research-led teaching is the more widely understood, and refers to the observation that strong researchers usually have such strong discipline insights that they are able to articulate the essential fundamentals of the discipline in ways that students often find easy to assimilate. “He makes it seem so obvious and easy” is a common comment in this context.
On the other hand, teaching-led research also has an important part to play. Academics engaged in teaching often develop sound models that inform and guide their teaching processes. Reflection is one such model. Its value in education is well documented (Palincsar & Brown, 1984). Reflection is also an essential part of research, and it is just one example of how research can be enhanced by transferring teaching skills; collecting data, data analysis, hypothesis formation, experimental design and evaluation are some examples.

3.4.4 Bridge III

In the third bridge the scaffolds were removed. This bridge involved further interactive workshops that focused on undergraduate teaching issues in general (i.e. without specific reference to research). The topics chosen at each institution were slightly different, as it was important to connect the workshops with local priorities.

Finally, in order to build a community of practice around these issues we conducted open forums or seminars in national conferences and also conducted an online national webinar where 17 participants from across seven universities in Australia engaged in discussions related to integrating teaching with research.

3.4.5 Post-test

The survey administered at the beginning of the project was repeated for the professoriate after completion of the project in order to measure any significant changes.

3.4.6 Project phases

The three bridges were spaced well apart, so that engagement with the less comfortable area could be achieved *gradually.* This slow rollout was important, because attitude changes are typically necessary when one embraces new and uncomfortable areas, and time is needed for attitude changes to occur (Kearns et al, 2008).

Initiative	Activities involved	Outcomes Expected
Bridge One (0-8 months)	Interactive workshops investigating learning strategies to improve postgraduate supervision. Commissioning of mentoring teams for peer observation & peer reflection.	1. Improved learning outcomes in postgraduate supervision (higher quality publications, improved completion rates). 2. Increased interest in pedagogical issues in research Professors.
Bridge	Interactive workshops	1. Improved learning outcomes in

Two (8-16 months)	investigating pedagogical strategies to help equip UG students for research. Workshops included feedback from peer activities. Establishment of cell groups of discipline-connected academics who review each other's work.	undergraduate teaching, especially with regard to improving research and lifelong learning skills. Improved teaching scores. 2. Further increase in incidence of peer observation among research professors
Bridge Three (16-24 months)	Interactive workshops investigating pedagogical strategies for improving UG teaching generally (without specific focus on research). Workshops included feedback from previous peer activities.	1. Improved pedagogy in UG teaching generally, resulting in improved teaching scores. 2. Increased desire and capacity of research Professors to lead educational reform
Open forums in state capitals and peer review of findings (18-24 months)	Interactive workshop exploring the issues around the project in each Australian State Capital (via Webinar). Submission of project findings for peer review (conferences & journals)	1. Establishment of a community of practice around transferring skills from research to T & L 2. Validation of (and refinement of) evidence derived from project.
Workshop at National conferenc es (24-30 months) and production of final report	Participants presented papers on the results of their action research, and final report produced by all PLs and project management personnel.	1. Dissemination of results from the project and further building of the community of practice at a National Level.

Table 3.1: Phased Bridging Model for transferring leadership in research to leadership in teaching

4 Project activities and workshops

4.1 The pre-test survey

The survey aimed to identify the extent of personal job satisfaction that academics gained from 16 research and 16 corresponding teaching activities, the extent to which the academics felt they were role models for these activities, and the academics' perception of the importance of these activities for advancement. The survey also sought academics perceptions of the extent to which research and teaching & learning activities are resourced and encouraged. A copy of the survey used for the professoriate is appended in Appendix 1 and detailed results are included in Appendix 2.

4.1.1 Summary of pre-test survey results

The results show that the participants were unequivocally in favour of research over teaching. T-tests for differences between the mean responses to the three sets of matched indicators for both research and T & L revealed highly significant differences between Research and T & L at the 0.01 level in all three areas. That is,

professorial and associate professorial staff in these four faculties across three universities:

1. gain far higher job satisfaction from research activities than they do in T & L activities
2. commit far more effort to being role models for Research activities than they do to T & L activities
3. perceive research activities to be of far greater importance for professional advancement than T & L activities.

Professorial staff feels also that their seniors encourage them more for Research effort than for T & L effort (significant at the 0.05 level).

The results show that there is a significantly stronger commitment to research than to teaching both within the professoriate and the non-professoriate academics in all three universities. The findings confirmed that irrespective of the individual differences within faculties and between universities, the rankings are remarkably consistent across the three universities and highlight the challenge faced by Australian universities in the area of Teaching and Learning, and also reaffirmed the need for projects such as this.

The survey had several open questions on what they considered were “attributes” related to research and T&L leaders and challenges related to the same. They show that in general, for research items, leadership and management issues were topmost - the main challenges related to developing ideas and projects that could be funded, and to attracting, motivating and supporting productive researchers. Lack of time for research was a key issue, along with the need to maintain balance with competing demands. Research culture and infrastructure issues included lack of support and opportunities, an individualistic research culture, and the current business model in universities. Gaining research funding, maintaining and developing personal research reputation and networks, and maintaining quality of research were also key challenges.

For T & L items, the majority of comments focused on issues relating to culture and infrastructure, and to teaching issues. Organisational politics, lack of recognition, and the need to maintain academic standards were mentioned, and the core challenge could perhaps be summed up by 'pragmatism about working within constraints of the system'. Teaching issues included developing and maintaining skills, keeping up to date in a dynamic environment, and 'maintaining enthusiasm for teaching when setbacks and frustrations occur. Resourcing and time issues included large classes and the need for time to develop detailed course material. 'Student issues' included attracting good students, inspiring and challenging students and 'dealing with gen X,Y,Z'. The challenge of maintaining research was also an issue.

There was also a substantial overlap in the qualities listed for Research Supervision and Teaching, and for Communication Skills. This provided some encouraging evidence for a potential for transfer of leadership from research to T & L.

4.2 Bridge I

The academics participated in the workshops (one each at every participating faculty) with enthusiasm and were very involved and interested in the issues and the findings from the survey, and recognised the need for this project and its aims. In each institution, team members received positive verbal feedback and thanks from attendees. Some examples:

UTS:

- Members of the professoriate commented on how refreshing it was to

have a meeting of *just the professoriate* to discuss strategic issues.

- Attendees commented that it would be good to have more such meetings.
- Associate Dean (Research) described the presentation as very insightful.
- Head of School commented that she enjoyed the workshop.

Monash:

- Professoriate attendees commented that they welcomed intentional focus upon the needs of teaching, and the need to explore the changing context of teaching.

QUT FBEE:

- A follow-up email from an associate professor to ten people, including the Faculty leaders, thanked all responsible for the session, and proposed Faculty changes for T & L.
-

QUT FaST:

- Academics engaged generously and five or six influential academics stayed very actively engaged even beyond 2.5 hours.

Written feedback: Written post-reflections were invited at the UTS Workshop. Eleven of the 14 professorial attendees responded. All but one was positive about the session. This feedback identified the thirty workshop points as being thought provoking.

- Ten suggestions were offered for directions for future workshops
- Constructive suggestions were made about the nature and structure of the workshop.

One professor wrote to the project team after the workshop:

There is a clear message that the Faculty, quite rightly, wishes to delve more into the intersection of the Teaching, Discovery and Application "circles". At a senior level, and possibly quite unintentionally, research and T & L are being presented quite distinctly giving the message that they are unrelated. The message seems to be, "We need to get there, but how do we get there?" I would like to suggest that indeed we are on the way there and we need to give a very open message as such. I think [we have] significant strengths in T & L leadership, scholarship, education research, and leadership in national and international communities of practice with a number of ALTC projects and fellowships …based around sound research principles...So, why don't we include a column labelled T & L Research alongside our research themes when presenting income, publications etc.? Why don't we include the educational relationships we have around the world along with the research and application relationships? I know that in fact this is done in the background, but the public stories seem to be missing this.

Besides these four project workshops within the three universities that provoked T & L discussions and activity among 70 professorial staff, we began engaging in the wider academic community beyond our four universities. We held an Open Forum at RMIT that attracted 29 Melbourne academics. The focus was on strategies for improving educational outcomes among postgraduate research students. Nine respondents returned a feedback form on the Forum. These were complimentary about the clarity, relevance and effects of the presentation. Two proposed that clearer timing and directions would improve the group discussions. One from "design-based practices" proposed more attention to creative right-brain thinking.

Evidence of lasting impact lies in the discussions provoked among professors and faculty leaders after the workshops. These include proposals for advancing Faculty T & L activities, and collation of T & L reports. Evidence of raised levels of awareness of the value and importance of T & L lie in a range of other T & L activities and discussions initiated by professorial staff. Professorial input then provided further directions for the Project and for the Bridge 2 and 3 Workshops.

During this phase, we assessed the T & L climate among IT and Engineering professorial academics in four Faculties and began to engage them in thinking and in dialogue in three important T & L areas:

- strategies to improve higher degree supervision
- the Teaching-Research nexus
- Teaching and Learning leadership.

An important spin-off was that non-professorial academics also elected to engage in these debates via our activities, and offered interviews for the project.

4.3 Bridge II

This Bridge was constructed in two stages. In the first stage, the project workshops were led by the project leaders who provided scaffolding for the professors by way of connecting the teaching to their research. In the second stage, some of the academics at QUT (the lead institution) were requested and agreed to lead workshops based on more general topics related to undergraduate curriculum.

The participants in these workshops were asked to comment on the findings from our pre-survey and also offer any ideas and solutions to bridge this disconnect between research and teaching.

The workshop discussions at all four first-stage Bridge 2 workshops centred on the contradictions between the sometimes-different perceptions and core long-term goals of the professoriate and the university management. The problems encountered by the professoriate that were mentioned included the following:

1. Although universities are predicated on T & L activities, the unspoken consensus seems to favour research over teaching, as it is research that helps them get ahead in their careers.
2. Many felt that they had more ownership of their research as they could make a choice depending on their strengths and interests, while the teaching activities weren't always voluntarily chosen but allocated to them and hence engaged them less.
3. Many had become jaded about their teaching as the T & L approaches and learning spaces hadn't changed in years and they did not always have the time or the resources they needed to upgrade their T & L skills.
4. The increased bureaucratisation of teaching and the business model followed by the higher education sector has pulled up the minimum standard but it has also dropped the maximum standard.
5. Current approaches in education have resulted in better results for the least able students and worse results for the better able students.
6. Standardasiation has taken away the enjoyment of teaching and learning, and reduced opportunities for innovation.

Many opinions and ideas were shared by the participants to overcome this gap. It was frequently noted that we need to find ways to pipeline future researchers through the undergraduate curriculum and that recruiting talented researchers alone is not enough. This theme became the focus of our Bridge Two workshops during Stage Two. It was evident also from the workshops that universities and academics

need to put in a lot of effort to provide feedback, direction, vision, examples, role modelling, and the right attitude to both students and faculty in order to address the leadership succession challenge that looms in the future of Australian higher education.

4.3.1 QUT:FaST

Concurrently with the Bridge II stage of this project, QUT: FaST had independently commissioned a Curriculum Review in 2009-2010 that had made a comprehensive set of recommendations. The QUT: FaST workshops took these recommendations as a starting point, and asked the participants for recommendations incorporating clear pathways to honours and postgraduate research. Specifically:

- Recommendation 10: Introduce research and advance coursework streams into complementary studies component of UG courses with flexible architectures.
- Recommendation 28: Some students, especially those who have undertaken basic sciences, maths or technology subjects at high school, and hence have considerable enabling knowledge, can be under-stimulated by material that seeks to up-skill students who have not previously studied these subjects…[these students need more encouragement into honours pathways through better engagement]

The Panel recommended also that QUT: FaST strengthen the pathways to honours within the Faculty's undergraduate curricula through unit offerings which may include, but which may not be limited to:

- providing introductory level research concepts in first year options units (including exposure to the philosophy and sociology of science)
- supervised smaller scale research projects
- methodological development units
- seminars and events showcasing exciting research
- cross-disciplinary project based units based on Faculty research themes in a global context and
- advanced topics/readings units.

The workshop at QUT: FaST focused on the general approach needed to strengthen the pathways to undergraduate research and honours pathways and the professors' involvement in the same. The workshops were organised in the Word Café conversation style to make participants comfortable and at ease (www.theworldcafe.com/), and participants were asked to contribute their ideas around 4 separate tables, one for each undergraduate year, and the designated table hosts presented a summary of their discussions to the whole gathering.

Some of the ideas included engaging researchers and students alike in T & L through offering more research-based topics that were also relevant to the industry and the job market. The professors discussed many ideas that were specific to their disciplines but the most common thread through all the ideas was one of inspiration and motivation. Many brought up the subject of how they themselves came to be involved in research or academia because of an inspirational or motivational teacher they had whilst they were students. This developed into a conversation where some of them discussed how they themselves could provide such inspiration and motivation to their students through more direct contact with students in the classroom and also through participating in panels and group projects within other subjects related to theirs.

Apart from the professoriate-only Bridge 2 workshop described above, six open

workshops (where both professoriate and other academics were invited) were conducted at QUT: FaST.

The six extra workshops were conducted at QUT: FaST on three different topics over a period of two months where we had a total of 109 participants. Professors and other academics in the faculty who assumed leadership roles in coordinating the discussions led these workshops. The workshops were based on three different topics, with each topic repeated on different days in order to encourage more participation.

Topic One: Inverted Curriculum: The questions used at this workshop were designed to re-examine the link between the learning outcomes and assessment processes adopted.

Topic Two: Streaming: The questions used in this workshop provided an insight into various strategies that have been working well to cater for different types of learners, as well as some gaps that exist in different areas.

Topic Three: Revitalising labs / practicals / workshops: The questions in this workshop addressed the T & L outcomes of practicals and their relationship to practicals structure, student experience, staffing structure, resourcing, and pedagogical strategies.

One of the curriculum redesigns at QUT: FaST is around the idea of an inverted curriculum. Traditional content does not prevent the progress of the superior students, but the majority of students who leave our introductory courses view them as a large collection of disconnected facts that have little relevance to their daily lives and will soon be forgotten. There is evidence to show that inquiry-based and research-based teaching can increase student engagement and hence student retention (Meyer, 1993). Hu and others (2002) define engagement as ‘the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes’. The new paradigm is to actively engage students with both the content, and with one another and the faculty. The so-called inverted curriculum is one such approach that combines both research-based and practicals-based course design in order to engage the student while letting the students discover for themselves what traditional subjects they need to understand in order to achieve their goals (Weaver, 2008). The principle of the inverted curriculum is a term borrowed from debates on electrical engineering education (Cohen, 1987) where the student's own motivation to achieve self-declared goals and ambitions contribute to greater proactive learning, leading to a 'progressive opening of the black boxes,' (Meyer, 1997), a somewhat longer but more precise description.

4.3.2 UTS:FEIT

The project workshop discussions at UTS centred on the contradictions present between the sometimes-different perceptions and core long-term goals of the professoriate and the university management.

Many opinions and ideas were shared by the academic participants to overcome this gap that included the following:

- more support for teaching activities including T & L workshops by professors who had high job satisfaction and high ratings for Student Evaluation of Teaching (SET)
- more scholarships for research students to increase retention, and more involvement of research students in teaching within their own areas of research expertise

- using undergraduate interns to work on paid research projects.
- make learning more important than teaching – L & T rather than T & L
- offering a semester off for teaching development activities (a Teaching Studies Period) and not just for research activities.

4.3.3 QUT:FBEE

The workshop at the Faculty of Built Environment and Engineering were conducted as part of the faculty staff meetings, which helped attract about 45 academics (both professoriate and otherwise) although the workshop was briefer than those at the other institutions. It lasted for 40 minutes but generated very high interest levels with discussions becoming quite animated. At this meeting, it was also announced that BEE was doing better than most other faculties at QUT in how the students rated the teaching and learning within that faculty with respect to the units that were offered in Semester 1 2010.

In response to the findings from our pre-survey that were presented in the workshop, one professor said:

There seems to be a significantly stronger commitment to research than to teaching. But are we comparing like to like? Faculty drives, direction, and motivations can be different. It may be a local thing. How people would answer a particular question depends on the culture within the faculty.

Some of the other issues discussed were:

- The university considers HDR supervision as teaching, but the professors see it as part of a research exercise, and consider their HDR students their partners in research. It is more of an apprentice model, but one can only have so many apprentices.
- The teaching/research commitment of an academic by itself is not going to produce better outcomes in terms of graduation rates etc. There are other factors.

In summary, it was noted that if we want to develop world-class expertise, recruiting talent alone is not enough. We need to put in a lot of effort. We need to provide feedback, direction, vision, examples, role modelling, and the right attitude.

4.3.4 Monash

A number of ideas and suggestions for engaging research professors in teaching were offered at this workshop. Professors were very engaged and interested, and also somewhat puzzled by the results of the pre-test survey. It was mentioned that research professors do engage in teaching in the form of research supervision but do not seem to consider it as T & L, perhaps because they are not necessarily measured in the same way. One more reason research was more exciting and provided more job satisfaction than T & L was the fact that new things were always happening in the research area (which included HDR supervision) whereas T & L seemed more static in content but fast-evolving in the modes of delivery while also being mired in more bureaucratisation.

4.3.5 Summaries of individual Bridge II workshops

Appendices 3-7 contain brief summaries of the Bridge 2 workshops as follows:

Appendix 3: Summary of Bridge 2 workshop at UTS

Appendix 4: Summary of Bridge 2 workshop (1) at QUT: BEE
Appendix 5: Summary of Bridge 2 workshop at QUT: FaST
Appendix 6: Summary of Bridge 2 workshop at Monash
Appendix 7: Summary of 6 additional Bridge 2 workshops at QUT: FaST

4.3.6 Summary of Bridge II phase of the project

The subject of incorporating research and engaging research leaders in undergraduate teaching engaged the faculty in a very passionate manner during the workshops. The subject also polarised the participants in a manner that took the discussions beyond the workshops and often into the hallways of the faculties. During the workshops it was harder to stick to an agenda because of the animated discussions that ensued when the data from the pre-survey was presented. This phenomenon was observed in the workshops at all four faculties. This is an unexpected, albeit positive, outcome in that it gets the subject out in the open, but it has taught us to go with the flow so far as the discussions in the workshops are concerned rather than force the participants to stick with a defined agenda.

4.4 Bridge III

In this stage of the project, we removed the scaffolding of the research-to-teaching focus and instead focused the professoriate workshops on actual undergraduate teaching and solicited their ideas on more practical issues such as curriculum, undergraduate pathways (including research pathways), identified problems with knowledge and skill gaps in students etc.

During the Bridge Three stage, we conducted five workshops: two professoriate workshops at QUT: FaST, one at QUT:FBEE and one each at UTS and Monash.

4.4.1 Summaries of Bridge III workshops

Appendices 8-12 contain brief summaries of the Bridge 3 workshops as follows:

Appendix 8: Summary of Bridge 3 workshop at UTS
Appendix 9: Summary of Bridge 3 workshop (1) at QUT: FaST
Appendix 10: Summary of Bridge 3 workshop at Monash
Appendix 11: Summary of Bridge 3 workshop at QUT: BEE
Appendix 12: Summary of Bridge 3 workshop at QUT: FaST

4.4.2 Summary of Bridge III phase of the project

During the workshops it was evident to the project team that the research professors were more than willing and able to engage with undergraduate teaching and all of them had been doing so within their own spheres of influence in various ways. Nevertheless, most are not aware of T & L literature and even among those that are aware, they are not interested in them unless it related to their specific discipline areas. Hence, getting together discipline groups more often would make them more open to exchanging T & L ideas and even make them aware of discipline-specific T & L research, at the very least. It also helps to bring the professoriate together for workshops such as we organised, for professors don't often get such opportunities to talk about teaching and learning issues with their research peers.

In this phase, in some of the workshops, we invited the professoriate to take the lead and present or lead the workshops. We found that professors were highly enthusiastic in these workshops and many of the ideas and issues discussed were at a very high level of granularity and very specific to the units and courses that were relevant to the professors' areas of research, especially to threshold concepts that they wanted the students to learn within their disciplines.

4.5 Post survey

A post survey was conducted at QUT and UTS in April-June 2011 to find out if the project had any measurable impact. It aimed to identify the extent of personal job satisfaction academics gained from 16 research and 16 corresponding teaching activities, the extent to which the academics felt they were role models for these activities, and the academics' perception of the importance of these activities for advancement. The survey also sought academics perceptions of the extent to which research and teaching & learning activities are resourced and encouraged.

There were 30 respondents to the survey from QUT (21) and UTS (9). There were 16 respondents from the professoriate (Levels D&E) and 14 respondents from the non-professoriate (Levels A, B & C) and 20 males and 9 females with 1 respondent not answering this question.

The sample size was much smaller in 2011 than the 2009 survey, but the results of the survey were very similar to the 2009 survey results. One notable exception was that the ratings for the "Improving student satisfaction" items were significantly higher for L&T than the corresponding Research items in the 2009 survey. When asked to consider the importance of activities to their career advancement, all the Research items were still rated higher than the corresponding L&T items except for "Winning Research/ L&T awards" and "Improving student satisfaction items." Although this shows that academics' perception of the relative value they place upon research and teaching hadn't changed much during the course of the project, there was still anecdotal and other evidence of T & L initiatives and engagement within some of the participating organisations that added up to a perceptible cultural change that is reported in Section 5.1.

The results of the post survey are reported in Appendix 14.

5 Project outcomes and recommendations

5.1 Project outcomes

Apart from the increased appreciation of the connection between research and T & L brought on by the embedding of this project within the faculties, a number of positive responses by professoriate members and senior management occurred during the period of these project workshops. Some occurred as a direct result of the workshops, and some as a result of the increased awareness created by the project. Some of these are listed below.

- As an immediate response to one of the early workshop discussions, one member of the professoriate at QUT-FBEE made a written request to the senior management in their faculty to have "the scholarship of teaching" set up as a recognised research discipline. The Assistant Dean for Research responded immediately in the affirmative, and administrative processes were put in place to record publications, grant income, and PhD completions within this discipline. One member of the professoriate was also appointed to be responsible for leading the newly formed discipline.
- QUT-FBEE created a new position (Discipline Leader for Engineering Education Research) in recognition of the importance of T & L to the faculty.
- The Head of the Information Systems Discipline at QUT-FaST expressed surprise that the survey data revealed a relatively poor engagement in T & L issues from the professoriate. He followed up on this issue by sending out a sequence of monthly newsletters in 2010 and 2011 that

stressed the discipline's T & L objectives, offering regular teaching workshops, and encouraging T & L evaluations. In the December issue, he said: "2010 was dedicated to setting up the processes and structures to achieve even higher levels of teaching and research productivity. Next year, we will keep on focussing on an increased nexus between teaching and research strengths, the exchange of proven best practices within the Discipline and the start of a Discipline-internal mentoring schema for mid-career researchers."

- AT QUT-FaST, the discipline leader in Computer Science (CS), has put up AUD 26,000 in 2011 from his discipline research funds to fund a T & L project by four faculty members to improve learning outcomes by improving teaching quality using real-time feedback from the students through electronic devices within the classroom. He has provided further funding of AUD 10,000 per year from the disciplines Higher Degree Research funds in order to appoint Dr. Ray Lister from UTS as an Adjunct Professor at FaST with the specifically and publicly stated goal to have him work on T & L projects within the CS discipline (along with six other faculty members) and also help future T & L grant applications over the next three years.
- At QUT-FaST, there is now an active Curriculum Renewal program, with two new co-ordinators working on it full time. In part, it aims to pipeline UG students in three coursework programs onto Honours and HDR with the help of the close involvement of the professoriate.
- At UTS, the Associate Dean (Research) stressed the integration of research and Teaching & Learning (T & L) in a faculty meeting, paralleling our project workshop discussions and demonstrating alignment to institutional priorities. At its annual retreat, the School of Computing and Communications adopted a strategy of having each of the school's teaching discipline groups led by a member of the professoriate. While the groups aren't a new idea, it is the first time a Head of School has explicitly announced that the professoriate should take leadership roles of discipline groups.
- QUT-FBEE also had a large increase in its 2010 teaching evaluation scores. The Assistant Dean T & L (ADTL) indicated in one of our project workshops that she suspected the increase was because of the effective operation of the Discipline Teams. As suggested by the external evaluator, however, while the improvement is pleasing, one needs to be cautious about the significance of these results.
- Monash is establishing "Education Focused" positions for academics engaged in research into teaching and learning, especially within their discipline. This is recognising the value of this research and promoting it as a worthwhile activity within the university. It was a great stride forward to have professors in the discussion workshops even talking about teaching issues with each other rather than just research issues.
- At QUT: FaST, the Project Leader Sylvia Edwards was simultaneously engaged in a faculty-wide Curriculum Review and renewal program and was also commissioned by the ALTC to write their Good Practice Report on Curriculum Renewal in 2011, along with Bhuva Narayan, the Project Manager of this project. The processes and outcomes of this current Leadership Project largely informed this Good Practice report.

The increase in engagement with teaching leadership appeared to be most significant where the professoriate are asked to practice their leadership skills within formal roles of Discipline Leadership. Two of the four faculties involved in this project engaged the professoriate in Discipline Leadership, and it was in these faculties where the most notable outcomes appeared to occur.

5.2 Project recommendations

Based on the experience of conducting this project within the three universities, the following are the recommendations for facilitating research professors to be teaching and learning leaders:

1. **Institutional and public recognition of teaching leadership and excellence by universities and agencies like ALTC/DEEWR must be continued.**

Such recognition helps inculcate the cultural change needed to better link research and teaching. Many exemplars exist of individual professors who have successfully integrated research and teaching within faculties, universities, and disciplines. These exemplars need to be recognised more widely than current practice.

2. **The ALTC Discipline specific work undertaken in the past few years is to be applauded, and should be continued.**

Professors perceive themselves as moral leaders and guardians of their respective disciplines and when they see their roles as teachers in terms of the moral responsibility they have towards their disciplinary specialisations, they are more amenable to it.

3. **Universities need to engage the Professoriate in a dialogue where their ideas of teaching innovation are given as much importance as their research innovation.**

Since Professors' perceptions of themselves revolve around their role as intellectuals and as leaders in research innovation, if we want to engage them in teaching and learning leadership, then we should facilitate the opportunities for this to happen by proactively seeking their ideas on the appropriate ways to teach within their research disciplines.

4. **University academic performance review processes need to encourage professors to make explicit connections between research and teaching in their mentoring of junior staff.**

Professors' conceptualisation of teaching is closely tied to mentoring others in their research areas. Research-active professors also fulfil roles such as peer reviewing, editing, and mentoring of younger colleagues. As a result, they are more motivated to take up teaching when classroom teaching and future research mentoring are integrated in an organic manner through an institutional framework that encourages it.

5. **The issue of leadership succession needs to be framed not just in the context of the obvious leaderships roles in academia such as teaching administration, but also in the less obvious roles of teaching leadership within the professors' own research specialties in order to keep their own contribution to the field more relevant.**

When this guardianship role is emphasised also as creating new learners in order to ensure continuity and succession planning within their disciplinary specialties, professors are more interested in the teaching that makes this possible.

6. **Faculty leadership should bring together research professors from various disciplines on a regular basis, facilitating a dialogue on the ideas around undergraduate and post-graduate coursework program and teaching.**

For too long we have assumed the professoriate are not prepared to engage in this dialogue. This is a mistaken belief. Many professors are already engaged in exemplary teaching practices within their disciplines, but do not write or publish in the area of teaching scholarship, for they view themselves primarily as researchers. Nevertheless, when we facilitated a dialogue between professors from various disciplines, the one common subject they could all understand and freely exchange information on was the subject of teaching. Although the workshops such as the ones we facilitated may not generate big ideas or bring about cultural change on their own, they do provide a forum for information exchange on the subject of T & L (as opposed to research meetings). Later, when one or more of the participants do propose any initiatives for change, the others are more amenable and open to the idea, for they understand where the idea originates from – and have more ownership of it.

7. **Universities should encourage the professoriate to write about discipline-specific teaching innovations in their discipline-specific literature.**

Research professors do not always publish in the area of T & L, but they are more likely to do so when they are encouraged to write about discipline-specific teaching innovations rather than about T & L in a broader sense.

8. **Universities and Faculties need to facilitate public engagement of the professoriate outside of their peers and research spheres, and showcase them as role models for both students and aspiring researchers.**

The professoriate needs to be able to articulate simply the value of their research in laymen's terms. Although professors see themselves as gatekeepers of their research discipline, the media and the general public see them also as teachers and mentors, and hence we need to facilitate this interaction by providing opportunities for public engagement by professors. This not only gives them the boost they need for their research, it also keeps the connection to their teaching alive, and the satisfaction of engaging with the larger community.

9. **The Australian Higher Education sector should consider introducing pedagogical training for their university academic staff.**

Researchers routinely engage in reflection about their research approach and methods. These are the same skills required in effective teachers; teachers who can demonstrate that their teaching rationales, decisions, and actions reveal equally principled knowledge about their teaching. Currently, we train people through higher degree programs to be effective researchers, but we do not train them to be effective teachers. This needs to change.

6 Dissemination of findings

6.1 Dissemination and communication of project findings

This project, being a form of action research, was heavily invested in and engaged in a continuous dialogue with around 400 plus members of the professoriate within the project organisations. Nevertheless, the project leaders were also engaged in continually keeping the broader higher education sector informed of our project approach and developments through disseminating them to a total audience of around 350 academics in 10 national forums and conferences over the three years, including the following:

Conferences:

a. Sheard, J (2009). Presentation at the Engineering and Technology Education Leaders Forum.
b. O'Shea (2009). Presentation at the Engineering and Technology Education Leaders Forum.
c. O'Shea (2009) IEEE Education Society, Victorian Section and SET College L&T Seminar:. Open Forum for Academics on Strategies for Improving Research Higher Degrees outcomes
d. Edwards, S. L. & O'Shea, P., et al (2010) ALTC Leadership Grant "Changing the Culture of Teaching & Learning in ICT and Engineering: facilitating research professors to be T&L leaders". *ACDICT (Australian Council of Deans of ICT) inaugural Learning and Teaching Forum*, Sydney, 5-6 July 2010.
e. Edwards, S.L., Shea, P. O., Cretchley, P., & Narayan, B. (2010) "It really is black and white when you look at it like this: Reporting on a study into Australian professors' research and teaching priorities." *Chemeca 2010: Australasian Conference on Chemical Engineering*, 26-29 September, Adelaide. (ERA ranking B).
f. Edwards, S.L., & Thomas, R. (2011) Contextualising learning for a real-world university: how an inverted curriculum in the first year can help better student retention. *FYHE 2011: First Year in Higher Education Conference*, Esplande Hotel Fremantle, 28 June -1 July, 2011.
g. Edwards, S.L. & O'Shea, P. (2011) Research and Teaching: Integration or an Interruption? *HERDSA 2011: Higher Education on the Edge,* Radisson Resort, Gold Coast, Queensland, July 4-7, 2011.

Additionally, we held a national online webinar in August 2011 in order to reach a wider audience where we engaged 17 academics from across 7 Australian universities. Now, with the successful completion of the project, the project will be disseminated more widely through national and international publications.

6.2 Linkages to other ALTC strategic priority areas

This project's aims, goals and outcomes would be of interest and relevance to anyone interested in or engaged in the following ALTC strategic priority area.

- Curriculum renewal (The ALTC Good Practice Report on Curriculum Renewal was authored by the Project Leader and Project Manager of this project during the course of this project)
- Improving tertiary pathways
- Research and development focussing on issues of emerging and continuing importance.

7 Evaluation

7.1 External evaluation

An external evaluator, Dr Catherine Manathunga, was engaged to assist with the evaluation of the project. The independent evaluation report focussed on the extent to which project outcomes were achieved. The scope of evaluation assistance involved:

- Providing advice on evaluation approaches and techniques tailored to meet the specific needs and contexts of the project
- Reviewing and providing feedback on project data and data analysis reports prepared by the project team
- Conducting interviews of project team members regarding their experience and perceptions of project processes and outcomes

- Conducting focus groups with professoriate from the lead university (QUT) regarding their experience and evaluation of the project, and
- Preparing an independent evaluation report to be included with the final report to ALTC.

7.2 Indicators of achievement

The external evaluator in consultation with the project team developed specific indicators for each of the listed outcomes.

Project Deliverables

- Workshop guidelines and exemplars for running leadership programs at other institutions
- Reports on the project phases
- A final report
- At least two workshops conducted at two national conferences in ICT and Engineering.

Evaluation Goals

The overall goals of the evaluation were to answer the following questions:

1. How effective was the project in achieving its goals?
2. What kind of impact did the project have on the individuals and groups involved?
3. How responsive was the project to the needs of participants and stakeholders?

Specifically, the evaluation would seek to ascertain whether the following outcomes have been achieved effectively:

Outcomes Bridge I:

1. Increased levels of T&L discussion among professors
2. Increased interest in pedagogical issues in research professors
3. Increased levels of T&L activity initiated by the Professoriate.

Outcomes Bridge II:

1. Increase in incidence of peer observation among research professors
2. Increased levels of T&L activity initiated by the Professoriate.

Outcomes Bridge III:

1. Increased desire and capacity of research professors to initiate, support and lead T&L activity
2. With time, improved learning outcomes in postgraduate supervision
3. With time, improved pedagogy in UG teaching generally.

Outcomes Open Forums and Workshops:

1. Establishment of a community of practice around transferring skills from research to T&L
2. Validation of (and refinement of) evidence derived from project
3. Dissemination of results from the project and further building of the community of practice at a national level.

The external evaluator provided two Preliminary Evaluations during the course of the project (at the end of Project Year 1 and Project Year 2), and a final evaluation

to ALTC at the end of Year 3. The Preliminary Evaluations provided us with formative evaluation including recommendations, and the final evaluation included the following commendation:

I also believe that this project has made a significant theoretical and practical contribution to research on T&L leadership, undergraduate research and the research-teaching nexus. To date, there has not been a great deal of work focusing on the beliefs, behaviours and values of the professoriate. While there has been some work on research leadership, there has been very little on the T&L leadership provided by the professoriate. This project has also created more impetus and additional examples of effective practice to the burgeoning literature on undergraduate research. This project has also provided additional, research-based support for the significance of the research-teaching nexus at a crucial time in Australian higher education, when post-ERA pressures are demanding that institutions focus more on research quality.

7.3 Reflections by project leaders

7.3.1 QUT: Faculty of Science and Technology

The ideas generated not just in the workshops but also in the post meeting discussion and emails have proved invaluable to our curriculum renewal work at Q:FaST. Institutions should not assume a lack of interest in teaching issues by the professoriate; they are indeed interested but have for the most part they have not been asked to engage in discussions around T & L.

In hindsight, we found our project leveraged off the work of other ALTC projects such as Christine Bruce's 2008 ALTC Teaching Fellowship that were drawing to a close. This proved beneficial to our project. The conversations had already begun and we dovetailed in with our first workshop just before her final workshop. We also gained traction from the ongoing cultural change process that was in progress in the Faculty.

One area of improvement would be that the 3 bridges needed more workshop opportunities than we anticipated. I would suggest more repeat workshop for each faculty, at different times of the working week. In Q:FaST we found that many professors emailed sincere apologies because of diary scheduling issues set in train months beforehand, and forwarded their ideas both before and after the events.

One other point that was interesting to note is that once the Discipline Leaders understood they were responsible for the Performance Planning and Review (PPR) of their academic staff in all areas of academic life, they became strong leaders in teaching. In some cases, they approached me as ADTL for advise on the quality indicators that would assist them in these discussions, but for the most part, their engagement was genuine and enthusiastic. It has been a pleasure to see this cultural shift happening over a period of a few years.

One of the most significant outputs from this project was the survey result showing the differences between the professoriate (level D and E professoriate academics) and the non-professoriate academic staff (Level A Associate Lecturers to C Senior Lecturers). This was a serendipitous finding. The survey was designed to provide us a profile of the academics before and after the 2.5 years of the project. While we did achieve that outcome, we also found clear differences between the two groups of academic staff. There was high personal interest and enjoyment of research activities and low interest in teaching activities at the professoriate level, whereas the A to C academic have a more balanced profile, equally enjoying teaching and research at similar levels. The levels A to C academic profiles do not match the professoriate, except for the importance to their career, where the profile matches

the professoriate responses. The level A to C academic has heard the message loud and clear of the importance of research to their career.

7.3.2 QUT: Faculty of Built Environment and Engineering

In reflecting on how to facilitate professors to lead in T&L, we came to the conclusion that the work of Allan R. Odden is highly relevant. Odden (2009) found that high achieving schools (i.e. schools where students doubled their performance) seemed to use a common set of strategies to elicit the improvement. These strategies were:

1. They established high goals/expectations
2. They made regular use of formative assessment and analysed student data to become well informed about the status of student achievement
3. They collectively reviewed evidence on how to elicit high achievement
4. They used their time more constructively than the staff from non-performing schools
5. They were led by people with good instructional leadership skills.

During the course of this project we noticed that these strategies seemed to be relevant not only for helping students but also for helping professors. These professors are high achievers and they can relate to the importance of high expectations (for both themselves, for their staff and for their students). They are researchers and are very responsive to data and evidence. They love to find efficient ways of doing things. Finally, they are not all expert teachers and value others who can help and guide them in teaching and learning. They seem to particularly appreciate the provision of good examples and patient support.

One of the unfortunate events that occurred during this project was a strong and sudden push for greater research intensification at QUT from the upper levels of the university. This occurred around the end of 2009, about half way through the project. This had an impact on the professoriate. While it did not rob them of their enthusiasm for teaching in general, they were confronted more starkly with the fact that the university would not recognise their efforts in teaching as much as they had previously.

7.3.3 UTS: Faculty of Engineering and Information Technology

These observations relate to the processes we used to execute this project.

- It is useful to tap into existing forums where possible, e.g. if there is already a meeting of the professoriate, then it helps to build these workshops into the existing sessions. Since the merger of FEIT at UTS, there haven't been regular professoriate meetings, and a number of the workshop participants commented on how it was nice to have a forum to discuss these kinds of issues with their colleagues
- It helps when the School/Faculty is already addressing the issue of cultural change, or an external driver has made the School/Faculty reflect on itself and perceive the need to change. i.e. you have to want to change (or at least, change is harder to initiate when there is no perceived need to change)
- One workshop per year such as we did at FEIT is really not enough – it's better if it's part of a larger agenda with more regular meetings
- It is important to link in with existing institution priorities / mission / activities, so as not to be seen as a distraction – academics already perceive too much is going on, and it's not helpful to be seen as something disconnected from everything else that's happening

- We need to present the tangible benefits (as opposed to the altruistic benefits), e.g. more HDR students is a tangible benefit, while improved alignment between R and L&T is altruistic, but maybe not considered necessary. This is perhaps connected to the idea of evidence – with tangible outcomes; you can measure the impact that change has had
- Personal contact is important to gain support/participation. Academics often skim emails and if something doesn't catch their eye, or is perceived not to be of benefit to them, then they skip the rest of the email. But a personal follow-up explaining the purpose/benefit of the workshop can change their attitude
- It is also useful to seed the ideas with the Dean or senior academics. Ideally it's preferable for the Dean to think he/she came up with the ideas him/herself, so there is ownership
- The biggest challenge seems to be getting the professors to perceive themselves as leaders, particularly in L&T. In the workshops, the professors discuss challenges/problems they see with L&T issues, but many view it as someone else's responsibility to take the lead in changing the situation
- It is helpful to draw the analogy between research and lifelong learning, i.e. to encourage the research professoriate to think about research as lifelong learning, particularly at undergraduate level. This changes the view of integrating research and teaching from just presenting research outcomes at undergraduate level to instead teaching undergraduates the skills and methods of research as a foundation for lifelong learning.

7.3.4 Monash University

Communication in projects like this one is essential. E-mail is not an effective means of communications for a large project like this with many project leaders, faculties, and universities involved. Communications between the project team may have been more effective if we had maintained web 2.0 communications tools like a wiki or a blog dedicated to the project with a view to the longer-term aims of the project.

7.4 Conclusion

Our research approach for this project was sound, and we achieved many of our aims for the project. The workshops were our greatest strength in this approach. Our original fear that the professoriate may not be interested enough to attend was proven unfounded. The research professoriate are intensely interested in quality outcomes from our undergraduate programs, but they are rarely, if ever, offered the opportunity to attend workshops aimed for them around T&L issues. This project has helped us see that the professoriate, in general, is prepared to engage in teaching and learning leadership. In quite a few cases, they are even prepared to engage enthusiastically. Many of these professors however, need to be encouraged and supported in their engagement because teaching and learning does not come as naturally to them as research does.

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9 Appendices

9.1 Appendix 1: Sample of survey used in the study

Leaders of Research and of Learning & Teaching

This survey aims to identify some of the priorities and strategies of academics in their roles as leaders of research and learning and teaching. QUT, Monash University, and University of Technology Sydney are leading this study to understand the leadership roles and priorities of the Professoriate in ICT and Engineering in Australian Universities.

Support for this research has been provided by the Australian Learning and Teaching Council Ltd, an initiative of the Australian Government Department of Education, Employment and Workplace Relations. The views expressed here do not necessarily reflect the views of the Australian Learning and Teaching Council.

This survey is anonymous, and no individual will be identified in any way in any analysis or report.
The data will be used alongside other information to build a picture of the culture of Research & Teaching across Australian universities, and to find strategies for advancing leadership capacity.

Interviews:

We welcome your further views and experience for the purposes of this research. If you are willing to be interviewed, please let Patricia Cretchley, Peter O'Shea or Sylvia Edwards know, and we'll follow up.

No individual will be identified in any way in any analysis or report.

Please offer as much of the following information as you are comfortable with:

Your gender: Male Female (Please circle.)

Age-group: Under 36 36-45 46-55 56 – 65 Over 65

Your academic level:

Your main discipline area:

Is Learning & Teaching your primary research area?

Are you in a Research-only position?

Please list your current Leadership role/s, and how long held:

To what extent do you gain *personal job satisfaction* from each of the following?

*Place a cross **anywhere on a continuum** from 1 to 5.*

	1 = Low	2	3= Medium	4	5 = High	Not applicable
Publishing refereed Research papers						
Participating in Research conferences						
Keeping your Research at the cutting edge						
Reading research literature in your field						
Undertaking Research training						
Reviewing Research papers/reports/activities						
Fostering Research networks extending beyond the University						
Mentoring future Research leaders						
Fostering Research teams within your University						
Strategic planning of Research activities						
Securing funding for Research						
Developing a high Research profile						
Successfully implementing new Research projects						
Advancing your Research knowledge and skills						
Winning Research awards						
Improving student satisfaction ratings for research supervision						
Publishing refereed Learning & Teaching papers						
Participating in Higher Education L&T conferences						
Keeping your Teaching resources up to date and effective						
Reading L&T literature and research						
Undertaking Learning & Teaching training						
Reviewing Learning & Teaching papers/reports /activities						
Fostering L&T networks extending beyond the University						
Mentoring future Learning & Teaching leaders						
Fostering L&T teams within your University						
Strategic planning of Learning & Teaching activities						
Securing funds for Learning and Teaching initiatives						
Developing a high Learning & Teaching profile						
Successfully implementing new Learning & Teaching initiatives						
Advancing your Learning & Teaching knowledge and skills						
Winning Learning & Teaching awards						
Improving student satisfaction ratings for your Teaching						

To what extent do you try to be a *role model* for the following?

*Place a cross **anywhere on a continuum** from 1 to 5.*

	1 = Low	2	3= Medium	4	5 = High	Not applicable
Publishing refereed Research papers						
Participating in Research conferences						
Keeping your Research at the cutting edge						
Reading research literature in your field						
Undertaking Research training						
Reviewing Research papers/reports/activities						
Fostering Research networks extending beyond the University						

Mentoring future Research leaders
Fostering Research teams within your University
Strategic planning of Research activities
Securing funding for Research
Developing a high Research profile
Successfully implementing new Research projects
Advancing your Research knowledge and skills
Winning Research awards

Improving student satisfaction ratings for research supervision

Publishing refereed Learning & Teaching papers
Participating in Higher Education L&T conferences
Keeping your Teaching resources up to date and effective
Reading L&T literature and research
Undertaking Learning & Teaching training
Reviewing Learning & Teaching papers/reports /activities
Fostering L&T networks extending beyond the University
Mentoring future Learning & Teaching leaders
Fostering L&T teams within your University
Strategic planning of Learning & Teaching activities
Securing funds for Learning and Teaching initiatives
Developing a high Learning & Teaching profile
Successfully implementing new Learning & Teaching initiatives
Advancing your Learning & Teaching knowledge and skills
Winning Learning & Teaching awards
Improving student satisfaction ratings for your Teaching

How important are the following for advancement in the academic profession?

*Place a cross **anywhere on a continuum** from 1 to 5.*

	1 = Low	2	3= Medium	4	5 = High	Not applicable
Publishing refereed Research papers						
Participating in Research conferences						
Keeping your Research at the cutting edge						
Reading research literature in your field						
Undertaking Research training						
Reviewing Research papers/reports/activities						
Fostering Research networks extending beyond the University						
Mentoring future Research leaders						
Fostering Research teams within your University						
Strategic planning of Research activities						
Securing funding for Research						
Developing a high Research profile						
Successfully implementing new Research projects						
Advancing your Research knowledge and skills						
Winning Research awards						
Improving student satisfaction ratings for research supervision						
Publishing refereed Learning & Teaching papers						

Participating in Higher Education L&T conferences	
Keeping your Teaching resources up to date and effective	
Reading L&T literature and research	
Undertaking Learning & Teaching training	
Reviewing Learning & Teaching papers/reports /activities	
Fostering L&T networks extending beyond the University	
Mentoring future Learning & Teaching leaders	
Fostering L&T teams within your University	
Strategic planning of Learning & Teaching activities	
Securing funds for Learning and Teaching initiatives	
Developing a high Learning & Teaching profile	
Successfully implementing new Learning & Teaching initiatives	
Advancing your Learning & Teaching knowledge and skills	
Winning Learning & Teaching awards	
Improving student satisfaction ratings for your Teaching	

What are the important attributes of a **Research leader**? And the challenges?

What are the important attributes of a **Research Supervisor**? And the challenges?

What are the important attributes of a **Learning & Teaching leader**? And the challenges?

To what extent do *your* Seniors and Managers *support and encourage* your Research efforts?

1 = Far too little	*2*	*3 = To a moderate degree*	*4*	*5 = To a strong degree*

Your thoughts on this:

To what extent do *your* Seniors and Managers *support and encourage* your Learning & Teaching efforts?

1 = Far too little	*2*	*3 = To a moderate degree*	*4*	*5 = To a strong degree*

Your thoughts on this:

9.2 Appendix 2: Detailed survey results

There were 152 respondents to the survey from QUT (88), Monash (34) and UTS (30). There were 72 respondents from the professoriate (Levels D&E) and 80 respondents from the non-professoriate (Levels A, B & C). Table 4.1 shows the academic profile from each institution. A Chi-Square test showed no difference in the distribution of academic levels across the three institutions. Note that it was possible to determine whether a respondent was in the Professoriate or the Non-Professoriate group as the surveys were administered separately. However, across both surveys 15 academics did not nominate their academic level.

Academic level	QUT	Monash	UTS	Total at each academic level
Professor	18	5	9	32
Associate professor	19	7	5	31
Senior lecturer	17	13	9	39
Lecturer	21	5	4	30
Assistant lecturer	4	1	0	5
Total at each institution	79	31	27	137

Table 4.1: Academic profile of respondents across the three universities

There were 99 males and 34 females with 19 respondents not answering this question. Table 4.2 shows the gender profile of respondents across the three institutions. A Chi-Square test showed no difference in the distribution of gender across the three institutions or across academic levels. (Appendix X includes the gender profile of respondents across the academic levels.)

University	Male	Female
QUT	63	17
Monash	20	7
UTS	16	10
Total	99	34

Table 4.2: Gender profile of respondents across the three universities

The mean values for each Research and Learning & Teaching (L&T) items within the job satisfaction, role model and career advancement questions were calculated for the Professoriate (Levels D & E) and The Non-Professoriate (Levels A, B & C). These are shown in Table 4.4 and 4.5. The remainder of this section reports different comparisons between these items.

Research Activity	6. Job satisfaction		7. Role model		8. Job advancement	
	9. evel (D&E)	10. evel (ABC)	11. evel (D&E)	12. evel (ABC)	13. evel (D&E)	14. evel (ABC)
1. Publishing refereed Research papers	4.65	4.13	4.30	3.53	4.79	4.70
2. Participating in Research conferences	4.32	3.72	4.05	3.41	3.91	4.03
3. Keeping your Research at the cutting edge	4.59	4.13	4.32	3.34	4.46	4.36
4. Reading research literature in your field	4.09	3.76	3.99	3.12	4.06	4.08
5. Undertaking Research training	3.47	3.03	3.58	2.98	3.54	3.43
6. Reviewing Research papers/reports/activities	3.42	3.26	3.84	3.08	3.67	3.47
7. Participating in Research teams extending beyond the University		3.84		3.15		3.94
7. Fostering Research networks extending beyond the University	4.09		4.10		4.24	
8. Participating in collegial discussions about Research		3.69		3.16		3.54
8. Mentoring future Research leaders (variation of above question used at Monash)	4.23		4.17		3.65	
9. Contributing to Research teams within your University		3.69		3.28		3.85
9. Fostering Research teams within your University (variation of above question used at Monash).	4.18		4.01		4.02	
10. Strategic planning of Research activities	3.93	3.31	3.99	3.16	3.94	3.71
11. Securing funding for Research	3.99	3.23	4.01	3.37	4.61	4.51
12. Developing a high Research profile	4.19	3.46	4.10	3.38	4.57	4.58
13. Successfully implementing new Research projects	4.47	3.91	4.28	3.22	4.37	4.15
14. Advancing your Research knowledge and skills	4.33	4.09	4.13	3.08	3.96	3.81
15. Winning Research awards	3.93	3.55	3.66	3.12	4.15	4.21
16. Improving student satisfaction ratings for research supervision	4.00	3.68	4.13	2.88	3.73	3.44
Mean ratings	4.12	3.55	4.05	3.20	4.10	3.98

Table 4. 4: Mean values of Research activities for professoriate (Levels D&E) and non-professoriate (Levels A,B &C)

Learning & Teaching Activity	Job satisfaction		Role model		Job advancement	
	Level (D&E)	Level (ABC)	Level (D&E)	Level (ABC)	Level (D&E)	Level (ABC)
1. Publishing refereed Learning & Teaching papers	2.92	3.24	2.74	2.77	3.11	3.27
2. Participating in Higher Education L&T conferences	2.47	2.89	2.43	2.78	2.69	2.81
3. Keeping your Teaching resources up to date and effective	3.77	3.85	3.54	2.93	3.33	3.31
4. Reading L&T literature and research	2.80	2.98	2.72	2.59	2.48	2.67
5. Undertaking Learning & Teaching training	2.71	3.08	2.74	2.82	2.80	2.88
6. Reviewing Learning & Teaching papers/reports /activities	2.35	2.74	2.59	2.59	2.38	2.57
7. Participating in Learning & Teaching teams extending beyond the University		2.96		2.65		2.88
7. Fostering Learning & Teaching networks extending beyond the University	2.83		3.01		2.97	
8. Participating in collegial discussions about Learning & Teaching		3.51		3.02		2.84
8. Mentoring future Learning & Teaching leaders	3.14		3.31		3.02	
9. Contributing to Learning & Teaching teams within your University		3.399		2.89		3.06
9. Fostering Learning & Teaching teams within your University	3.01		2.97		3.12	
10. Strategic planning of Learning & Teaching activities	3.25	3.36	3.31	2.93	3.16	3.10
11. Securing funds for Learning and Teaching initiatives	2.86	3.05	2.87	2.83	3.47	3.24
12. Developing a high Learning & Teaching profile	3.29	3.56	3.20	2.95	3.54	3.51
13. Successfully implementing new Learning & Teaching initiatives	3.59	3.92	3.53	2.92	3.46	3.46
14. Advancing your Learning & Teaching knowledge and skills	3.50	3.84	3.49	2.98	3.14	3.24
15. Winning Learning & Teaching awards	2.91	3.37	2.86	3.03	3.47	3.63
16. Improving student satisfaction ratings for your Teaching	3.87	3.99	3.82	3.18	3.94	3.80
Mean ratings	3.09	3.36	3.09	2.91	3.11	3.12

Table 4.5: Mean values of Learning & Teaching activities for professoriate (Levels D&E) and non-professoriate (Levels A, B&C)

Research and Learning & Teaching items

Paired-samples t-tests were used to compare matched pairs of Research and L&T items, independent samples t-tests were used to compare ratings of Research and L&T items of Professoriate and Non-Professoriate groups and between male and female groups and ANOVA tests were used to compare ratings of Research and L&T items across academic levels. A significance level of $p < 0.05$ was used to determine differences. The wording on questions 7, 8 and 9 were different on the D&E and A, B & C surveys – leadership questions were changed to suit junior academics.

Comparison of matched pairs of Research and L & T items for the Professoriate

For the professoriate, most of the ratings for the research items were significantly higher than the corresponding L&T items. There were no cases where L&T items were rated higher than the corresponding L & T items. Figures 4.1, 4.2, and 4. 3 show the mean values for these items for job satisfaction, role model and career advancement questions.

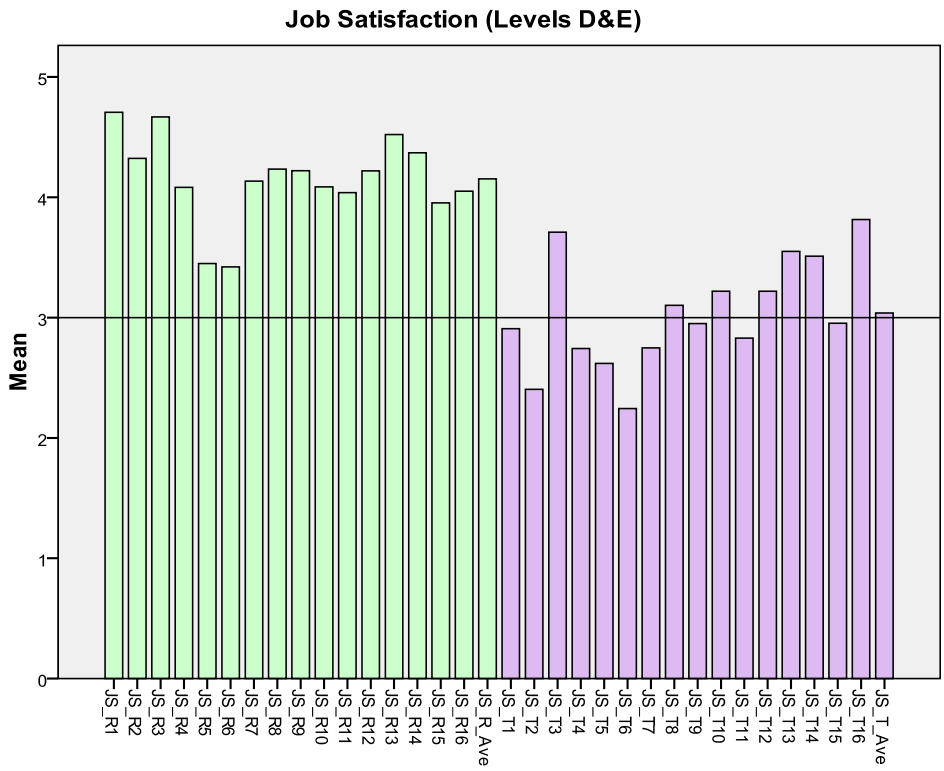

Figure 4.1: Extent of job satisfaction for Research and L & T activities for Professoriate

In relation to gaining personal job satisfaction from teaching compared to research activities, all the Research items were rated higher than the corresponding L&T items except for “Improving student satisfaction items” where no difference was found.

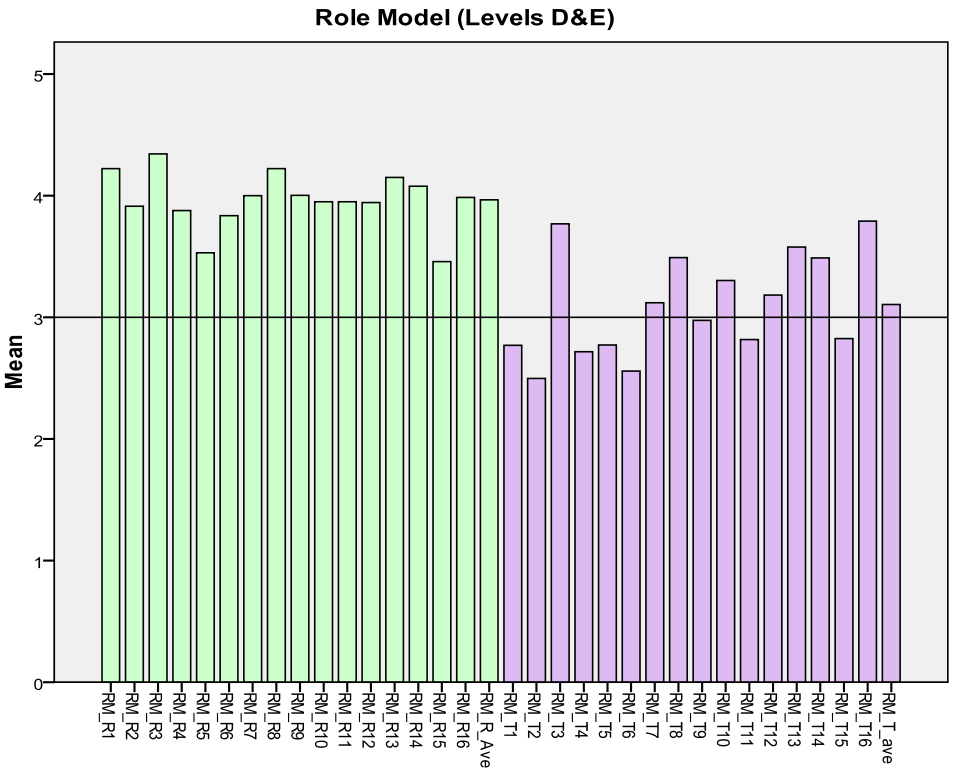

Figure 4.2: Professoriate perceptions of the extent to which senior academics are supportive role models for Research and L&T activities.

When asked to consider the extent to which senior academics were acting as supportive role models, all the Research items were rated higher than the corresponding L&T items.

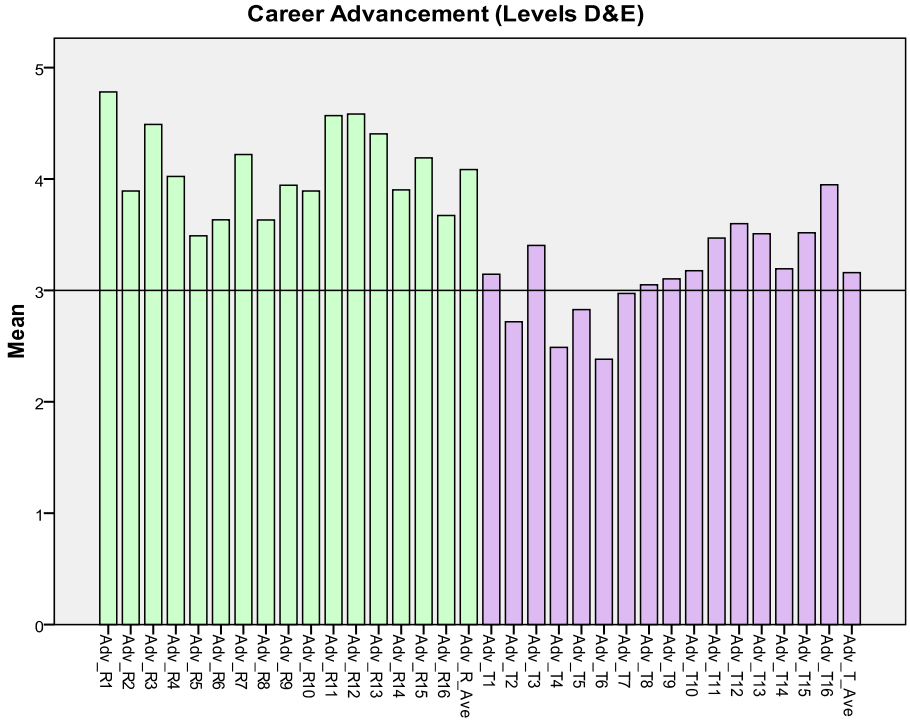

Figure 4.3: Professoriate perception of importance of Research and L&T activities for career advancement

When considering the importance of the variety of tasks in both Research and T&L activities to their career advancement in the academic profession, once again all the Research items were rated higher that the corresponding L&T items, except for “Improving student satisfaction” (R16/T16) where no difference was found. This was a clear indication that even research-oriented academics cared about the student perceptions of their teaching, at the very least.

Rank order comparison of Research and L & T items for the professoriate

To further draw out the differences between the rankings for Research and L&T, a comparison of the ranking of each item was also carried out. The rank order comparison (Table 4.6) gives a different perspective to comparing the absolute Likert values, as it shows how the professoriate *prioritise* activities against each other in both the Research and L&T domains.

In the tables 4.6, 4.7, and 4.8, the items are first ranked in research order of importance, and then matched against the L&T rank of the corresponding item.

(Topics, ordered by ranking from Research perspective)	**Research**	**L&T**	**Rank difference**
publishing refereed papers	1	10	-9
cutting edge and up to date	2	2	0
implementing new initiatives	3	3	0
advancing knowledge and skills	4	4	0
participating in conferences	5	15	-10
mentoring future leaders	6	7	-1
fostering teams within own uni	7	8	-1
developing high profile	8	5	3
fostering networks beyond own uni	9	12	-3
strategic planning of activities	10	6	4
reading literature in your field	11	13	-2
improving student satisfaction ratings	12	1	11
securing funding for activities	13	12	1
winning awards	14	9	5
undertaking training	15	14	1
reviewing papers/reports/actitivies	16	16	0

Table 4.6: Job Satisfaction (D&E)

This clearly shows that members of the professoriate gain higher job satisfaction for publishing refereed research papers and participating in research conferences than they do for L&T papers and L&T conferences. It also reinforces the results presented earlier showing that the professoriate do get higher job satisfaction from improving student satisfaction ratings for their teaching than for their research supervision.

But equally important are those where there is little difference in rank between the research and the L&T item. In particular, staying cutting edge and up-to-date, implementing new initiatives and advancing knowledge and skills are ranked the same for job satisfaction for both research and L&T. Note that although the rank order is the same, the absolute Likert values are higher for the Research activities than the L&T ones. This highlights the potential for using the bridging approach of this project in transferring these skills from a research domain to an L&T domain.

(Topics, ordered by ranking from Research perspective)	Research	L&T	Rank difference
cutting edge and up to date	1	2	-1
publishing refereed papers	2	12	-10
mentoring future leaders	3	4	-1
implementing new initiatives	4	3	1
advancing knowledge and skills	5	5	0
fostering teams within own uni	6	9	-3
fostering networks beyond own uni	7	8	-1
improving student satisfaction ratings	8	1	7
developing high profile	9	7	2
securing funding for activities	10	11	-1
strategic planning of activities	11	6	5
participating in conferences	12	16	-4
reading literature in your field	13	14	-1
reviewing papers/reports/actitivies	14	15	-1
undertaking training	15	13	2
winning awards	16	10	6

Table 4.7: Role Model (D&E)

The differences in table 4.7 are not as stark as for Job Satisfaction, but it does add a new item: winning awards. The professoriates do act as role models in winning teaching awards somewhat higher than being role models for winning research awards. However the “winning awards” item is quite low on the list for both Research and L&T (ranked lowest for research and 10th out of 16 for L&T).

(topics, ordered by ranking from Research perspective)	Research	T&L	rank difference
publishing refereed papers	1	9	-8
developing high profile	2	2	0
securing funding for activities	3	5	-2
cutting edge and up to date	4	6	-2
implementing new initiatives	5	4	1
fostering networks beyond own uni	6	12	-6
winning awards	7	3	4
reading literature in your field	8	15	-7
fostering teams within own uni	9	10	-1
strategic planning of activities	10	8	2
advancing knowledge and skills	11	7	4
participating in conferences	12	14	-2
mentoring future leaders	13	11	2
improving student satisfaction ratings	14	1	13
reviewing papers/reports/actitivies	15	16	-1
undertaking training	16	13	3

Table 4.8: Career Advancement (D&E)

It is interesting to note here the difference that fostering research networks beyond one’s own university and reading research literature are seen to be

somewhat more important for career advancement than the corresponding activities in the L& T domain.

Comparison of matched pairs of Research and L & T items for the Non-Professoriate

In contrast to the Professoriate, fewer differences were found between the matched pairs for the Non-Professoriate. There were number of Research items that were rated significantly higher than the corresponding L&T item and two cases where an L&T item was rated higher than the corresponding Research item. Figures 4.4, 4.5, and 4.6 show the mean values for these items for job satisfaction, role model and career advancement questions.

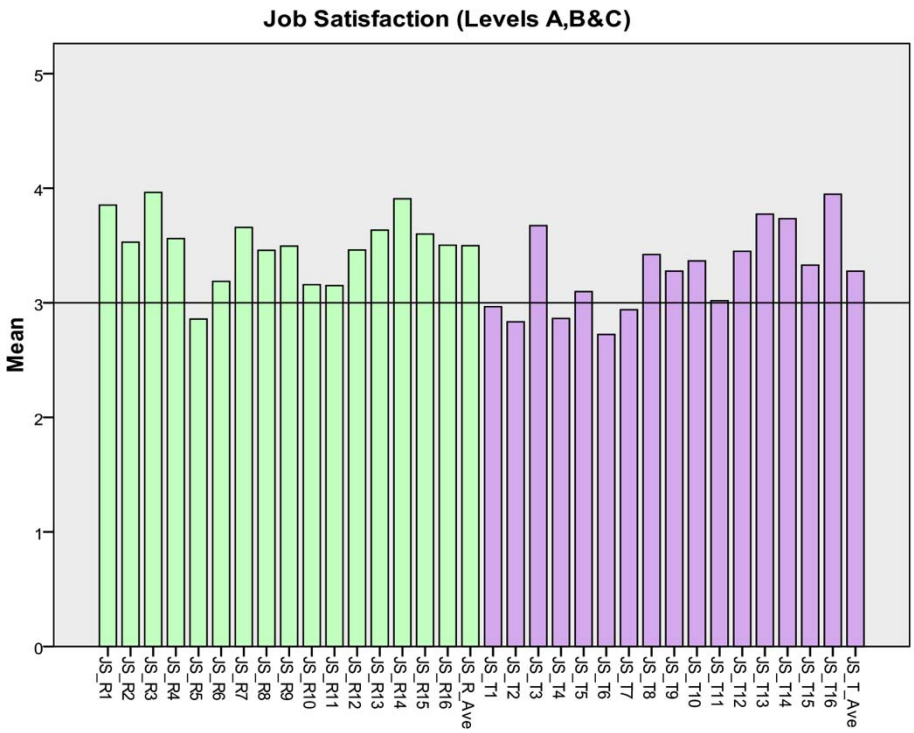

Table 4.4: Extent of job satisfaction for Research and L&T activities for Non-Professoriate

Research items (including research publishing, reading research, reviewing research, collaborating on and conducting research) were rated higher than the corresponding L&T items for personal job satisfaction. Only one L&T (T16) item was rated higher than a corresponding Research item (R16), which was “Improving student satisfaction items.” This was very much in line with the responses for the professoriate (D & E levels).

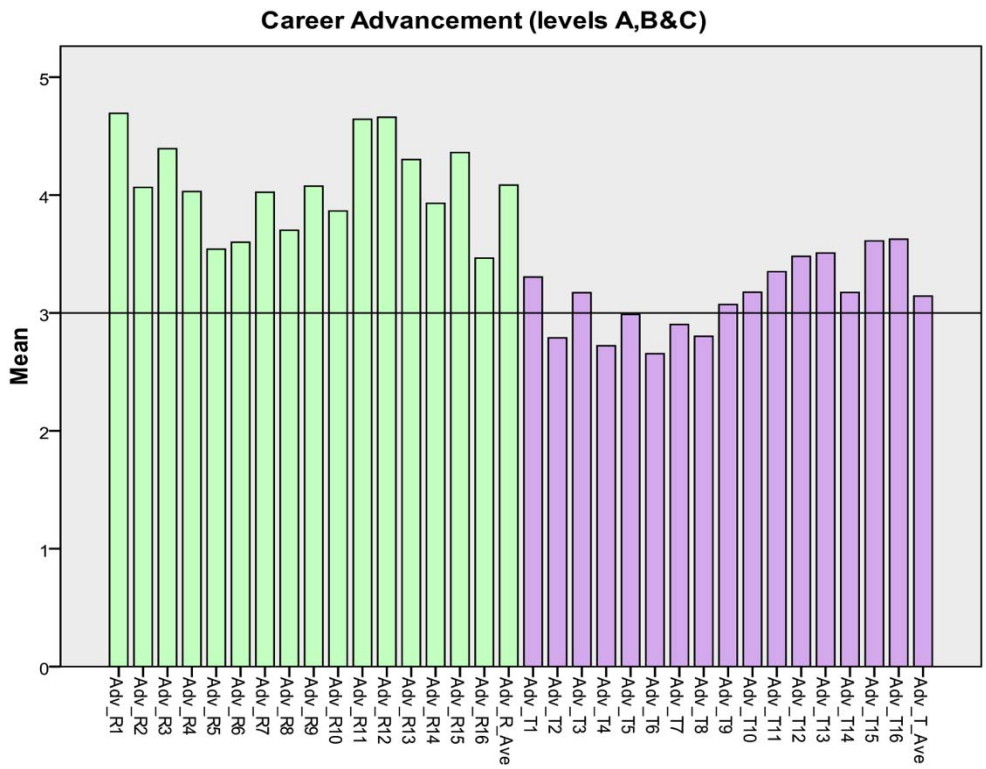

Table 4.5: Non-Professoriate perceptions of the extent to which senior academics are supportive role models for Research and L&T activities

When asked to rate the extent to which senior academics in their area were supportive role models the following the research items were once again rated higher that the corresponding L&T items, except for the “Improving student satisfaction” item.

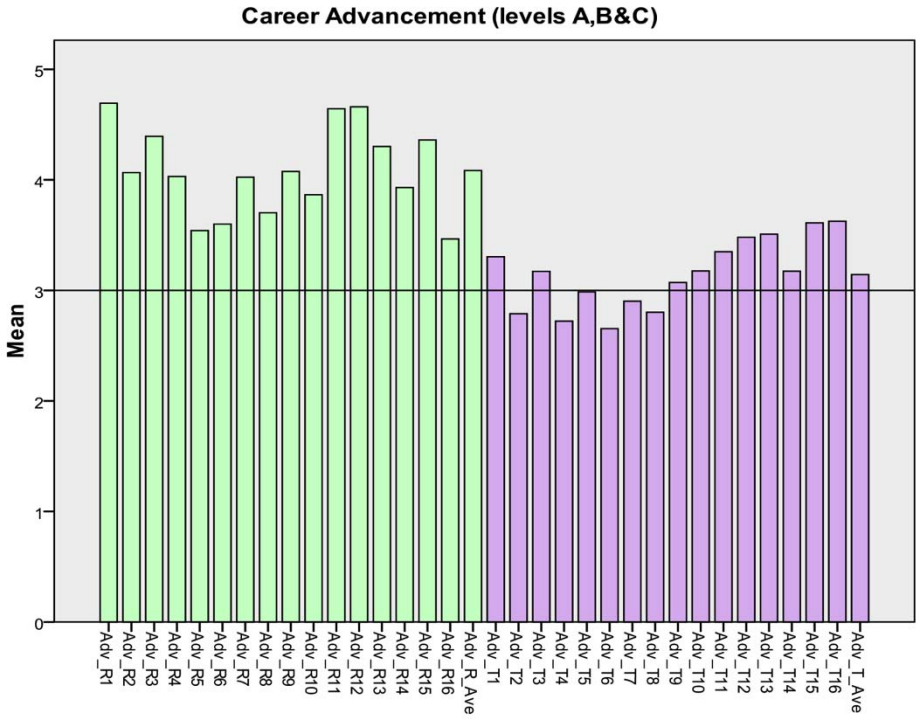

Table 4.6: Non-Professoriate perception of importance of Research and L&T activities for career advancement

For the questions related to advancement in the academic profession, all the Research items were rated higher that the corresponding L&T items except for "Improving student satisfaction items" for which the L&T item was rated higher than the corresponding Research item.

Comparison of Professoriate and Non-Professoriate Research items

Comparisons of the Professoriate and Non-Professoriate ratings of Research items found that Professoriate ratings were higher than the Non-Professoriate ratings for more than half the job satisfaction items and all the role model items. There were no items where the Non-Professoriate ratings were higher than the Professoriate ratings.

In general, there were clear trends of increasing job satisfaction moving up the academic scale, and an increasing perception of senior support as we moved up the academic scale also.

There were no differences in the ratings of the items perceived as important to career advancement between the Professoriate than the Non-professoriate. It is clear from this data that junior levels of academic staff have heard and

understood the aspects of academic work that is important to their career advancement, and it all appears to be research-focused rather than T & L focused. This further validated the need for a project such as this.

Comparison of Professoriate and Non-Professoriate T & L items

Comparisons of the Professoriate and Non-Professoriate ratings of T & L items found a number of differences. Further tests compared differences across the academic levels for each of the items but no clear trends were found although in general, there were some T & L related job satisfaction items that were rated higher for the non-professoriate including T & L training, new T & L initiatives, and T & L awards.

In regard to supportive role models, the Professoriate rated T & L items such as strategic T & L planning and implementation higher than the Non-Professoriate did.

These results reveal the different T & L roles that the Professoriate and Non-Professoriate are generally asked to engage in, with the Non-Professoriate academics performing the hands-on teaching roles while the Professoriate engaged in more high-level and strategic planning of T & L.

Comparison of Research items according to gender

Although not all respondents indicated their gender, among those who did, male academics gained more satisfaction from publishing refereed Research papers and also rated higher the extent to which senior academics were supportive role models their research.

Comparison of Learning & Teaching items according to gender

Comparisons between male and female ratings of T & L items found a number of items where the female ratings were higher, including participation in T & L conferences, keeping up to date with T & L research, and also securing funds for T & L research. There were no cases of higher male ratings for any T & L item.

Other Comparisons of Research and T & L items

Comparison of the Research and L&T items by discipline found very few differences, and comparison of the Research and L&T items by university also found very few differences.

Comparison of Attributes of Research and T & L Leaders

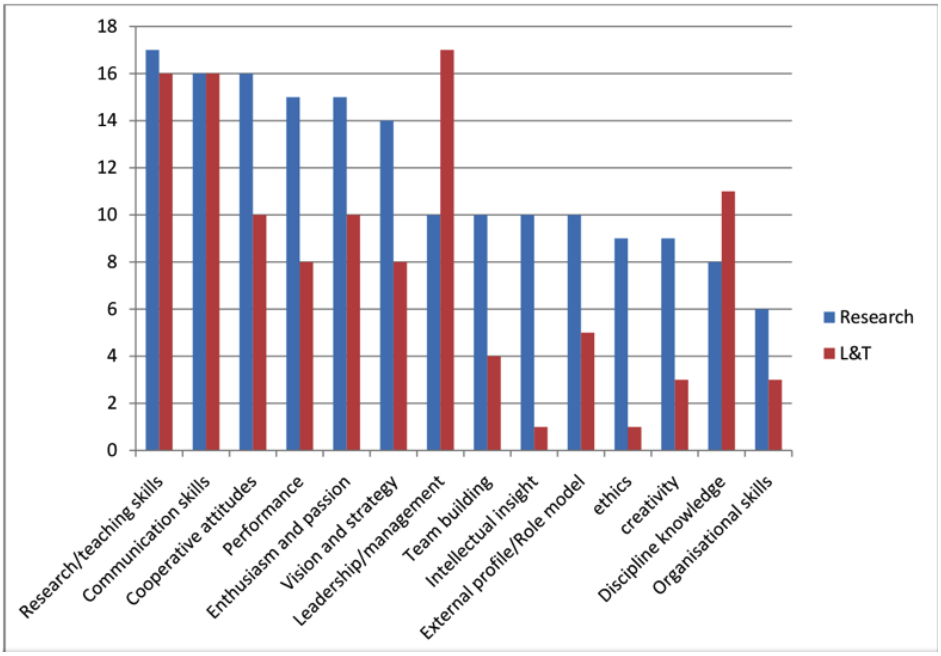

Figure 4.7: Professoriates' response to open questions on attributes of leaders in Research and Learning and Teaching: Common attributes compared

Figure 4.7 also shows a substantial overlap in the qualities listed for Research supervision and for Teaching, and for communication skills. This provides evidence of a potential for transfer of leadership from research to T & L.

9.3 Appendix 3: Summary of Bridge II workshop at UTS

Workshop and Discussion led by Wayne Brookes and Tim Aubrey

23 April 2010

Eight members from the Faculty of Engineering and Information Technology at UTS participated in the workshop.

Dr. Wayne Brookes presented the findings from the initial survey data on leadership from the professoriate at QUT, UTS, and Monash conducted last year.

Below are some notes that consist mainly of remarks made during Wayne's presentation of the data and afterwards during a discussion where all attendees participated.

Discussion

Participant A: Research and teaching are not separate. I consider them very much connected. We can integrate research with learning. Your passion for research reflects in your teaching.
Participant B: I agree, but does the university reward you for it? There is no incentive in teaching.
Participant C: Also, we have many consultant practitioners that teach. It's not hard to get good researchers to teach but hard to get teachers to do research.
Participant B: Do we have time for both?
Participant D: We are given all this literature about teaching and learning etc. but we don't understand it even when we read it. I don't understand what they are looking for or what they are trying to establish.
Participant A: We need a team approach within the faculty to identify different strengths within the faculty and work as a team.
Participant C: *Responding to the data graphs*: Perhaps Monash is at a cruising altitude and don't need that push?
Participant D: Monash has a medical faculty and that makes a difference in the research culture.
Participant B: Good to see data that confirms what we already know. We have discussed this research vs. teaching problem many times but we haven't moved an inch. What is the starting point to make the change? We are moving from anecdotal evidence to hard data. Who is going to let the VC know of this problem?
Participant B: Those who are not involved in teaching but publish papers are the ones who get promoted.
Participant D: I think it is important to recruit and involve undergraduate students into research. You may not see the results immediately, but you will have students in 3-4 years who are interested in your research and will be your PhD students and will ultimately advance your research agenda.
Participant B: We certainly need more admin. help so we can concentrate on teaching and research.
Participant C: We still have elements of T & L research outside the TED (Teaching and Educational Development Committee). We need to bring them together.
Participant D: We need more support in identifying teaching and learning theories to use and evaluate our T & L, not just in the delivery of the subject, but in the long-term consequences.
Participant B: What's the vision? Someone needs to come up with a well-articulated vision and take the lead.
Participant E: *Responding to the data*: This is pretty comprehensive. The questions on these survey show that some of these were developed over a long time and are good.
Participant F: It would be good if the faculty organised workshops on these

subjects that were discussed so we can share ideas with others on what has worked.
Participant G: It is also important to develop PhD students to become academics by matching them up to units they are interested in teaching and that is actually connected to their research rather than arbitrary allocation of units.
Participant D: Also have researchers give guest lectures in each other's classes.
Participant H: There is no teamwork on the pedagogy as the teaching allocation is content driven.
Participant D: Making undergraduate students more research-capable not just involves introducing our research to them, but also about building research skills and critical thinking skills. Also, if we want to attract more Australian students into research, then we need to pay them more. First, we need to get them to want to do research, then get them to do it, and then get them to finish what they started. That is the biggest challenge, as most of them get a job by Year 3 and take another 2-3 years to finish their final year.
Participant G: Even the PhDs are more valued by the industry than by academia.
Participant D: Undergraduate courses here (at UTS) are too good for their own good because the students are work-ready when they graduate and hence there are less PhD students.
Participant H: Even students who want to do a PhD could be asked to do a Masters rather than letting them do a PhD directly. In that way, they can choose to either articulate to a PhD or at least leave with a Masters if they are not able to complete a PhD.
Participant G: For some reason, Honours work by undergraduate students seem to get more points for PhD admission than Masters by coursework, which doesn't really make sense.
Participant C: We have increased the number of PhD students only because we have more scholarships available. If we have more money for scholarships, we will have a bigger pool to choose from.
Participant A: UNSW pay 5k plus 5k top-up on top of the APA scholarship.
Participant D: You need to be careful about what the universities say they do and what they actually do. They may be paying more to attract PhD students.
Participant G: Only 5-10% of undergraduate students may be capable of PhDs.
Participant D: We don't need to teach the research content to undergraduates, but we need to teach the research process.
Participant I: Yes, life-long learning skills are the same as the skills for a good researcher.
Participant H: Also, there is no way to document administratively how good a student might be.
Participant D: Perhaps we can stress innovation rather than research to get them interested? We academics are classic examples of “we're not interested; we're not going to do it” so why should the potential research student recruits be any different? Also, if a student gets 100 on a subject he or she loves and barely passes on the subjects they are not interested, why not encourage them in the areas they are interested in?
Participant G: No, we can't do that. They need to have a basic foundation in a wider area.
Participant D: If you wait till the final year to recruit PhD students, it's already too late. It is good to let them know early on what it is to be a research student and what it is to be a PhD student and what it involves.

Written input by participants in the workshop:

After the discussion, the participants were invited to walk around the World Cafe-style tables set up on one side of the meeting room that had three tables covered with chart paper (one table each for every year of the undergraduate degree). Here, they were asked to write down their ideas (and critique others' ideas) on how to motivate that cohort towards research and what are the problems involved. In

particular, they were asked to address the question "What approaches to build research, curiosity and life-long learning into…"– first year, middle years, and final years

a) **First year courses**
   - Include more mathematical subjects so that good students have good fundamental background for research
   - Concentrate on learning instead of teaching
   - Make it less boring
   - Introduce the idea of 'developing the question'
   - Capstone introductory concepts/ideas
   - Access process not just outcomes
   - Project-based activity
   - Have a few lectures in introductory first year subjects to be delivered by PhD students and their supervisors
   - Encourage some inspirational researchers to team-teach in first year subjects
   - get researcher to preset innovative material in the context of their subject
   - strip down research ideas and deliver the fundamentals as [being] open to questioning

b) **Middle year courses**
   - Pick 'good students' and offer them advanced subjects ("no comprises") and projects to train them in small groups
   - UTS research conference
   - Show students around research labs
   - Encourage students to go to doctorial presentations [DAs]
   - Include subjects on future vision and developments and what they will have to do to keep relevant [skills for life long learning?]
   - Internships
   - Using internships to work on research projects
   - Incorporate into real projects and shift fro real responsibility (?)
   - New pedagogy – problem base requiring research
   - Make learning more important than teaching
   - Start using current research projects as case studies in technical subjects
   - Flexible teaching programs –honours

c) **Final year courses**
   - Offer more specialised subjects
   - Internship caps – project in/with research centres
   - Co-authoring
   - Practice research (not just hear about it)
   - Offer a HECS free final year 12 CP capstone projects with a min. WAM [Weighted Average Mark] eg 72%
   - PSP [Professional Service Project] type subjects – in connection with late stage subjects to 'extend' students [summer projects + credit?]
   - Encourage enquiry discovery
   - Shift onus onto students (in a safe way)
   - Get students to set their own goals within subjects [eg learning contracts]
   - Highlight 'why' and identify the 'how' as the tool to get there
   - Learning space – work in the research lab [interact with the researchers?]
   - Invite high achieving final year students to research group seminars

9.4 Appendix 4: Summary of Bridge II workshop (1) at QUT:BEE

Workshop and Discussion led by Peter O'Shea and Sylvia Edwards
10th June 2010

The 40-minute workshop was attended by about 45 faculty members from the Faculty of Built Environment and Engineering at QUT and was part of a faculty meeting with the following agenda that was disseminated in advance of the meeting:

Professor Doug Hargraves first presented the results of the LEX (Learning Experience Survey) survey results within QUT that showed that the BEE school was doing better than most other faculty in how the students rated the teaching and learning within that faculty with respect to the units that were offered in Semester 1 2010. This provided a good segue into the T & L discussion to follow.

Next, Professor Peter O'Shea presented the findings from the initial survey data on leadership from the professoriate at QUT, UTS, and Monash conducted last year.

Below are some notes that consist mainly of remarks made during Peter's presentation where all attendees raised questions and made comments and participated enthusiastically.

Presentation and Discussion

Peter: Peter presented a slide that showed there were more recruitments but less completions of PhDs 2009 in the BEE faculty than in 2005, and that the number of completions was steadily declining.
Participant 1: But these figures are not comparable as it takes 3-5 years to complete a PhD. Unless we know what the recruitments were for well before 2005, we cannot compare these figures.
Participant 2: Nevertheless, it is accepted that completion rates are not that good.
Participant 3: [In response to the ALTC-Leadership survey data and Peter's statement that the findings were similar across the professoriate and non-professoriate across the three universities] There seems to be a significantly stronger commitment to research than to teaching. But are we comparing like to like? Faculty drives, direction, and motivations can be different. It may be a local thing here. What do Monash people think? How people would answer a particular question depends on the culture within the faculty.
Sylvia: The results are based on a survey with a set of matched indicators for teaching and research, about 15 for each: T & L indicators and research indicators. The study is focused on ICT and Engineering faculties that we surveyed in all three institutions.
Participant 4: There is a strong correlation between commitment and enjoyment.
Participant 2: What sorts of variation is there from the mean?
Peter: We did a statistical analysis and the results are significant.
Sylvia: Very few teaching indicators score *above* the median line, and very few research indicators score *below* the median. Except in regard to LEX scores or evaluation of their teaching by their students and the university is pushing it.
Participant 5: What's the problem with saying that we enjoy research more than teaching?
Participant 6: The university classifies PhD supervision as teaching, but I don't look at it the same way. PhD supervision is very much part of a research exercise.
Sylvia: There is an evaluation of PhD supervision (PREQ) but most post-graduate research survey people are not even aware it exists.
Participant 7: The teaching/research commitment of an academic by itself is not going to produce directly the outcome of graduation rates. There are other factors.
Participant 8: The university moving people round quite a bit does not help either.

The PhD students' labs are moved from campus to campus and some students have been held up by up to 6 months. There is accommodation for this in the scholarship.
Participant 9: Yes, the quality of space and access forces them to work from home, and hence they are more distracted.
Participant 8: In Civil Engineering alone, about 50 PhD students have been affected.
Participant 10: There is a difference between teaching UGs and supervision of PG and Research students. Pressure of numbers alone in UG makes it difficult to think of them as the same.
Participant 7: Working with your HDR student is different. They are part of your research team.
Participant 6: They are our peers rather than our students.
Participant 11: As a PhD student and also as someone who teaches and also supervises HDR students, the difference is that there is no lesson plan. As a PhD student I also need to learn research skills but there is no such plan or training available.
Participant 12: The things that supervisors are looking for in their students are very common to what teachers look for in their students, so why not make it clear in your study?
Sylvia: We did attempt to make it explicit.
Peter: There is the idea of “Deliberate Practice” by Matthew Syed that shows that rates of practice correlate with quality of performance. If we want to develop world-class expertise, recruiting talent alone is not enough. We need to put in a lot of effort. We need to provide feedback, direction, vision, examples, role modelling, and the right attitude.
Participant 13: How can we impart that drive and implementation in UG and PG?
Sylvia: We will have to start in UG so we can pipeline research and transition better to PG.
Participant 6: It depends on the degree of “withness” of the student. The apprenticeship model is the model that works for research students. I'd love to work with a 100 apprentices (UG), but how much of me can be with them?
Participant 8: Remember that your HDR students are already up there.
Participant 14: [to Peter] What was your hypothesis?
Peter: We didn't begin with a hypothesis. It is a study to determine the current state of the matter through a survey.
Participant 15: What if there is or there is not [a research/teaching nexus]? What does it mean?
Sylvia: The hypothesis is, I suppose, that we can prepare UG students better for PG. The researchers are forgetting how to pipeline the students through UG learning so they will transition better to research.
Participant 11: is there a correlation between a good researcher and a good teacher?
Peter: No, according to other studies, there is no such correlation.
Sylvia: We had used Julius Sumner Miller's statement in our proposal for this study as an exemplar of a teaching and research nexus, but research to date sows that the research/teaching nexus doesn't exist. When a HOS in your faculty completed our survey instrument and brought it back to us, he said: “Ouch, it really is black and white when you look at it like this!”
At this point, the meeting ran out of time. There is another Bridge 2 session scheduled for July.

9.5 Appendix 5: Summary of Bridge II workshop at QUT: FaST

WORKSHOP LEADERS: Professor Dann Mallet headed the workshop along with Paul Comiskey, the Curriculum Review Project Coordinator, and Professor Peter O'Shea.

WORKSHOP PARTICIPANTS: About 25 professors and associate professors participated in the workshop. There was also a Project Manager from another ALTC project at QUT-Law (Natalie Gamble) who came to observe the workshop. Both the current and previous Project Managers for the current ALTC-Leadership project, Bhuva Narayan and Pat Cretchley were also present as observers. Stephanie Beames from FaST was also present as an observer and promoted a science conference she was organising.

Stage 1:

The results of the Bridge 1 survey were distributed to the participants for review a couple of days before the workshop and hard copies of the same were provided to them at the workshop venue as they entered. Dann Mallet introduced Professor Peter O'Shea, who presented a quick recap of the results from the Bridge 1 survey and solicited questions or comments on the same. Below are the participants' input, where P# represents participant number:

P1: I understand the philosophy behind this teaching-research relationship, but we get mixed messages from the university about L & T. But it all comes down to competition at the end of the day.

P2: Intention does not lead to awareness.

P3: If you look at the Cambridge model, L & T and research are very much linked.

P4: But the Cambridge model has also led to L & T and research over industry needs and has led to the isolation of the industry from academia in the UK.

P5: The general feeling is that one gets more job satisfaction from research.

P6: That is also because we can measure excellence in research.

P7: What are we here to discuss? The invitation said we are going to discuss the curriculum, so let's get on with it. If I knew we were going to discuss this (the survey results) I wouldn't have come today. I came here to discuss how to increase our conversion rates of UG to HDR.

P8: We know that the high IP students are not motivated and may drop out, but we have a diverse target, so we have to be equitable and teach a broad range.

P2: High IP students who dropped out. Where do they go?

P5: Is it true attrition, or are those students changing to other courses within QUT? Or did they go to another university?

Dann: We don't have the numbers on that.

P9: SEO 1 is an 18-month-long stepping-stone, so we need to look at attrition over the 3 years. Our attrition rates in Life Sciences are very low over the 2nd and 3rd years.

P3: Many students are bored in 1st Year, as they have already covered the content

in Year 10.

P7: Is this universal or unique to QUT? If it is universal, then there's no point in us talking about it. There's nothing wrong with students doing what they want to do – they sometimes move to other professions like dentistry etc.

P5: Science is in crisis all over and not just at QUT.

P7: maybe they learned about other options after they came to QUT?

P9: We have statistics to say that 2% go to medicine and a few get into the Dean's scholar program and go on to do a PhD overseas.

P5: We have anecdotal evidence that in medical biotechnology capstone units, 30% are SEO 45 students and 70% SEO 1 pre-med students. We have many students wanting to know the answer to the question: Who should I do honours with so I can do medicine? Answer: No one.

P9: GPA for honours matter more than overall GPA.

P10: We are starting this process as if we are starting from Curriculum Review, but we have been talking about this for a while. The group came to the view that we have positioned ourselves for students to get a job, and not for research; only a fraction of our students go on to honours degrees.

P8: For students to go to higher degrees, we need to increase our honours cohort.

P5: Best way to do that is not sell honours as a pathway to research but to sell honours as a pathway to a better job, as honours students do get better jobs.

P7: I don't agree. I am not going to spend my time on non-productive PhD students who have been pushed into HDR in the hope of better jobs. I'll need QUT to pay me 15,000 a year more for that.

P11: Sorry P7, but having a pool of domestic students to pick from is not a bad thing. Forget about PhD and research and think of honours as a learning exercise that will keep them at QUT for another year.

P12: We have 6 Honours a year in IT, but 50 HDR students and they are not coming from within our own honours program. For students who get between OP 1-3, QUT is not their first choice. The quality of the students coming in is OP 4 and lower. QUT is very popular with first-in-family students who are motivated by the job prospects on account of our “real world” emphasis.

P13: I think we should all remember what our own experience at university was in order to understand our students.

P12: In fact, the students who go into honours or into a PhD are not always the high OP students. We underestimate the students. Also we can have PhD students who don't go on to be researchers but go into industry. There is a niche for everyone.

Stage 2:

After afternoon tea, Dann Mallet presented some of the recommendations from the Curriculum Review recently conducted at QUT-FaST, in particular, the following recommendations that pertained to research in undergraduate courses:

The QUT FaST Curriculum Review recommended incorporating clear pathways to honours and postgraduate research.

Recommendation 10: Introduce research and advance coursework streams into complementary studies component of UG courses with flexible architectures.

Recommendation 28: Some students, especially those who have undertaken basic sciences, maths or technology subjects at high school, and hence have considerable enabling knowledge, can be under-stimulated by material that seeks to up-skill students who have not previously studied these subjects…[these students need more encouragement into honours pathways through better engagement]

The Panel recommends that FaST strengthen the pathways to honours within the Faculty's undergraduate curricula through unit offerings which may include, but which may not be limited to, but include:

- Providing introductory level research concepts in first year options units (including exposure to the philosophy and sociology of science);
- Supervised smaller scale research projects;
- Methodological development units;
- Seminars and events showcasing exciting research;
- Cross-disciplinary project based units based on Faculty research themes in a global context and,
- Advanced topics/reading units

Stage 3:

After a brief discussion of the Curriculum Review Report recently completed at QUT-FaST, the participants were invited to move to the world-café style tables set up on one side of the meeting room, where they were asked to write their ideas in response to the following questions:

1. If you wanted to develop a new set of FaST UG courses what would they look like?
2. If you wanted any of the courses (in that set of courses) to pipeline your future HDR students – what would you want that course to include?
3. Other ideas?
4. What must we maintain?

Write your ideas down (1 to a post-it note):

First year (Yellow table)
Middle years (Orange table)
Final years (Green table)
FaST UG courses in general (Purple table)

Below are a few photos of the table set-up at the workshop:

After the participants spent 10 minutes writing down ideas on their post-it notes, they were asked to post them onto the respective tables, where each table had a volunteer table host who organised the ideas and also discussed them with the other participants who walked around from table to table reading each others' ideas, and also adding more ideas for the next 45 minutes.

Below are the written ideas from the post-it notes:

1. FIRST YEAR IDEAS

   Level of content

   - Drop a lot of the basic science taught in 1st year as much is already taught in high school
   - Stream 1st year students by previous experience and exposure to content by giving a 1st or 2nd week short quiz that can identify evidence of prior learning.
   - Stream 1st years through bridging and some advanced research focus.
   - Set theory: teach them the stuff they should have been taught in school but weren't.
   - Offer science bridging courses targeted at lower IP students and set higher standards for 1st year subjects.
   - Build basic essential knowledge and then offer streaming depending on major or degree

Careers and employability

- Offer a unit on “science is everyday survival” i.e., how you need maths to do landscape gardening, calculating the gradation of a road, what molecular events happen in cooking, what are the fundamental ingredients in cosmetics etc.
- Talk to students beginning in the 1st year about the benefit of honours in developing generic skills that will improve employability in many areas.
- Engage students in 1st year by career-pathway presentations by traditional scientists e.g., research or lab-based and non-traditional pathways e.g., science journalists and science editors.
- Try to embed the notion that you will not have a career if you don't study science. It is not optional. It is just as vital as English etc.
- Offer a unit on careers that explores the possibilities in particular disciplines with examples and case studies on how a particular science finds application in the workplace, and showcase examples of them.
- Offer a careers module that gives the students information on bachelors, honours, masters, and PhD careers.

Motivation

- What about the inverted curriculum? I think it will definitely help.
- Early units need active researchers teaching in them.
- Have research leaders work with teaching academics to present sub-sets of slides, or part presentations within lectures to illustrate the relevance of what they are learning and to illustrate approaches to solving problems.
- Include great lectures from inspiring researchers.
- We need more inspiring teachers in the first year.
- Have a session to 'explore a new idea” each week i.e., showcase research innovation in a given area relevant to the weekly lecture.
- Need to get across to the students that there is much more that we don't know than we do know. Maybe each subject should end with speculations about the future.
- Hold an introductory research seminar day one week each year and and make it a requirement for UG students.
- Hold a 1st year lunchtime research seminar/discussion for advanced students. UQ does this and has a selections process for the same.
- Regularly have researchers present to UG students about their research.
- If you want top researchers to do 1st year teaching then they need decent support for large classes.
- Have inspiring teachers especially in the first year and the final year.
- Send letters to good students at the end of 1st year to say they have pre-qualified for an honours degree and hold an awards night for students who excel in their 1st year.

Content

- Focus on problem-based learning.
- Maintain and improve hands-on practicals in the 1st year.
- Have 1st year practicals that are designed to generate skills. They

should have breadth, exposure to different disciplines, and small-group exercise.
- Offer units with some really exciting but really difficult content.
- Offer classes in basic Arithmetic and English

Contextualise with the Social Sciences and Humanities

- Bring a bit of culture and history into science teaching i.e., show how it's intertwined with the evolution of our society.
- Teach the history of the discipline, especially in IT
- Also contextualise with environmental studies by teaching the environmental and pathogenic basis of diseases, along with molecular, genetic, and cellular basis of diseases.
- Use themes like oil, rare metals, obesity etc., to teach about other implications like economy, environment, culture etc.
- New FaST UG courses should include compulsory topics/units from other disciplines to show students a broader picture of technology/research e.g., IT/EE, Law/IT, Eng/Maths etc.

Unit offerings

- Offer more choices for first year students and don't have a common first-year syllabus. Maths and Physics can be off-putting to Biologists.
- We need a strong cell biology unit that focuses on disease examples like cancer etc.
- Design 1st year units around what interests Year 10 students now.
- Teach how to evaluate research by asking the students to analyse claims made about new products etc.
- Bioscience degree should cover major health challenges to Australians like obesity, diabetes, heart disease, cancer etc.

MIDDLE YEAR IDEAS

Content

- Units should have a more integrated rather than a systematic approach.
- Units structured around themes rather than science without context.
- Find out about student aspirations and meet their expectations.
- Offer negotiated assessment opportunities.
- No exams until end of 3rd year, just as in Cambridge.
- Offer practicals that explore major problems/topics but provide the diverse skills required by the discipline.
- Require statistics course targeted for sciences

Streams

- Start to introduce more streaming options

Research in action

- Provide opportunities to see research outcomes and how they are actualised in practice.
- Have PhD students lecture and tutor in the subjects they are interested and engaged in rather than teach randomly assigned ones.
- Involve PhD students in developing the curriculum.
- Provide a resources summer 'research' program.
- Offer summer research scholarships
- Offer summer 'electives' for students interested in research.
- UG assignments and projects should be inspired by teachers' research work, and clearly flagged as such, so that students become aware that research even takes place at QUT!
- Provide group work options for minor research assignments with student-selected topics and encourage them to present findings to their class.
- Students should be able to submit short proposals to real-life researchers with QUT and elsewhere for evaluation and feedback.
- Offer seminars and modules to expose students to real research groups.
- Expose students more to the work in IHBI.
- Offer a Dean's Scholar type program to guide research
- Provide students with basic resources, labs, skills, and abilities that will help them explore their research questions.
- Career Advise and Motivation
- Start to introduce work-placement opportunities including working as RAs
- Introduce fieldwork and field trips for courses that do not traditionally offer them as such.
- Invite senior UG students to talk to freshman students about their experience.
- Invite alumni to talk to UG students.

IDEAS FOR FINAL YEARS

Research opportunities

- Offer units where students can develop potentially publishable papers working with researchers where they can perform a literature review in semester 1 and a carry out research in semester 2.
- Help students write PhD proposals for project work.
- Provide RA opportunities to students
- Provide group research opportunities

Research Content

- Students need more opportunities where they develop public speaking skills and learn how to make presentations of their research. Invite seniors to come talk in freshman classes.
- Focus on more contemporary issues
- Research programs and research groups could own specialist units.
- Provide problem-based learning options

- Integrate the knowledge from the different units that they have covered in the last three years.
- Offer units on applied-research
- Offer research-project-based units.
- Advanced UG units should focus of QUT's existing research strength.
- Offer capstone units where students can do a small research project.

Motivation

- Provide career advice, journal clubs, paper discussions, review of global developments etc.
- Provide credits for shadowing researchers in a field.

IDEAS FOR ALL YEARS

Incentives

- Provide fee waivers to good international UG students if they want to do honours. Currently, this is a big disincentive.
- Student-negotiated assessments
- Assessment items should allow opportunity for exploratory work.
- Require 100% attendance in lectures to pass.
- Offer General Science with a Major with a choice of a) general or broadening of topics, b) more specific and advances skills and knowledge, and c) interdisciplinary studies.
- Offer online lectures complemented by small group tutorial discussions.

Develop Critical Thinking Skills

- Analysis of seminal papers in science at UG level and teach critical evaluation.
- Hold seminars, book clubs, journal clubs, and show and tell.
- Teach scientific and technical writing as subjects, specifically.
- Infuse the teaching of problem solving, the scientific method, and curiosity into UG courses.
- The scientific method needs to be taught as a separate unit.
- Teach students to be reflective.
- Teach students how to utilise websites and other information tools to answer questions – information literacy?
- Offer technical writing classes.

9.5.1.1.1 Introducing Research

- Offer a research unit on project design, record keeping, report writing, commercialisation of research, publishing of research outcomes, and research collaboration.
- One research unit every year should be a requirement.
- There should be a short project every year with a performance requirement for entry.
- Hold a research showcase seminar series with QUT and other

research stars.
- Vertical and horizontal mapping of research skills throughout the curriculum.
- Need to map backwards from intended outcomes in 3rd year to what is needed in 1st year. Pathways should be outcome dependent.
- Stream research preparation units with mini projects etc.
- Offer science courses based on themes rather than disciplines e.g., energy technologies, drugs in sports, epidemiology through ICT etc.
- Stick with subject names that describe content e.g., can use a themed approach.
- Independent learning should be encouraged more, particularly in a group or team situation e.g., student teams should be provided with a research question or problem (including online problems) and need to design experiments to address the problem.
- Get real-world people, researchers and experts in to lecture in each of the 1, 2, 3 years.
- Use research / extension material for units that fill in the gaps and in streaming options.
- Offer honours with more coursework, less intensive research project emphasis. Focus on research training – not research results.

Motivation

- Regularly talk about great scientists and their lives in all undergrad classes.
- An UG course hat develops a thirst of new knowledge rather than an expectation of a finished product.

Contextualise with the Social Sciences and Humanities

- Offer Science and technology courses with a social aspect.
- Teach the history of science and philosophy

Career Pathways

- Need to map out job opportunities in Science more clearly, and not just in research. It can be combined to give you advantages in communications, law, teaching etc.
- We need a science course aimed at future school science teachers.

PEOPLE FACTOR

There was a separate table with the question: Who inspired you in your own research career?)

- A great 3rd year lecturer.
- An excellent professor who lectured in my 1st year unit.
- Watching Julius-Sumner Miller on Black & White ABC-TV back in the day (2 participants mentioned this)
- I switched to a science degree rather than a lab technician degree as originally planned (I was first-in-family) because my English encouraged me to aim higher.

MISCELLANEOUS IDEAS

Mentorship + pastoral care + university's identity + academic advising.

- Provide more pastoral care
- Help student develop their identity
- Active academic advising
- Provide lots of feedback and as much personal attention as possible.
- Invest in students in the UG courses.
- UG students should be invited to PG seminars and conferences also.

Spaces

- Use new spaces to challenge the way we teach
- Don't hesitate to diverge from the classroom and do some impromptu classes outside without any tech aids.

Image

- Make TV programs that make PhDs sexy
- Change QUT's advertising to present QUT as a place with exciting research.
- Get more OP 1-5 students into QUT.
- Perhaps use the word science less and technology more. School students understand technology as they use it all the time whereas science still means lab-coats to most.

Prediction

- Survey existing domestic HDR students in faculty to find ways to predict which 1st years are most likely to go to honours/ HDR

Preparation and partnership

- Why don't we work directly with schools and school curriculum more so we can help them prepare students better for university?
- Fund different project areas in a realistic fashion.
- Offer a B Phil like ANU (3 people suggested this).

Stage 4:

Finally, after the professors walked around the tables discussing their own and others' ideas with each and with the volunteer table hosts at each table, each of the table hosts presented a summary of what had transpired at their respective tables to the whole group.

First Year Table Host:

The comments at my table were about the methodology of teaching: more practicals, hands-on courses, inverted curriculum, problem-based learning, getting researchers to teach, careers and employability, career options and pathways, presentations by people who have proper jobs, how science is needed for survival, level of content, streaming options, and bridging courses. We also talked about providing choices, integrating sociology and history and society within the science curriculum and about emphasizing technology more than systematic science.

Middle Years Table Host:

Half of the comments at my table were about content. We need to provide sexier content, find ways to inspire students, get students to see what research goes on at QUT already, giving them research unit options and more flexibility of unit choices or even assessment choices within a unit. Lastly, we need to actively identify potential HDR students and nurture them.

Final Years Table Host:

We discussed research-based units, problem-based learning, and case studies. Also giving students opportunities to shadow a researcher. Students need to have concrete pathways to a career with enough choices within a broad range. Students need capstone units, statistics units, public speaking training, and knowledge of their chosen trades in the real world. Follow the Cambridge model of no exams until 3rd year and spend more time getting know your students.

All Years Table Host:

We discussed investing more in our students, providing students with feedback, providing them some personal attention, offering a bachelor of philosophy course like ANU, involving them in research earlier on in the UG program so they can complete a 2-year PhD, offering a coursework honours, emphasising research training, introducing themes into subjects, mapping research vertically and horizontally through the curriculum, and inculcating a research mind-set and research culture through campus activities and clubs.

The workshop lasted 2.5 hours. Many professors lingered on after the event to have coffee and to further discuss the issues with each other.

9.6 Appendix 6: Summary of Bridge II workshop at Monash

8th June 2010

John and Judy began the workshop with a summary of the purpose of the research project, a description of the project plan (Bridge 1, 2 and 3) and a PowerPoint presentation of some of the results from the Bridge 1 survey.

Comments made during the workshop by 10 participants.

P10: Can we carry over lessons learnt in research into the T&L area? There have been significant changes in T&L, moving more and more to services on the web. Is the curriculum well oriented to this? What skills, capabilities, knowledge can we give to our students in this environment? The rapid changes occurring in the environment are leading to rapid changes in leadership.

P1: (commenting on the graph of job satisfaction) We're saying, as level Bs and Es, we believe we get much more job satisfaction from our research than our L&T. That comes across the three institutions. Is that a problem we are facing?

P2: Isn't it kind of sad that the thing we like most about teaching is improving our ratings?

P10: Funding for research is nationally competitive. Inside the university there is a fixed budget for resources.

P1: We ought to look at job satisfaction models from the organisation management area. This might give insight into the different job satisfaction regarding L&T and research.

P4: Research into leadership and management in the corporate world shows up leadership to be more satisfying than managing. It looks like it might be a similar pattern between research and L&T.

P10: Is it more an entrenched cultural attitude than an ephemeral thing?

P1: If we don't see teaching as giving us job satisfaction we are not going to engage in it. What can we do to give us job satisfaction as a group of colleagues?

P5: Is there any indication whether this sort of thing has shifted over the years?

P10: There have been one or two studies in the last 10 years but no older data.

P5: You'd expect some shift in 10 years. If not, that would also be interesting.

P10: The articles have been prompted by greater accountability - how teaching and research attitudes have changed in that context.

P7: Teaching is usually seen in the context of some structure.

P2: With teaching, you are told what to teach but with research you choose what to research. There is more ownership.

P6: Promotion criteria are a factor.

P1: Is there something inherently in T&L that makes it less satisfying? If so, we need to change this in some way.

P5: It would be interesting to differentiate between type and level of teaching. People fight over who is going to teach some units, e.g. honours units as opposed to standard undergraduate units.

P4: If that were true you'd expect a difference in unit evaluation between honours and undergraduate units but the last time I saw the figures there was no difference.

P10: We talk about attracting good students, building up the learning ethos - students figure highly in general but the issue of student satisfaction is lessened in the case of 'research student satisfaction'. There is not the same level of filling in of surveys - if there was we would expect the two measures to be more consistent.

P7: With research, you are driving it, in L&T you don't have the same choice - you have to work within a certain framework.

P10: The faculty quality committee set out to identify discipline groups - so there were discussions about, for example, the best forms of labs, so that people might engage more with teaching. With teaching you are given an environment and you have to work within that.

P4: It's a question of scale, too, isn't it - one is higher and one is lower than the other. We rated people on how research-active they were. We compared this to teaching ratings and found no relationship - negative or positive.

P1: There’s really very little relationship between them.

P4: It's interesting to look at the ratings. What's actually holding me back from doing a good job? One approach is to cut out the lower factors and improve the top end.... Consistency has always been a worry but now it's become a severe worry...The bottom end items are seen as making people's job difficult...You can't answer from the survey what is giving me negative satisfaction. You might want an answer to this as this impacts negatively on my teaching activity - it's not just rewards that impact on it.

P2: The survey questions on conferences - the majority are not attending them, so the ratings are likely to be skewed.

P1: It's still somewhat associated with the Schools' lack of ownership of the degrees - they are not really ours anymore, because of the structural changes in universities.

P10: Approaches to teaching depend on the individual rather than the research direction.

P1: Is this similar to how we are organised or not?

P10: This is the motivation for the discipline groups that the quality committee is exploring. It is an attempt to identify overlap and synergy between different areas.

The presentation concluded by emphasizing the opportunity to become better teachers by paying attention to the research that is going on in our environment - the strengths we might exploit, the weaknesses, the opportunities, and the threats.

P2: What's strength in Monash - our strengths in relation to raising the 'scores'?

P10: The strengths are what we have. The opportunities are where we would like to go. How do we improve the ratings for job satisfaction?

P9: Do the results of the survey - the low teaching score – is this due to low satisfaction from teaching or that teaching doesn't help in achieving promotion? That you are not promoted due to your teaching so you put in the minimum effort? Or is it that people don't get any satisfaction from teaching?

P1: I think we're pointing to a very serious anxiety here. I think the current structure of universities is under serious threat because we are using a business model. Look at on-line universities. Building infrastructure is so expensive. Students will vote with their feet. The structure we are using is defunct.

P1 cont.: We probably don't get satisfaction from teaching because we are doing the same thing we've done for years. But the student body has changed. What can we do to transform the model we use for teaching? For example, how can we change learning spaces, simulation models? What environment for teaching & learning do we want to create if we had the resources and time? We don't, so we keep doing what we have been doing.

P7: A lot of resources are needed to use new technology such as the web.

P10: We could be more collaborative about it. We could get away from the model of one staff member per unit. Learning materials could be generated by a range of people, not just one.

P2: There is a very different perspective now. What students are buying isn't knowledge but credentials. This is one of the things I find very demoralizing.

P8: Now the expectation is that it's a product – we've paid our money to get our degree.

P9: I still love giving lectures, but if others don't, I'm wondering why? Is it because they haven't had enough time to prepare the lecture? Or do they feel they've put so much effort into it but it hasn't been appreciated?

P4: We can only speculate on things like this. With individual teachers who have high job satisfaction – perhaps we should interview them about why? There is far more excitement in research that in teaching because new things are happening. Learning environments need to change but that doesn't mean technology has to drive that. People can get excitement from quite different things.

P7: One issue is – if people were provided with all the resources would there be better interaction?

P1: If we assume it is correct that universities aim at giving high credentials – are we wasting our time thinking about the quality of teaching?

P3: The crude business model is to get the most students through – to entertain them and make them feel like they've learnt something and get good grades. But part of the business model is the reputation of graduates in the workforce.

P10: For very good students entertainment means providing very good material.

P1: If we think about it rationally that model is not what we should go with.

P3: I don't think that's what universities should be doing

P9: Students come here because of the reputation of the university.

P10: If the university has high-flying researchers the students will come.

P5: Perhaps it's a good idea to outsource parts of a course to on-line or commercial providers (e.g. programming) but the higher units need more discussion and face-to-face contact.

P7: Being able to think is one of the most important things. Students need to learn how to learn, how to do research, how to think outside the square.

P10: Thinking is something you get from a face-to-face situation, not a multimedia environment. In one high profile university the failure rate dropped when there was more face-to-face teaching.

P1: There is a need to outsource a lot of it.

P10: For face-to-face teaching you need high quality people.

P3: Outsourcing is very dangerous – why not go straight to the Open University?

P10: We have to work with what we've got. We can't run the entire university on high achievers. How do we address a low performing profile and make it a high performing profile? To feel job satisfaction, people need to see tangible rewards coming their way. Even the worst lecturer needs to be better.

P7: Something that I've found extremely rewarding- and so have the students – is a group project – where you don't just go away and do it. Students see these as an opportunity to show off their talents, to contribute to something (e.g. a project on an information system on the Marshall Islands). It takes a lot of work but it is very rewarding.

P9: If you are going that way you need to find a way of rewarding a lot of people. Recognition that is not meaningless – is that what you are talking about?

P9: Or do we need a seminar on how to get classes interesting?

P10: Both.

P1: There have been a whole series of teaching workshops. We try to identify a 'low hanging fruit', the things that give quick results. But this is not grabbing people. The satisfaction is probably between you and your student. We have tried a lot of things (eg peer assisted students) but are not seeing much change.

P3: The infrastructure discourages creativity – the procedural infrastructure to introduce new teaching mechanisms and so on. Creative ways of doing things that are so very engaging to students are hard to do. There isn't enough time or resources. We've seen increased bureaucratization of teaching and this has pulled up the minimum standard but it has also dropped the maximum standard. Doing things differently (eg an intensive workshop) is very hard to do because of the infrastructure and bureaucracy. It's worth taking a look at Monash High School – they have been able to do more interesting things.

P5: We need freedom to experiment with new forms. If we want to do something new that involves the development of materials we need more time – otherwise we lose time from research. Maybe we could run an internal competition asking for ideas for what could be done, then choose a few of them and develop them.

P3: Could we offer a semester off for teaching development - a TSP (teaching study period)?

P5: But most people won't want to give up their research for this.

P1: Could we put up a concrete proposition – arguing that, say, $100,000 is needed to do it? We've been building up a war chest. I think the teaching area is absolutely critical – this is a way of both generating enthusiasm within the faculty, but also a threat. We need a vision for what we want to be doing in teaching that would really excite us.

P10: We need to scale this across the faculty too. And it needs a school or faculty level process to it. We could try out innovative ideas across a group of academics, teachers. How to take an innovative approach? Build on our own momentum.

P5: That's a top-down approach. A bottom-up approach might be more likely to grow. As Ron says, we need things that are do-able.

P1: What if the top-down challenge was to throw out the degree and start again? Is this a challenge that would engage people?

P5: Or should we make changes in smaller steps so people can engage with it?

P3: Massive changes are less likely to work.

P9: It should also involve passion. A 6-month project would remove some of the constraints.

P8: Are we focusing too much on the score? It's good in one sense but it kills creativity. When I was at RMIT they said they were interested in what experiments and improvements they have done. If you do that here, my score would drop down and I wouldn't dare to risk that so I do what I'm good at rather than risking my score going down.

P9: Not focusing on the score – that's already happening. It's all about how you are engaging your students.

P7: We could be looking at a completely new unit – e.g. a unit that gets more research into the undergraduate.

P6: Within the faculty we can work on some ideas.

P3: I think it's about rethinking the procedure by which units are offered.

P1: Can I just challenge you again here? We need lots of time to give to a small group of colleagues – assuming we could start from the beginning.

P5: It may be productive to consider a completely different kind of degree.

P1: Even if this doesn't work, we could then reflect on our current degrees. If, say – at the end of the year we want a completely new idea of teaching.

P1: What say we give the challenge to some students?

P9: I love teaching and I teach first year undergraduates. I really love it. It can't just be that what we're doing is the basics. We need time to develop something that we're happy with. Take the restrictions off. TSP (Teaching Support Programmes) is a good idea.

P10: It comes back to peer group pressure – the way you get enthusiasm to spread.

P9: I'd rather invite people's creativity to generate enthusiasm.

P10: We could ask people to get together in twos and threes to look at a particular idea.

P5: Call for initiatives to improve teacher quality?

P10: We could offer a sweetener – to get people working for a year or so and the best one gets a TSP.

Written input by participants in the workshop

After the discussion, four sheets of chart paper were placed on the table and the participants were invited to write down their ideas (and critique others' ideas) on the Faculty's strengths and weaknesses, opportunities and threats.

Responses given for **strengths**

- Size
- Diversity of knowledge and skills
- Disciplinary strengths
- Cross campus links + cross faculty links
- Industry links
- Passion for teaching among some staff
- Leading edge research
- Cross-disciplinary research

Responses given for **weaknesses**

- Staff feel lack of ownership of the programs into which they teach
- Lack of deep knowledge within the Faculty about how to:
    - Teach well in a 'new' world of student
    - Exploit new teaching and learning technologies
- Fragmentation of research
- Changes in metrics and focus teaching vs research
- Homogeneous approach to teaching
- Not enough recognition of L/T
- Overloading of staff

Responses given for **opportunities**

- Major changes in environment of IT create major incentives for change
- New technologies potentially change the way we might do teaching and learning (eg new forms of learning spaces)
- Increasing support for interdisciplinary (cross Faculty) programs
- Passport - research led teaching is being emphasized (and resourced?)
- Monash High School + Nossal High School
- KPIs in education
- Relevant of IT research to environmental issues etc.
- E-science//increasing role of IT in other fields
- Expertise in IT education
- Engaging students through social internetworking

Responses given for **weaknesses**

- Administrative overhead
- Changes in technology

- Student expectations and requirements
- Viability of Faculty
- Commercial competition
- World-wide rankings
- Workload
- Lack of recognition
- Students focussed on passing
- Low quality students and no separation between cohorts
- Death by Powerpoint
- Substantial changes in workplace (eg move to the 'cloud'?)
- Emergence of new on-line universities that offer high-quality learning objects

9.7 Appendix 7: Summary of six additional Bridge II workshops at QUT: FaST

Curriculum Renewal Workshops

There were 6 workshops in total: 2 workshops discussing the idea of "streaming", 2 discussing revitalizing practical and laboratory work in our courses, and 2 related to the concept of the inverted curriculum. These three major themes (streaming, practicals, and inverted curriculum) were identified as priorities in the FaST Curriculum Review Recommendations.

Inverted curriculum workshops (Leaders: Ron Epping & Richard Thomas)

If you are a Unit Coordinator then the current redesign of the courses and majors in FaST presents a timely opportunity to re-examine the link between unit learning outcomes and assessment processes adopted in our units. In any redesign of your unit(s), start by asking yourself the following questions:

Are my expected unit learning outcomes still the same? Please reconsider the position of your unit in the new course(s); the nature of your student cohort (often from a variety of courses) and the "assumed knowledge" for those units that have nominated your unit as a prerequisite. This requires that you should examine the content of your unit in detail with the relevant unit coordinator(s).

What is the best assessment method(s) to use to measure my learning outcomes? Are mid-semester and end-of-semester exams my only real option? We should try to avoid simple reliance on a final formal examination, but wherever appropriate consider authentic learning strategies that engage students more effectively and provide more formative and summative assessment throughout the semester. Students come to us from Secondary education with this expectation.

Is it possible for me to adjust my syllabus to demonstrate a more inverted curriculum? Recent curriculum renewal workshops have explored how an *inverted* curriculum might engage and challenge students more effectively (i.e. having students engage in authentic research or problem solving tasks related to big-picture science *EARLY*, before providing them with all the necessary detail – providing for a more contextual and enjoyable learning experience. In line with the inverted curriculum approach, a host of other factors for consideration emerged in the workshops including:

- The need to promote and glamorise real career paths in science and the achievements of past graduates.
- Involving postgraduate researchers in teaching from first year level.
- Nurturing problem-solving skills with more real life examples, issues and data from both research and industry.
- Consider introducing new, highly relevant lab exercises to new courses.
- Understanding what employers are seeking in our graduates.

For more information on Inverted Curriculum, see:
https://wiki.qut.edu.au/display/scitech/Inverted+Curriculum+and+backward+mapping

Can I still assume prerequisite units have adequately prepared my students for my unit? "The basics" is something for which all teachers must assume responsibility. Teachers in earlier units should not wear the blame for students' deficiencies. If students struggle with particular concepts then we should all reinforce/repeat some materials already covered to ensure that "the basics" are ingrained throughout the course within an appropriate context(s) and are well understood. More difficult content/concepts may require teachers to backward and

forward map to complete the development of the concept, sometimes through several previous units.

Summary

Many of us have considerable teaching experience and some may resent the implication that the new courses necessitate the introduction of a whole range of new teaching strategies. But this is not the case.

The questions above are intended to encourage everyone to re-examine and reconcile our teaching strategies and philosophies with anticipated outcomes. With help from the Academic and Curriculum Team and Curriculum Design Teams, we should strive to engineer learning and assessment environments that work really well for us, fostering generic skills that we value in a contemporary scientist, exploiting every opportunity for more authentic learning and stimulating our students to achieve the very best that they can.

Streaming workshops (Leaders: Dann Mallet & Paul Comiskey)

As with most of the curriculum renewal workshops, the streaming workshops provided to academics across the faculty's disciplines, insight into various strategies that have been working well to cater for different types of learners, as well as some gaps that exist in different areas. This summary provides a brief description of how these strategies can be continued and/or extended as well as some new ideas that academics in the faculty would like to see form part of our new curriculum, catering for the diverse group of learners entering courses in FaST.

What are streams? Streams are 48cp sets of units that complement the core and major studies in a course, and fit neatly into the 96cp of a 3 year course known at QUT as "complementary studies".

Why talk about streams? Streaming allows us to offer high quality courses in S, T & M (with a core and major) while simultaneously catering for the needs and wants of a diverse group of incoming students. Streams can

- Increase engagement and reduce attrition
- Stimulate high achievers
- Engage non-scientists
- Allow connections with industry, international experience
- Allow flexibility and alternatives
- Lead to HDR enrolments.

What streams should/could we develop? Various streams could be developed to cater for our students, including:

- Research pathway/preparation stream (units such as Exposure to Research, Research Methods, Research Project)
- Advanced coursework stream (units beyond those in majors – could be faculty wide unit codes, non-workload, special topics etc)
- Disciplinary minor streams (units taken from existing majors, marketed as minors)
- Requisite studies stream (facilitating progress of students with weaker backgrounds)
- Streams allowing easy inclusion of existing study options such as:
    - Co-operative education/Industry experience stream
    - International exchange
    - Interfaculty studies (involves students taking existing or new university-wide minors offered by other faculties)
- Within-unit streaming using student-negotiated assessment, modular units and delivery modes for accelerated learning.

Can streaming work? Yes – but students need to be informed of their options and advised based on their needs and aspirations.

How might we implement streams into our courses? Various possibilities exist, depending on the way each design team develops their course structure. These are merely suggestions of possibilities.

- 48cp spread evenly over four different semesters (e.g. research stream, interfaculty studies)
- 48cp, 24cp per semester for one year (e.g. advanced disciplinary stream, discipline/cross-discipline minor)
- 48cp in a single semester (e.g. international exchange, cooperative education)
- Units that have symbiotic relationship (run at the same time, providing support) to core units (e.g. requisite studies)

Faculty-wide units

- Using somewhat generic faculty-wide units may increase economic viability of units. For example,
    - a 4 unit set of international exchange units (or a 48cp unit)
    - a 4 unit set of cooperative education units (or a 48cp unit)
    - a set of research preparation/experience units
    - a set of requisite studies units
- Disciplinary studies (advanced or standard) may or may not be standard units existing in the disciplines or new units. They may also be faculty-wide units taught into by discipline academics.
- Wherever faculty-wide units are employed, it must be kept in mind that learning outcomes, descriptions of content etc., must be generic enough as to make the units flexible for use across the faculty.

Revitalising labs/practicals workshops
(Leaders: Mark O'Brien & Robin Thwaites)

The approach to the Revitalising Practicals Theme can be categorised into the 6 key areas below. It is important to recognise that the term "practicals" is an umbrella concept covering all of the following: dry lab experiences, wet lab experiences, virtual lab experiences, and field trips.

A. RESOURCING

1. Most agree that more funding for even baseline resources is necessary. It is critical that the equipment being employed across the spectrum of laboratory experiences be up-to-date as this reflects upon our credibility to offer world class learning experiences as per the Faculty Mission Statement. More funding to adequately maintain our current resources is needed together with funding for upgrading of out-dated, obsolete resources and laboratory infrastructure.
2. Since funding is always an issue, it is envisioned that "model" practicals be set-up in each discipline and evaluated. Successful models can be rolled-out across disciplines with funding coming from ALTC grant support in a step-by-step strategic approach. Unsuccessful models can be terminated thus minimising capital expenditure in the short-term.
3. One recommendation has been to establish dedicated laboratory spaces that are not currently available, but would meet a critical demand. e.g., Anatomy 3D model lab. Blended learning experiences are being seriously considered (and in a few cases implemented) across the Faculty. Use of multimedia in labs as a complement to non-PC based pedagogy is slowly gaining momentum.
4. Industry-sponsored labs are quite a novel way of looking at our practical

experiences. This would appeal to industry, as they would want to be seen as good corporate citizens. The use of their equipment in our practicals provides industry sponsors with brand-recognition.

B. PRACTICALS STRUCTURE

1. Usually a 12cp unit is structured as 2hr lectures plus 2hr practical per week. This varies across the Faculty with some units having 2 + 3 or even 2 + 4 model. Flexibility in hours should be formally recognised and approved on a case-by-case basis with justification (determined according to learning outcomes and consider with staff workload).
2. Post-experimental discussion should be happening either at the end of the lab session, during the lab session or afterwards via a tute or Blackboard discussion.
3. Wherever possible, simultaneous (wet/dry) lab classes should be considered to reduce the teacher: student ratio by allowing teachers to move between (connecting) labs.

C. LEARNING AND TEACHING OUTCOMES

1. Need to identify fundamental and advanced skills being used/developed; reflective of workplace and research-setting drivers.
2. Practicals need to emphasise "hands-on engagement", though the value of virtual lab experiences should not be undervalued.
3. Key attributes to aspire to include: scientific thinking, critical thinking, inductive reasoning, problem solving, communication teamwork, concept recognition, and QA Systems.
4. Key attributes should coincide with employer's/research supervisor's requirements.

D. PEDAGOGICAL STRATEGIES

1. Various approaches to consider: Context-based, Enquiry-based; Problem-based, Scenario-based, Authentic learning, Life-Long Learning
2. Integration between lectures/tutes/practicals is essential to ensure a coherent pathway of learning and eliminate disconnectedness in learning.
3. Incorporation of mini-project unit in curriculum allows for team-based learning experiences.
4. Design practicals that connect practical experiences directly with the workplace. Needs to be a greater involvement with industry in this regard forging key networking relationships.

E. STAFFING EXPERTISE

1. Possible advantages to having a hierarchical (mentored) teaching team in the lab setting: e.g., Jnr sessional → Snr sessional → Lab Coordinator.
2. Demonstrator training is critical to good teaching and effective learning.
3. External-based sessional academics to provide a rich, diverse, relevant learning experience for students and forge important industry links.

F. THE STUDENT EXPERIENCE

1. Practicals should be designed so that they are engaging, instructional and informative, and also enjoyable for students.
2. Science practicals should stimulate, develop and refine enquiring minds.
3. Students should exit each practical experience feeling that they have learned something and not just performed a series of unconnected exercises. Knowledge and understanding should underpin all types practical experiences.

9.8 Appendix 8: Summary of Bridge III workshops at UTS

Date: 12th May 2011, 2-4 pm

Introduction by A/Dean (T&L) – Dr Tim Aubrey

UTS Model of Learning (hand-out with case studies):

- What is it? Part of the strategic plan from 2009 – will be a main focus of UTS AUQA audit in 2012.
- Interpretation –Implementation – integration – engagement and motivation and learning.
- Academic leaders from professoriate are needed as examples of how we implement the UTS model of learning and to encourage/inspire other academics

Drivers for curriculum renewal:

1. AUQA + accreditation (AQF)
2. New Technology Building
3. UTS Strategic plan – a reality
4. Ideas and research projects (Help the executive see ways to support you):
    - Be a mentor
    - Apply for faculty grants
    - Champions of progressive ideas, include some measured risk-taking
    - Understanding of and nurturing others in understanding of modern pedagogical opportunities, remembering that we have some international recognition already.

Presentations:

1. Prof Jie Lu, Head of School of Software, UTS FEIT: Research and Teaching Integration
2. Dr Nathan Kirchner, School of Electrical, Mechanical, and Mechatronics (UTS FEIT): Teaching/Learning, Research and University (TRU) Integration Model

9.8.1 Professor Lu's Presentation

Research and Teaching Integration through three themes

1. Embed research outcomes and methods into current subjects in course

Rationale

- Use solutions of research problems as motivation for learning
- Teach students how to perform research

Ideas

I. PG coursework subjects
    a. Embed ARC grant results in subjects
        i. Develop courseware tools (software) based on ARC published results with student version to be used in subjects
    b. Advantages:
        i. Real world applications to help students understand complex ideas
        ii. Learn how to handle real world problems

II. UG subjects
    a. Research methodology – problem solving skills, e.g.:
        1. First year students review research papers, write technical reports
        2. Software development subjects – identify a problem, compare possible solutions, and link to other subjects
    b. Develop creative thinking and problem solving activities

c. Use own experience to teach how to be more effective when writing and reading research

III. Research students: move from dependent to independent learners
   a. Doctoral assessment preparation
   b. Thesis writing
   c. PhD study at UTS
   d. ARC writing activities

2. Apply research outcomes and methods to enhance the learning environment
   a. Develop new subjects
   b. Apply for T&L grants
   c. Apply advanced research results to develop effective teaching approaches
      i. E.g. e-service 'personalised teaching' approach
      ii. Involve students in research projects (coursework PG)
      iii. Provide opportunities for research and coursework students to learn together
   d. Build support programs, e.g. develop subject recommendation system
3. Enable students to experience research
   a. Coursework students can be involved in research projects (skills), pilot research, produce research papers, disseminate own research results

Discussion

- Teaching and research – parallel universes; no incentives to encourage interaction
- No incentives for integrating research and T&L.
  - Research professors are not interested in coursework students (perhaps research strengths should have a KPI of how many coursework students they have engaged with)
  - Reward people for building research strengths in coursework subjects, separate to ERA
  - How many coursework students go onto research, and not necessarily at UTS?

- No incentives for writing a textbook

  - No credit for writing textbooks, no reward from university (in USA, one is often required to write a textbook to get tenure). In the discipline area of data mining, for example, the highest citation rate comes from a textbook, but it is not considered.
  - If you write a research monograph you get HERDC points, but a textbook counts for zero.
  - We can't expect every academic to write a textbook though.
  - How many good quality textbooks can there be on a subject? Of all the textbooks that exist, maybe only 1% are high quality.
  - But that's the same as research papers or other outputs – how many of those are high quality?
  - I have over 20 textbooks on ‹Topic XYZ› in my office, but they all say the same thing – they're all as bad (or good) as each other.
  - Maybe what we need to reward is writing a textbook that is the first in its field, or widely adopted/cited, rather than just ones that repeat what's already available.
  - New technology means other ways to disseminate new knowledge than printed books

- In Princeton, one needs to research before they are allowed to teach.
- Academics should regularly contribute their thoughts to the community every year through a publication.

9.8.2 Dr Kirchner's presentation

Teaching and Learning, Research and University (TRU) integration model
Nathan talked through the model –built on the paradigm of social robotics. RoboCup@Home was the motivation to engage students into this research.
The model engages students in their first year, and is integrated through courses until PhD level (students do PhDs framed by this experience). This creates a synergy with the research group, where members review each other's papers; students publish as well as the research academics.
[Background: The RobotAssist team consists of researchers from the ARC Centre of Excellence for Autonomous Systems (CAS) – a collaboration between UNSW, USYD and UTS, with over 200 students and academics.
http://ims.uts.edu.au/RoboCUPHome.html

Research topics include Human Robot Interaction, Simultaneous Localization and Mapping, Rehabilitation Robotics, Data Fusion, Object Recognition, Robot Motion Planning in a Social Context]

There was a need to define what constitutes research – this may not be the same for each of us.

Nathan argued that the research culture needs to change, to start research from year 1, day 1. This is the model used at Stanford. From the 1000 or so students in the undergraduate program, 10 to 15 move into PhDs. Define research by better preparing students from 1st year. [DVC (Research) says research in classrooms builds PhDs.]

- Need to change culture and environment /system, i.e. need research centres to practice
- The idea is to go viral (students telling other students), to capture the research interest
- Mass education model simply needs scaling
- Use UG students as a resource to do research (as a counter to the lack of grants/resources)
- Capstone projects and internships are also suitable

Model of TRU: Robot-Assist

- Identify a topic that can attract attention
- Build core capabilities that support research agenda
    - Deconstruct core capabilities into accessible projects from undergrad to PhD level
    - Feed into research and teaching – starts to happen without the need to push; also attracts interest from external groups (other faculties, industry)
- Demonstrate/show what we do (no research content but attracts interest- this is a compromise, as not really interesting from a research point of view)
    - increases interest from a range of groups
    - builds engagement with industry
- Key driver - talk about what you do:
    - Translate research into language that is appealing to students

    - Broaden/change culture towards research focus
    - Excite students and go viral (students introduce new students into the work)

- Key focus: work in practice
    - Students investigate
    - Students come up with capstone project

Jobs in engineering and IT are not research based in general. An enquiry based learning approach supports both T&L and research, from year 1. Students will spend time on the projects and their work is valued.

Get undergrad and postgrad research students to work together, do projects together, - applied and practical design to course structure.
Main Issue is UTS culture. We need a greater number of researchers in the classroom.
In summary: System needs to accommodate the model; students go to workshops by themselves
Capstone: need to offer alternative models; research centres should address practice and education

Goal: to bring the life-learning model into classroom: research can inspire the process

Discussion

- Students going onto research, how do you justify this (reply – start with first year and build)
- Scaling up is a big problem (response- deconstruct into accessible projects for the year level)
- Research and teaching nexus: culture change is similar to Taiwan, where projects are inquiry based built and more relaxed with the use of lab equipment (i.e. without supervision).
- Also need support staff who help to facilitate research (including student research) as much as possible, rather than acting as gatekeepers who decide what gets supported and what doesn't (e.g. access to lab equipment). There was a range of views on how well this is currently managed at UTS.
- Funding - Bottleneck; Nathan is lucky to have uni wide support
- Plagiarism at UTS: one way to avoid plagiarism is to set different assignments for each individual - perhaps still an issue for group projects. But if project has each student doing a different part, then all bring ideas together as one big project. Having students do individual research work correlates well with wanting each student to a different assignment – using research-oriented assignments can kill two birds with one stone

- Discussion on student projects that are valued by student, peers and researchers
- Capstone courses have little academic acknowledgement (little time to support, one size fits all, 12 credit points at UTS while 48 credit points at UNSW, set up the expectation for students to do capstone).

9.9 Appendix 9: Summary of Bridge III Workshop (1) at QUT: FaST

Title of workshop: Undergraduate Research Experience: A professorial discussion

Wednesday 13 April 2011
10am-12pm – IHBI Seminar Room KG-Q430

10 – 10:05	Welcome & Workshop Agenda presented by the FaST Curriculum
10:05 to 10:20 (about 15 min)	Question 1: What skills/attitudes that you value do you feel are lacking in potential research students?
10:20 – 11:00 (about 40 min)	Question 2: What would you expect to see in a student portfolio that demonstrates a capacity to successfully undertake research? Question 2a: Considering the portfolio items identified, what tasks/activities/assessments could be used to develop students towards those outcomes? Morning Tea
11:15 – 11:30 (about 15 min)	Question 3: What could the Professoriate do to participate in the undergraduate program other than coordinate a unit?
11:30 – 12:00 (about 30 min)	Question 4: How can we make first year activities more fun?

Participants

- Three professors
- Two staff members from the faculty's curriculum design team, one of them who moderated the discussions, and
- The project manager for the ALTC project

Moderator: What skills/attitudes that you value do you feel are lacking in potential research students?

Professor 1: This is so timely for me, because I've got problems! Many students are lacking in critical analysis skills: they do not know how to collect data, analyse it, and know if the results are reasonable. They just do experiments with the help of software and write down the results and don't analyse or understand the data. There is no thinking input at all. They are missing critical analysis skills needed in questioning the data and do not have the confidence to defend and argue for their

conclusions when challenged. They are not courageous enough to make decisions because they are afraid to make mistakes. They have not been encouraged to be creative. They are not able to generate multiple ideas and don't value the process of elimination in order to arrive at a decision. They are not able to think ahead and envision the whole either and want to know what to do on a week-by-week basis. They don't know how to take a concept and develop it.

Professor 2: You are right. This really bothers me also. They do not know how to defend and support their conclusions until they come to the PhD level and then these problems fall into the supervisor's lap. This bothers me more.

Professor 1: What we are lacking are people wanting to become “research technicians” in the sense that everyone into research thinks in terms of a PhD although many of them have only the competency of a research assistant. Many of them want a PhD because someone else is willing to pay for them to get one and their research curiosity is not entirely intrinsic.

Professor 3: Yes, I have encountered this problem with some PhD students whose governments are paying for their PhD. They seem to think of the 3-yr stint as a paid vacation and this puts a big burden on their supervisors when it comes to completion. Their skill level is really that of a “research assistant.”

Professor 2: Also most of our units are recipe driven. We hardly give them open-ended problems. This may be because open-ended problems are difficult to assess and then they get used to getting too many specifications and expect the same when it comes to research also. They do not have the courage to make mistakes so they refuse to think for themselves and just want to follow the rubrics. This does not work when it comes to becoming a researcher.

Professor 3: I like the term “courage.” How do we encourage our students to have the courage to fail?

Professor 1: What works well is when they do an experiment or assignment and we ask them to write it up. Good researchers know that we need to go through second ideas before we get a new one, but many students have this angst about failure and are scared of it. We need to help them understand that “it doesn't work” is a valid research result so long as they understand why.

Professor 3: This comes back to “courage.” I recall Churchill's words “Success is not final, failure is not fatal: it is the courage to continue that counts.”

Professor 2: The important part is that we are training them for the research process rather than for the research results. They don't appreciate the “breadth” of the journey. One way to get them to do this is by reading and analysing other peoples' work, which always helps in the process of understanding how research works, and how it's done. I recall that in my own university days, we were asked to critique other researchers' works and make presentations to our class on the same. We were given the work of professors who were them invited to hear us present their work to the rest of the class. I learned a lot about research from that process, as teaching is the best way to learn. We begin to understand rather than just follow instructions.

Professor 1: Yes, I like that idea and I think it is a form of “concept learning.” It would be good to split the class into two groups of students who can then present their respective experiment results to the other group where the other group gets to critique their results.

Professor 2: The students' efforts need to be driven by their own curiosity rather

than by us.

Professor 1: The difficulty also lies in identifying and mentoring the right students with the potential for research. I find that the successful researchers are always in the middle and not necessarily the students that always get the highest grades. This brings us back to the nature and nurture issue and the hard-working students versus the brilliant ones.

Professor 2: There are studies that show that the brightest students don't necessarily finish their PhDs but the less bright but hard-working students always do. I have noticed this with my students also. Because the middle-level students that have always had to work hard have a work ethic that is different from those of the bright students who are used to sailing through but that doesn't help when it comes to serious PhD research. The Dean's scholars rarely go onto research.

Professor 3: What are we doing for the students in the middle? Are they falling through the gaps? We are not currently doing anything for the ones in the middle.

Professor 2: Also feedback is missing for the good students. They are already doing well so they go unnoticed without any special attention. They do not get any reinforcement in the form of feedback and don't have a sense of pride in their work. They can get used to this success in the early years and become afraid of failure. We need to provide them with challenging opportunities where they are allowed to try something without the fear of failure or their grades going down.

Professor 1: Also we need ask ourselves if our pipeline is wrong. We don't encourage show and tell like the American schools do right from the beginning, thus producing confident and professional researchers, perhaps even a bit too cocksure. Our students seem unsure of themselves and hesitant in comparison. It is like what they say is the difference between professional photographers and amateur photographers. They both take 100 photos, but the professional throws away 99 and publishes just one, while the amateur keeps 99 and throws away just one!

Professor 2: It also helps to have brainstorming sessions on various topics just to get them used to thinking about and defending their ideas rather than for marking purposes.

Professor 1: At UQ they have the AIP Hatch. For example, your experiment is to measure the charge of an electron and you have to design the experiment to do that within a couple of weeks. This helps them think about research in a new way.

Professor 3: At QUT, we are proposing a unit like Mythbusters in the first year as a team activity where the students get to design and execute a small experiment hands-on over time rather than watch someone else demonstrate or help them do several experiments pre-determined experiments where they watch or participate in a passive manner.

Professor 2: On the same lines, long-term projects that span more than just a semester are important, for it is not possible to do everything within the 13 weeks we normally have. It would be better to do a one-year project under the supervision of a mentor. How many students can we absorb into research every year? How many UG students come in every year?

Professor 3: Probably not more than 100 students out of the 1000 or so that enter into our university every year. Which means that we will need 50 or so mentors who can each supervise 2 students?

Moderator: What would you expect to see in a student portfolio that demonstrates

a capacity to successfully undertake research?

Professor 1: I would want to know what their research question or hypothesis is?

Professor 2: I would ask them if they have a research plan.

Professor 1: I would expect that they would have narrowed the field down to a specific aspect or interest by then. If not, my next question would be " What interests you?" If they don't have a clear or convincing answer to that, my next question will be "Why do you want to do a PhD?" and then "What do you think is involved in a PhD?" Many students expect us to give them a plan of research and even a topic for a PhD.

Professor 2: Yes, the motivation for the PhD is often simply the fact that their government is paying for them to get a PhD. There are two completely different categories of students – those who want a research future and those who just want a PhD. Also, among the potential research students, say 10 of them, you may know only 5 of them personally so you will choose from among those 5 as your research students because a known devil is better than an unknown one. So sadly, it's important to be seen first by a supervisor in order to be seen as a researcher.

Professor 3: We also need role modelling in general rather than in disciplines in particular. We need to have 'career talks', 'show & tell' etc. within units and get the students enthusiastic about research. It can be a 30-minute talk followed by 30 minutes for questions and discussions. Students don't realise that research requires bloody-minded determination and self-confidence. We need to role model the values we want to see by demonstrating values such as creativity or the courage to accept failure.

Professor 2: Half-a-day field trips to research facilities are always useful.

Professor 1: Yes, I do a lot of that.

Moderator: What could the Professoriate do to participate in the undergraduate program other than coordinate a unit?

Professor 1: I do field trips and don't refuse any student who wants to come.

Professor 2: We also need panel discussions and we don't do enough of that, such as class presentations of research papers in your field with the research professors/authors of the peers sitting in. Presenting someone else's paper is one of the best learning experiences.

Professor 1: An interactive Young Physicists tournament would be a good model where the class is split up into two teams and Team 1 sets up the experiment while Team 2 critiques it. Then Team 2 sets up a different experiment and Team 1 critiques it.

Professor 2: One more thing. The professors own motivations are important also. I never have trouble getting honours students when I want them. But in order to attract good potential researchers, we need a prestigious UG program with perquisites of 5 GPA or more. It needs to be a goal-oriented program with the specific intention of recruiting research students.

Professor 1: We need a minor in 'creativity' that encourages inspiration and research in general rather than content. Discipline content can come later with content modules etc.

Professor 2: One more thing that I have tried to push through unsuccessfully in the past is to get scholarship money for honours students for I think that the money is better spent in earlier years rather than finding HDR students later who can get an APA. Also 10 Australian PhDs is better than 10 International PhDs who will leave after their studies. Funding is certainly needed for honours pipelining.

Professor 3: But how may honours students have gone onto become HDR students? Not many. The Dean's scholars rarely go onto to become HDR students.

During the discussion, the professors were asked to note down some ideas on paper even as they were discussing them (Part 2 of Question 3), and the following are those notes, categorised by which UG year they relate to.

Year 1 ideas:

1. Research mentoring program
2. Brainstorming – all about it till they are experts at it
3. Show and Tell career talks demonstrating values
4. Short Experiments
5. Tournament in a discipline
6. Field trip to research centre
7. Research Minor – called creativity and entrepreneurship
8. Boxes of tricks, what happens if I do this or do that
9. Mythbusting projects
10. Design multiple methods to test it
11. Team decides on appropriate methods to follow
12. Showcase event (1 per group each year)

Year 2 ideas:

1. Do they understand what a PhD is?
2. What will the journey be like?
3. 1 year connection to a project mentor
4. Brainstorming – present real-world problems
5. 1:1 activities
6. 3 minute thesis on any topic
7. Meet the “profs”
8. Know who the academics are and what they do and understand what skills are needed for what jobs.
9. Prestigious UG students program
10. Show and tell activity
11. Many open-ended problems
12. Peer review and interrogation

Year 3 ideas:

1. Types of cohorts
2. Motivation for coming
3. Just get a PhD, just want to buy it
4. Fire in the belly
5. Last unit on research methods
6. Incentives for honours
7. Find someone who thinks the way you think and bothers to have time for you
8. Final year showcase event, have keynotes from industry
9. Show me your plan, show me your hypothesis, need to be emotionally

committed to curiosity
10. Help develop a draft research proposal
11. Long-term project with 24 credit points – takes time to do things.
12. Knowledge of your research staff and what they do

9.10 Appendix 10: Summary of Bridge III workshop at Monash

Dr. John Hurst and Dr. Judy Sheard led the workshop

The participants were asked to discuss three questions:

a. What changes have you made recently in your teaching?

b. What could you have done to make students feel involved?

c. What evidence would you collect?

Some interesting things that came out of the discussion:

- A lot of participants discussed changes to teaching in an attempt to 'engage' the students.
- In one group all four participants had tried questions in lectures (questions to students and from students) in an attempt to get more involvement from students.
- No one admitted to looking at any educational literature to inform what he or she was doing in his or her teaching. "Where do we find it?" said one participant.
- Participants claimed that they did not know how to measure what they were trying to achieve.
- Only one participant had collected or looked at data - Moodle logs where he found a strong correlation between activity and success.
- One professor mentioned the MURPA undergraduate international research program as a model.

http://advances.asee.org/vol02/issue02/05.cfm

https://messagelab.monash.edu.au/MURPA

9.11 Appendix 11: Summary of Bridge III workshop (2) at QUT: BEE

9th June 2010

There were 11 members of the professoriate present, and about 20 other people present, including a number of non-professoriate Teaching and Learning Discipline directors.

The workshop opened by asking staff to write down on a piece of paper

1. What are the three most important things students should do if they want to succeed in their learning?
2. What are the three most important things teachers should do if they want to be successful teachers?

Some were prepared to hand these in, while others were a little uncomfortable handing their responses in.

The submitted responses are given below.

Things students should do to succeed:

- Believe they can learn
- Be ready to learn
- Be willing to communicate

- Be creative
- Be interesting
- Be persistent

- Spend sufficient time
- Have good time management
- Attend lectures and balance studies/work

- Have a good attitude and be prepared to learn
- Work hard
- Have good time management

- Engage
- Reflect
- Act

- Engage with subject
- Work hard
- Come to lectures

- Read a lot
- Participate
- Think about broader issues

- Work consistently
- Ask for help

Things staff should do to be good teachers:

- Make it relevant
- Make it interesting
- Make it challenging

- Be enthusiastic
- Engage with students
- Have integrity

- Organise
- Facilitate
- Listen

- Challenge
- Guide

- Be interactive in class
- Understand the students if possible
- Be responsive

- Be patient
- Show care
- Have good planning

- Understand the needs of the student
- Give feedback

- Use good teaching methods
- Have interesting lectures
- Connect to practical society/applications

- Motivate
- Role Model
- Be on top of Discipline knowledge

There was then a presentation of some of the evidence on what it is that influences students to achieve. In summary, this evidence suggests that students tend to learn best when:

1. The student deliberately tries to continuously improve their learning, gets lots of feedback, practices their skills frequently, reflects often, regularly pushes the envelope in their skill development and carefully monitors their performance,
2. The teacher deliberately tries to continuously improve their teaching, and in the process gets lots of feedback, practices their skills frequently, reflects often, regularly pushes the envelope in their teaching and carefully monitors their teaching performance,
3. There is a good teacher-student relationship.

As this evidence was discussed numerous spontaneous comments and reflections came from the staff. Some of these reflections were:

- One staff member said that just because they believe they have given students feedback doesn't mean anything positive happens. The students have to believe it is useful before they will act on it.
- A staff member questioned whether performance monitoring was really that important. Another staff member responded by saying that they felt performance monitoring is important because it triggers reflection and reflection is the engine of learning. The same staff member said that it is important that students actually reflect, not just that they are taught how to reflect.
- One staff member said that the care factor in student-teacher relationships can be overdone and can cause some teachers to spoon-

feed students. Another staff member responded by saying that caring does not imply spoon-feeding - care implies that you do what is best for the students, challenging them when necessary.

- One staff member asked who was responsible for the effectiveness of feedback, performance monitoring, pushing the envelope, etc. – the teacher or the student. It was suggested by the presenter that the effectiveness of all of these elements was dependent on both the student and the teacher. A collaborative relationship was vital.

Participants were then asked to enter into small groups and discuss these issues. They were asked to discuss instances where they had succeeded in improving their teaching and areas where they were struggling.

Some of the feedback that came out of the small groups is given below:

- One group said that prompting students to reflect and ask questions was more successful if these questions/reflections flowed naturally out of some task/project the students were engaged in.
- Another group said that it was difficult to get good student engagement and reflection in very large classes of several hundred. They said that having students engaged in some sorts of interactive quizzes might be a way to overcome the large class problem.
- Another group discussed the fact that one group member had a sequence of quizzes in their unit which was working well at engaging students. This group member said, however, that he had a problem based learning component in the same unit which was not working well because some of the students were falling behind and getting lost. As the group member discussed his problems he actually came up with a solution – he said he needed to have some regular meetings with the students to monitor progress.
- Another group said that they felt there were three intersecting factors in the learning equation – the student, his/her environment and their natural ability.
- Another group said that they felt the ideas brought up in the meeting would be of interest to colleagues at the University of South Australia. They felt that some collaborations around the ideas discussed in the workshop would be possible and desirable. They also said they felt we should have more prac work in our units.
- One person said that they felt the spectre of student evaluations of teaching prevented teachers from challenging the students more.

The acting Head of School said at the end of the workshop that the discussions had gone well – staff had been prompted to really start thinking more about their teaching and learning practices.

9.12 Appendix 12: Summary of Bridge III workshop at QUT: FaST

Tuesday 7 June 2011
12pm-2pm – GP Q-601

12pm	Welcome & Workshop Agenda presented by the FaST Curriculum
12:05 to 12:20	Question 1: What skills/attitudes that you value do you feel are lacking in potential research students?
12:20 – 1:00	Question 2: What would you expect to see in a student portfolio that demonstrates a capacity to successfully undertake research? Question 2a: Considering the portfolio items identified, what tasks/activities/assessments could be used to develop students towards those outcomes?
	Lunch
1:15 – 1:30	Question 3: What could the Professoriate do to participate in the undergraduate program other than coordinate a unit?
1:30 –2:00	Question 4: How can we make first year activities more fun?

Participants

- 15 professors (including Prof. Sylvia Edwards)
- Two staff members from the faculty's curriculum design team, one of them who moderated the discussions, and
- The project manager for the ALTC project
- The professors are identified by number for purposes of anonymity

Introductions around the table.

Moderator: What skills/attitudes that you value do you feel are lacking in potential research students?

Professor 1: Critical thinking, analytical capabilities, advanced communication skills, and written skills. Students in science don't write assignments until 3rd year or honours as they just do exams. This does not give them these skills. It is true that teaching first-year writing is extremely time consuming and hard.
Professor 2: Research students when they get to the end are too innocent [ignorant? naïve?], but they think they know everything! They think that if they follow a procedure, it will work. If it doesn't work, they don't know what to do.
Professor 3: Hubris!
Professor 4: Perhaps when we deliver the stuff we don't tell them that it can be questioned. We don't tell them what research is.
Professor 3: They have a lack of awareness of research in general or even any idea of what honours is.
Professor 5: We can't tell them what research is either. It is not easy. It helps if they read a lot of papers. It is a long and hard process.
Professor 3: I developed and delivered a first-year first-semester research unit where I taught them the basic principles of research and taught them how to write through reading and editing other people's writing.
Professor 4: We can also use popular topics to discuss the several sides of the debate and analyse them through different viewpoints that bring in research. For example, we can use Climate Science.
Professor 6: I teach a Philosophy of Science unit but the reception is quite mixed among students.
Professor 2: Perhaps we should introduce research in small doses in the first year.
Professor 7: But the idea is to spark that initial excitement for all students. There are a lot of areas where the students can benefit from it whatever they do.
Professor 2: In a field like Chemistry for example, there is nothing exciting at all unless you report on the experiments through writing.
Professor 3: It helps if we deliberately distort the facts and make it look believable and ask the students to work it out; sort of like Truth or Lies. Ask them: By what criteria do you rate it believable based on research. Inculcate scepticism early on as kids take to it natively. We need to create excitement from first year. Bring in professors (who would otherwise be very boring as a teachers) talk about their specialties or their own area of research and why they are so passionate about it.
Professor 5: We needn't presume that we are pushing them to research. We need to prepare them for a variety of career paths and not just for research. They can learn the fundamental concepts of research that are valuable in every area in their future careers.
Professor 3: We also need to teach them more practical stuff. For example, they miss any understanding of basic statistical analysis that is needed for a critical analysis of others' results. Also, we need more open-ended assignments that will give the students freedom to explore their ideas. We don't have them because they are difficult to assess. Perhaps we should have more Pass/Fail grades rather than marks? Also, students don't have any ideas of what a career in research might mean.
Professor 2: The high-achieving students hate pass/fail grades though. Industry in general recognises the need for certain behaviours such as entrepreneurship, risk-taking, creativity, work ethic, and the ability to handle unexpected situations.
Professor 6: We go back to the philosophy of science.
Professor 2: I disagree. They don't need to know the philosophy of science to know the value of these various skill sets like entrepreneurship and enterprising behaviours. By that I don't mean entrepreneurship for the sake of monetary benefits but of doing things differently, of design-led innovations.

Professor 8: We need to encourage our students to participate in more open competitions etc. like Library Hacks, Mythbusters, Nick Gruen's Kaggle, Robot Soccer etc. We should be able to let our students compete in them and get credit for them.
Professor 2: The problem will be with the grading for these credits. High-achieving students hate pass/fail units.
Professor 4: If we could pick 50-80 students to do these competitions, we may end up with 10-12 honours students that would give us that many projects. Also, each professor can put up 5-6 projects for final year students to choose from.
Professor 2: I would actually change the terminology from 'high-achieving' though. What Prof. 8 is talking about is extremely difficult in terms of doing it university-wide although we can achieve it within smaller groups.
Professor 8: Let's talk about the successful projects, not the failure problem.

Moderator: Thank you. What would you expect to see in a student portfolio that demonstrates a capacity to successfully undertake research? What kind of hard proof would you need that would demonstrate to you that the students have the skills you are looking for in a HDR or PhD student.

Professor 5: A pulse!
Professor 3: It would help to have examples of work they have done, abstracts of papers/projects etc.
Professor 6: We would need to teach our students what is an abstract. What are the important things in this paper? How to be critical? Pull the eye out of the paper, so to speak.
Professor 2: I would like to see evidence of some level of writing skills!
Professor 8: When you talk to a student you just know because they resonate with you and your interests. They need to have a passion but an informed passion about their proposed area of research. You can tell when a student is switched on and thinking about it. It is also about the matching of personalities and about relationships with students. Prof. Christine Bruce's ALTC work on PhD supervision styles says it all.
Professor 9: How to reference and cite properly.
Professor 6: Persistence is important too, that they don't give up.
Professor 4: Remember they become you colleagues so you need to get along. Personal traits are important. There must be chemistry between the supervisor and the student.
Professor 8: They need to know not just how to write research papers but also reports and business plans. They need to know how to write boring stuff!
Professor 3: Currently our teaching of writing is not structured. It is disjointed and haphazard.
Professor 4: Yes, they also need to learn to write for different audiences.
Professor 8: Also be able to interact with and write for people from other disciplines.

Moderator: Thank you. What activities can we do at UG level in order to promote these skills? What could the Professoriate do to participate in the undergraduate program other than coordinate a unit? Considering the portfolio items identified, what tasks/activities/assessments could be used to develop students towards those outcomes?

Professor 8: Competitions and challenges.
Professor 10: Like the Robot Soccer etc.
Professor 2: One of the issues with the widespread use of competitions and challenges in assessment is that they have a tendency to favour students with a high GPA.
Professor 8: That's why it should be pass/fail. Take an external new problem and provide some scaffolding to engage with it in a new way.
Professor 3: Evidence of problem solving and oral communication skills, and not

just writing skills.
Professor 8: Knowing how to tell a story to the general public in 3 minutes.
Professor 10: Telling it in less than 45 minutes for most seems to be a challenge for most PhD graduates!
Professor 5: Thinking back on my own MBA, we did 3 case studies a day 5 days a week. Written assignments were to be submitted in duplicate by noon everyday; one was assessed by our business professor, and another by a communications professor. Such cross-unit assessments bring different perspectives to the value of the assessment.
Professor 3: Creative writing skills can be helpful also.
Professor 11: I would not ask my potential research students to dissipate their energies on a touchy-feely Haiku project though!
Professor 10: We need to also remember that many of our HDR students come in from industry without an honour's degree.
Professor 3: Can we take a way of looking at GenY and using their positives? They are generally confident, verbally articulate, know how to use tools like PowerPoint, and are not averse to risk-taking.
Professor 8: Yes, if they get something wrong, they just say "my bad" and move on. They are good at social networking, and not terribly embarrassed about failure.
Professor 3: I don't see a lot of resilience in that generation. They give up too easily.
Professor 10: I like the part about resilience. We don't build that into the program. The ability to take criticism doesn't seem to be easy for students.
Professor 8: I don't care if they know something so long as they know how to find it when needed. We should encourage open book exams, as we now live in a world where we don't have to remember stuff.
Professor 10: Of course, there are extremes at either end that we are not happy with, but we need to find the middle.
Professor 7: They also need to know what questions to ask; how to formulate a question. This is not easy. This is why we don't get questions in class.

Moderator: Thank you. What could the Professoriate do to participate in the undergraduate program other than coordinate a unit?

Professor 5: I have conducted a unit on Advanced Research Topics but it hasn't gone so well. They consist of 6-hr modules offered by volunteers drawn from HDR students and staff but we get 3-4 students only!
Professor 3: We could invite guest speakers and help them build professional networks.
Professor 4: We have Work-Integrated-Learning projects in the IT department. We could also invite multidisciplinary professorial panels where they debate on important issues like climate change, genetically modified food etc.
Professor 5: One-on-one with students is always the best way to get to know the students. We could have introductory sessions and panels where professors can come and talk to the students about their projects etc. or visit a unit to be part of the debate. Even then, the students are impassive and never ask questions.
Professor 10: Yes, we noticed that at the Robot Soccer. Students never ask questions.
Professor 8: I think it's because this is the generation that is used to passively 'watching' without interactive engagement. They want to sit back and be entertained. Perhaps we should put up guest speakers on YouTube for them.
Professor 2: We could invite UG students to research group BBQs and ECARD events.
Professor 2: To even bring a student through the door costs us $5000. An honours students costs 15-20K. We need to consider the costs of the research recruitment efforts also. How many honours students go for a PhD?
Professor 1: We could have a Save the World challenge.
Professor 8: Let's inform them about the issues in an informed way.

Professor 2: I did try some of this stuff on second years as part of an ethics exercise, but had to stop, as some of the stuff was too radical.

Moderator: Thank you. How can we make first year activities more fun?

Professor 8: I think we need to talk about not grand challenges, but about BBQ topics. Perhaps we could have seminars on topical stuff that will help them in their social life, around BBQ conversations? Like debates about stem cells, coal seam gas, vaccinations, climate change, paedophiles, issues of plagiarism in making mash-ups etc.
Professor 3: Why don't we ask the students' opinions?
Professor 10: Also to reflect on what we liked in 1st year ourselves. I recall how Professor Z made a comment that she saw a guest lecture in her 1st year that made her a researcher.
Professor 7: Do we want to make it fun or relevant? Relevance can be fun.
Professor 10: We could also explore the use of things like iPads in teaching. There was a study I read that in one institution where they introduced it, there was a bipolar distribution of the student grades.
Professor 4: We saw similar effects when the Internet was first introduced into teaching. There was a bimodal distribution. It takes 3-5 years for a culture to change and for learning styles to change.
Professor 2: But do students know what kind of learners they are?
Professor 8: Perhaps we should give them a test at the beginning to determine what kind of learners they are? We have a lot of first-in-family kids whose learning styles are different.
Professor 2: I think the Dean's Scholar program should be converted into a Research Minor.
Professor 3: Ask the students!
Sylvia Edwards: Perhaps we should invite some students here for such discussions. Thank you all.

SUMMARY
The research professors are more than willing and able to engage with undergraduate students and each one of them has been doing so within their own spheres of influence in various ways. It does help to get them all together like this once in a while to share and generate ideas. Below are some of the problems identified along with some of the solutions offered.

Problem or skill gap identified in UG to HDR students	Solutions offered
Basic writing skills	Structured writing courses right from Year 1 based on a lot of readings: research, reports, and business writing.
Narrative writing skills	Having students read and present others' research papers.
Critical analysis skills	Reading and analysing others' research papers
Oral communications skills	Encouraging presentations of papers and projects in a peer-assessed setting where professors can sit in on panels as experts. Having seniors come present in junior classes.
Problem solving skills	Encouraging students to participate in open problems through participation in competitions etc.
Entrepreneurship skills	Teaching students to be innovative and

	engage in informed risk-taking through examples and mentoring.
Lack of resilience	Teaching students not to be afraid of failure and not to give up. Provide the right scaffolding at the right time.
Lack of attention	Provide alternate ways to learn that suit their learning styles. Perhaps offer a learning-styles test in first year.
Different learning styles	Provide different ways to learn and offer technological solutions where needed for students more comfortable with virtual interactions: iPad modules, iPod applications, SMS chats, Virtual Office, Elluminate etc.
Lack of enthusiasm	Have professors and guest speakers talk about their own personal journey to research and talk about what motivates and excites them. Provide networking opportunities to get to know researchers and professors.
Lack of motivation due to a lack of relevance to their day-to-day lives	Conduct seminars, panel discussions, debates etc. on the topics of the day that are in the media, but give an evidence-based perspective on them that will help the students understand the research on these issues.
Lack of awareness of research pathways	Presenting and connecting research outcomes to research careers and alternate employment opportunities.

9.13 Appendix 13: Results of the post survey

Demographic profile of the survey respondents

There were 30 respondents to the survey from QUT (21) and UTS (9). There were 16 respondents from the professoriate (Levels D&E) and 14 respondents from the non-professoriate (Levels A, B & C) and 20 males and 9 females with 1 respondent not answering this question.

Research and Learning & Teaching items for Bridge 3

The mean values for each of the Research and Learning & Teaching (L&T) items within the job satisfaction, role model and career advancement questions were calculated for the Professoriate (Levels D & E) and The Non-Professoriate (Levels A, B & C). These are shown in **Table** and **Table** . The remainder of this section reports different comparisons between these items.

Paired-samples t-tests were used to compare matched pairs of Research and L&T items; independent samples t-tests were used to compare ratings of Research and L&T items of Professoriate and Non-Professoriate groups. A significance level of $p < 0.05$ was used to determine differences.

Note that the wording on items 7, 8 and 9 were different on the Professoriate and Non-Professoriate surveys. Also, the wording of the Role Model question differed in the D&E and A,B &C surveys. Consequently no comparisons of items 7, 8 and 9 and all the Role model question items were made between the professoriate and non-professoriate groups.

Comparison of matched pairs of Research and Learning & Teaching items for the Professoriate for Bridge 3

For the Professoriate, most of the ratings for the Research items were significantly higher than the corresponding L&T items. There were no cases where L&T items were rated higher. Specifically, the following differences were found within each question:

To what extent do you gain personal job satisfaction from each of the following?
All the Research items were rated higher than the corresponding L&T items except for the following items where no differences were found.

- Keeping your Research at the cutting edge/Keeping your L&T resources up to date
- Improving student satisfaction items

To what extent do you try to be a role model for the following?
All the Research items were rated higher that the corresponding L&T items except for the following items where no differences were found.

- Keeping your Research at the cutting edge/Keeping your L&T resources up to date
- Winning Research/L&T awards
- Improving student satisfaction items

In your view, how important is each of the following for advancement in the academic profession?
All the Research items were rated higher that the corresponding L&T items except for the following items where no differences were found.

- Participating in collegial discussion about Research/ L&T
- Strategic planning of Research/ L&T activities
- Improving student satisfaction items

Comparison of these results with the 2009 survey

In both 2009 and 2011 there were no differences in "Improving student satisfaction items" question across the three questions.

In the 2009 survey, all other comparisons showed higher ratings for Research. In the 2011 survey there were four items across the three questions where there were no differences.

Comparison of matched pairs of Research and Learning & Teaching items for the Non-Professoriate

In contrast to the Professoriate, fewer differences were found between the matched pairs for the Non-Professoriate. There were a number of Research items that were rated significantly higher than the corresponding L&T item and two cases where an L&T item was rated higher than the corresponding Research item. Specifically, the following differences were found within each question:

To what extent do you gain personal job satisfaction from each of the following?
The following Research items were rated higher that the corresponding L&T items:

- Publishing refereed Research papers
- Reading research literature in your field
- Reviewing Research papers/reports/activities
- Participating in Research teams extending beyond the University
- Participating in collegial discussions about Research
- Securing funding for Research
- One L&T item was rated higher than a corresponding Research item:
- Improving student satisfaction items

These results were very similar to the 2009 survey results.

To what extent are the senior academics in your area supportive role models for the following activities?
All the Research items were rated higher that the corresponding L&T items except for:

- Undertaking Research/L&T training
- Improving student satisfaction items

These results were very similar to the 2009 survey results. One notable exception was that the "Improving student satisfaction items" was significantly higher for L&T than the corresponding Research item in the 2009 survey.

In your view, how important is each of the following for advancement in the academic profession?
All the Research items were rated higher that the corresponding L&T items except for:

- Winning Research/ L&T awards
- Improving student satisfaction items

These results were very similar to the 2009 survey results. Once again notable exception was that the "Improving student satisfaction items" was significantly higher for L&T than the corresponding Research item in the 2009 survey.

Comparison of Professoriate and Non-Professoriate Research items

Comparisons of the Professoriate and Non-Professoriate ratings of Research items found no differences in ratings across the job satisfaction and career advancement questions. The results for the job satisfaction items were in contrast to the 2009 survey which found that Professoriate ratings were higher than the Non-Professoriate items for more than half the items. However, the results for the career

advancement items were the same.

Comparison of Professoriate and Non-Professoriate Learning & Teaching items

Comparisons of the Professoriate and Non-Professoriate ratings of L&T items found no differences in ratings across the job satisfaction and career advancement questions. The results for the job satisfaction items were in contrast to the 2009 survey that found that Professoriate ratings were higher than the Non-Professoriate items for about a third of the items. However, the results for the career advancement items were the same.

Comparison of Bridge 1 and Bridge 3 professoriate responses

Increase in job satisfaction from 2009 to 2011 for:

- Reviewing Research papers
- Increase in perception of importance for career for the following:
- Publishing refereed Research papers (all respondents rated this as 5 in the 2011 survey)
- Securing funds for Research
- Developing a high Research profile
- Decrease in perception of importance for career for the following:
- Mentoring future Research leaders

There were no differences between the 2011 and 2009 surveys responses for any of the L&T items.

Comparison of Bridge 1 and Bridge 3 non-professoriate responses

Increase in job satisfaction from 2009 to 2011 for:

- Publishing refereed Research papers
- Increase in perception of importance for career for the following:
- Publishing refereed Research papers (all respondents rated this as 5 in the 2011 survey)
- Strategic planning of Research activities
- Decrease in job satisfaction for:
- Undertaking L&T training
- Participating in collegial discussions about L&T
- Contributing to L&T teams within your university
- Strategic planning of L&T initiatives
- Securing funds for L&T initiatives
- Developing a high L&T profile

Decrease in the extent to which the leaders were role models for the following activities:

- Publishing L&T papers
- Participating in Higher Education L&T conferences
- Reading L&T literature and research
- Securing funds for learning and teaching initiatives
- Developing a high L&T profile
- Advancing your L&T knowledge and skills
- Winning L&T awards

Overall, there were some increases in satisfaction and job importance of Research and decrease in job satisfaction for T&L activities and decrease in perception of their importance for research.

Encouragement and Resourcing of Research

The respondents were asked to nominate to what extent Seniors and Managers encourage and resource research efforts. For both the professoriate and non-professoriate the perception was that in 2011the encouragement of research had not changed but the resourcing was less.

Encouragement and Resourcing of L&T

There were no differences in the extent to which Seniors and Managers encourage and resource Learning & Teaching efforts from the 2009 to 2011 surveys.

Table of Mean values of Research activities for professoriate (Levels D&E) and non-professoriate (Levels A,B &C)

Research Activity	Job satisfaction		Role model		Job advancement	
	Level (D&E)	Level (ABC)	Level (D&E)	Level (ABC)	Level (D&E)	Level (ABC)
1. Publishing refereed Research papers	4.50	4.67	4.06	3.71	5.00	5.00
2. Participating in Research conferences	4.44	3.67	4.19	3.64	3.75	4.07
3. Keeping your Research at the cutting edge	4.81	4.50	4.63	3.57	4.38	4.36
4. Reading research literature in your field	4.44	3.71	4.19	3.43	3.69	4.00
5. Undertaking Research training	3.44	3.00	3.56	2.86	3.38	3.64
6. Reviewing Research papers/reports/activities	4.00	3.54	4.13	3.29	3.56	3.71
7. Participating in Research teams extending beyond the University		3.77		3.43		4.43
8. Fostering Research networks extending beyond the University	4.19		4.00		4.00	
9. Participating in collegial discussions about Research		3.91		3.36		4.07
10. Mentoring future Research leaders	4.00		4.07		3.13	

11. Contributing to Research teams within your University		4.00		3.57		4.43
12. Fostering Research teams within your University	4.00		4.07		3.63	
13. Strategic planning of Research activities	4.38	3.58	4.19	3.29	3.75	4.43
14. Securing funding for Research	3.81	3.67	4.06	3.36	4.88	4.86
15. Developing a high Research profile	4.13	3.85	4.19	3.43	4.81	4.71
16. Successfully implementing new Research projects	4.50	4.23	4.38	3.43	4.56	4.36
17. Advancing your Research knowledge and skills	4.69	4.15	4.06	3.29	3.75	4.14
18. Winning Research awards	3.50	3.92	3.31	3.29	4.56	4.14
19. Improving student satisfaction ratings for research supervision	4.00	3.36	3.88	2.75	3.56	3.14
Mean ratings	4.18	3.85	4.05	3.37	4.02	4.22

Note that the wording on questions 7, 8 and 9 were different on the D&E and A,B&C surveys.

Table of Mean values of Learning & Teaching activities for professoriate (Levels D&E) and non-professoriate (Levels A, B&C)

Learning & Teaching Activity	**9.13.1 Job satisfaction**		**9.13.2 Role model**		**9.13.3 Job advancement**	
	9.13.4 Level (D&E)	**9.13.5 Level (ABC)**	**9.13.6 Level (D&E)**	**9.13.7 Level (ABC)**	**9.13.8 Level (D&E)**	**9.13.9 Level (ABC)**

1. Publishing refereed Learning & Teaching papers	2.38	2.62	2.31	1.92	3.13	2.50
2. Participating in Higher Education L&T conferences	2.25	2.67	2.31	1.85	2.44	2.57
3. Keeping your Teaching resources up to date and effective	4.19	3.77	3.94	2.23	3.25	3.07
4. Reading L&T literature and research	2.56	2.46	2.69	1.85	2.38	2.43
5. Undertaking Learning & Teaching training	2.69	2.29	2.63	2.39	2.69	2.57
6. Reviewing Learning & Teaching papers/reports /activities	2.25	2.08	2.13	2.23	2.32	2.50
7. Participating in Learning & Teaching teams extending beyond the University		2.42		2.39		2.88
7. Fostering Learning &	2.63		2.44		2.81	

Teaching networks extending beyond the University						
8. Participating in collegial discussions about Learning & Teaching		2.75		2.54		2.84
8. Mentoring future Learning & Teaching leaders	2.75		2.88		2.69	
9. Contributing to Learning & Teaching teams within your University		2.67		2.39		3.06
9. Fostering Learning & Teaching teams within your University	2.81		2.81		3.13	
10. Strategic planning of Learning & Teaching activities	3.50	2.73	3.13	2.39	3.44	3.00
11. Securing funds for Learning and Teaching initiatives	2.44	2.09	2.50	1.85	3.06	2.71

12. Developing a high Learning & Teaching profile	3.19	2.83	3.06	1.92	3.69	2.93
13. Successfully implementing new Learning & Teaching initiatives	3.81	3.50	3.13	2.33	3.44	3.14
14. Advancing your Learning & Teaching knowledge and skills	3.56	3.36	3.38	1.92	3.00	3.07
15. Winning Learning & Teaching awards	2.38	3.17	2.63	2.08	3.44	3.43
16. Improving student satisfaction ratings for your Teaching	3.94	3.93	3.56	2.58	3.69	3.50
Mean ratings	2.96	2.93	2.84	2.17	3.04	2.81

Note that the wording on questions 7, 8 and 9 were different on the D&E and A,B&C survey