What International Engineers Want: Motivations, aspirations, expectations and perceptions of students in a postgraduate engineering course

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CONTEXT

The beginning of this decade has seen unprecedented situations across the globe as the result of the Coronavirus disease. Universities and Australian engineering academic units are under significant pressure to tackle projected loss arising from the decline in international student commencing Australian coursework degrees in 2020 and beyond. There is no better time for Australian engineering education units to understand what international engineers want from our postgraduate degrees, and where do they want to go after graduation.

PURPOSE OR GOAL

While reports suggest that Australia’s skilled migration policy can have an influence over international student interest in postgraduate coursework degrees, there seems to be a range of other reasons that makes Australia the third popular destination of choice for higher education after USA and United Kingdom. Establishing definitive desires for education and destinations beyond graduation has been difficult, as international students were only included in the Quality Indicators for Learning and Teaching surveys 2016-2017. We investigated what international students want from coursework master’s degrees by asking questions about what it means to support their engagement in learning and what it means to nurture their development.

APPROACH OR METHODOLOGY/METHODS

In this paper, we present our initial findings from a three-year repeated cross-sectional study looking deeply into what international students want from coursework master’s degree offered at a regional campus of an Australian University.

ACTUAL OR ANTICIPATED OUTCOMES

Initial survey results indicated that quality of education, cultural diversity and work placement opportunities were among the main reasons that influenced students’ choice of destination. By unpacking the learning motivations, aspirations, expectations, perceptions of postgraduate international students we explore two key research questions: what does it mean to support international student engagement in learning engineering? and what does it mean to nurture their development for professional practice?

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Our findings highlight a shared challenge for Australian Engineering Units is the development of global competence and experience relevant to their future careers.

KEYWORDS

International students, Engineering Education, Work Integrated Learning (WIL).
Introduction

English speaking countries are attractive to international students as domestic education capacities have not always evolved fast enough to meet the growing skills needs in increasingly knowledge-based and innovation-driven economies (Douglass & Edelstein, 2009). Rising wealth in emerging economies has encouraged children of growing middle-class families to seek educational opportunities abroad (Wecker, 2018). Economic factors such as costs of international flights and technological factors such as faster and more affordable internet technologies have contributed to a surge in international mobility and helped international students maintain long-distance social contact with family and friendship networks. While conditions of migration differ, most countries have implemented reforms that have lowered the barrier for skilled migration and introduced programs such as employment opportunities through post-study work rights, which also provide an attractive proposition for student mobility beyond educational purposes (Martinez & Colaer, 2017).

In 2017, students from Asia formed the largest group of international students enrolled in tertiary education programmes at all levels, representing 56% of all mobile students across OECD (OECD, 2019). Two-thirds of Asian students congregate mainly in five countries: Australia, Canada, Japan, the United Kingdom and the United States of America. Australia’s education system takes almost one in ten of all international students from countries that are members of the Organisation for Economic Co-operation and Development (OECD), making it an attractive destination country for international students. Education-related travel services, including student expenditure on tuition fees and living expenses contributed the fourth highest value of exports in the 2018-2019 period at over 37 billion AUD (Department of Foreign Affairs and Trade, 2020). The demand for Australia’s educational services has seen an upward trend since 2002, with only a minor downturn in 2009, before coronavirus disease understandably burst that bubble this year.

Reports on international student experience in Australia in the last decade have focused on reputational damage arising from racial attacks on international students, exploitation by employers, universities treating them as easy profits, mistreatment by deceitful landlords, with a view to highlight social problems (Graycar, 2010). The rapid spread of coronavirus disease and prolonged border closures this year have revealed the important role that international students play in the Australian economy with coverage on savings measures and job cuts announced by universities - highlighting that the government has good reasons to support international students who have lost jobs and are not eligible for JobKeeper or JobSeeker payments (Doughney, 2020; Hurley, 2020).

Data on Australian international education and training exist in disparate data sets, in different locations, with varying degrees of access, resulting in a number of gaps and limitations in the understanding of international students and their experiences (Nous Group, 2018). Kiley and Cumming note that coursework master’s students are the silent majority of postgraduate education in Australia, with international students making up about half of all enrolments, and that the experiences of this student group are relatively unexplored in the research literature. The Australian Council of Engineering Deans noted in 2018 that recent overall growth in university engineering enrolments is due almost exclusively to international coursework master students (Australian Council of Engineering Deans, 2018). Overseas students accounted for just over 76% of postgraduate coursework enrolments in Engineering and Related Technologies (Department of Education and Training, 2020).

For engineering in particular, international students are an important aspect of university education and finances (Kaspura, 2017). The nexus between Australia’s overseas student program and permanent skilled migration is complex and constantly evolving. Census data are a potential source of information regarding graduate outcomes, including for international students. For engineering, using both 2001 and 2006 census data, Trevelyan and Tili (2010) observed a significant differential between Australian-born and foreign-born engineering graduates (including master graduates) regarding the likelihood of working in an
engineering-related occupation, and the likelihood of working in any occupation. Using 2011 census data, Buddelmeyer, van de Ven and Zakirova (2013) showed that graduate labour market engagement was correlated with time of arrival in Australia – employment rates were lower for recent international arrivals, somewhat higher for those resident for more than five years, and highest for those born in Australia.

For international coursework postgraduate students, existing research are typically small, qualitative, incidental and/or general in nature. Wang, Andre, and Greenwood (2015) present a systematic review of the literature on Chinese students studying Nursing in Australia. Yu (2016) considers Asian students studying in Australia, but includes students from all levels and many disciplines. Larcombe et al. (2016) incidentally include international master students in an investigation of psychological distress of Australian university students. Hawthorne (2014) provides some general, but now historical, data on Indian students studying in Australia. Robertson and Runganaikalo (2014) explore the education-migration nexus for international students in Australia, and incidentally include some master students in 35 qualitative interviews. STEM disciplines and/or relevant student cohorts are hardly ever specifically represented in the existing literature. There is also limited, timely information about the experiences and aspirations of its international master students.

In this paper, we present our initial findings from a three-year repeated cross-sectional study looking deeply into what international students want from coursework master’s degree offered at a regional campus of an Australian University. By unpacking the learning motivations, aspirations, expectations, perceptions of postgraduate international students we explore two key research questions: what does it mean to support international student engagement in learning engineering? and what does it mean to nurture their development for professional practice?

**Methodology**

In the second half of 2019, we invited all 909 international students who were enrolled to study an engineering master program at the regional campus of an Australian university. Our aim was to capture a broad spectrum of responses to quantitatively describe aspects of learning motivations, aspirations, expectations and perceptions of engineers who have come to study this program and to plan continuous improvements that enhance their learning experience and engagement. A mixed mode survey instrument was developed using questions to elicit text entry, choice, multiple answer and Likert scale responses from students in order to listen carefully to the challenges and needs of students. Using input from stakeholders (including from those who will use the survey data and from those who will conduct the survey), questions were themed under five broad categories: background, motivation, experience, expectation and aspiration to help address the following questions in each category to answer the two main research questions articulated in the previous section:

1. What are the motivations for students to study a postgraduate degree in engineering at the said Australian University?
2. What learning, professional, and cultural experiences are they after?
3. What are their aspirations for a career in engineering or related fields at the completion of their degree?
4. What support do they need and expect the university, School and course to provide?

Survey questions were carefully worded to attract responses that would enable us to develop answers to these research questions. A low-risk application for ethical approval was sought from the university. Subsequently, students were sent an email to their university email address with the link to voluntarily participate in the survey administered via an online experience management tool. Responses collected from students were de-identified using a coding process before analysis. Analysis involved preparation of descriptive statistics and analytical visualisation of data.
**Results**

Of the 123 students that commenced the survey, 75 students continued on to read the disclaimer and select either ‘they consent’ or ‘they do not consent’. Of the 74 students that consented, 40 students completed the full survey. As not all questions required a response to move to the next question the response rate for each question varied and for some questions, students were able to choose more than one answer, meaning the total figure could be greater than 100%.

**Background**

At the time of the survey, 27% of the respondents \( n=49 \) had completed between 0-4 credit points in the course, which indicated that they are commencing students, 18% had competed 5-8 credit points indicating that they are approaching mid-point in the program, 33% had completed 9-12 credit points indicating that they are beyond the mid-point in the program, and 22% had completed 13-16 credit points indicating that they are closer to finishing the program. Figure 1 indicates that 44% of the respondents \( n=49 \) had never lived outside of their family home before commencing their study in Australia. Figure 2 shows that for 70% of the respondents \( n=40 \) that family/friends were the main financiers of their education. Eighty-three percent of respondents have a part time or casual work to financially support their living expenses \( n=40 \) with almost half of respondents working an average of 15-10 hours a week \( n=48 \) on top of their studies.

![Figure 1: Time lived outside of family home](image1.png)  
![Figure 2: How study is financed](image2.png)

**Motivation**

Figure 3 shows that seventy eight percent of respondents \( n=49 \) indicated that their main motivation for commencing a postgraduate degree was to improve their hands on skills, other motivations included: increase my employment opportunities (70%), gain an overseas engineering qualification (58%), to migrate to Australia (28%), satisfy social / cultural pressure (15%). Thirty seven percent of these respondents indicated their preferred area for specialisation as Engineering Management, 32% indicated their preference for Mechanical Engineering, 20% indicated their preference for Mechatronics, 10% indicated their preference for Electrical and Renewable Energy Engineering, 5% each in Additive Manufacturing and Civil Engineering.

When asked why they selected a specialisation, student responses indicated views including gaining managerial knowledge, project management being an important aspect of any job, and interest in an area. Figure 4 indicates student responses for the question about what motivates them to learn. They considered that relevance for learning, clear goals, technical and practical experiences, meeting new people, interactive sessions were characteristics of learning activities that motivated them to learn. Eighty eight percent of respondents \( n=42 \) also considered feedback for learning a critical motivating factor. Ten percent of respondents considered that feedback for learning was somewhat important.

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Figure 3: Motivation for studying a postgraduate degree in engineering

Figure 4: Motivation for study

Expectation

Of the 43 students that responded to the learning expectation questions, a majority of respondents indicated that their preferred approach to learn is a combination of active (doing things hands on) and passive (listening to teachers). It is important to note that students preferred self-directed learning and team-based learning the least (see Figure 5). There were a range of responses submitted by students of what they were hoping to acquire from their engineering studies. These included engineering knowledge and concepts, technical and management skills as well as leadership qualities, problem solving skills, confidence and interpersonal skills.

Figure 5: Preferred approach to learning
Experience

Ninety three percent of the respondents found that the course provided them with a supportive environment for learning. The survey looked at various factors within the course and external factors that contributed to their overall experience and influenced their learning. Figure 6 shows that the majority of respondents’ (n=43) found teaching staff (teachers, tutors and technical staff) approachable with peers contributing to creating a supportive environment for respondents (Figure 7).

Respondents (n=43) also indicated peers which included team members, fellow students and senior students had an influence on their learning and engagement (Figure 8).

Fifty-eight percent of respondents (n=48) regularly participated in learning activities. Forty-six percent indicated that they study between 10-20 hours a week and 29% study 20-30 hours a week.
week (n=48). Feedback is important for a student’s motivation and experience in learning with 67% of respondents indicated that feedback they received was meaningful and a further 26% found that feedback was somewhat meaningful (n=42). Respondents listed knowledgeable teachers and new and challenging approaches to learning as their highlights from the course they also listed unfamiliar assessment methods, unclear expectations and assessment dates as the top three challenges that they encountered within the course. Other challenges listed external to the course were time management issues and work commitments.

**Aspiration**

Following graduation respondents aspired to find employment in engineering or in a related field that required the application of the engineering skills that they had acquired in their course. These aspirations were ranked as their main priority whereas returning home was ranked as least important (n=40). The majority of respondents (67%; n=39) claimed to be very confident or confident in looking for employment in engineering or related fields. Forty-six percent of respondents indicated that they are either very confident (26%) or confident (41%) with their communication and interpersonal skills (n=39) and that the course had either prepared them very well (33%) or somewhat well prepared (36%) to find employment (n=39). A comparison of those respondents that feel confident in finding employment in engineering or a related field shows that the majority of respondents (62%; n=39) indicated that they would allow less than one year to find employment (Figure 9).

![Figure 9: Confidence level in finding employment vs time given](image)

**Discussion**

A limitation to the research presented here is the response rate. The first question: what attracted you to the said Australian University, which required a text response saw a majority of the survey participants who consented to complete the survey drop off. We think students may have halted in frustration given the ambivalent nature of the question – indicating that consideration must be given to assumptions about student attitudes, their capacity for answering questions versus revealing preferences, framing effects arising from question wording and question order effect that can momentarily make a question salient to them (Zaller & Feldman, 1992).

Nevertheless, from those who proceeded to complete the survey we learned that overall students felt that the course provided them with a supportive environment (93%), characterised by approachable staff, meaningful feedback for learning and supportive peers influencing their engagement with learning activities and keeping them motivated. They seemed motivated to become a better engineer by improving their hands-on technical skills and thought that the dominant learning experiences delivered in the course such as lectures and seminars were less useful than project and research-based activities. However, we found that students were influenced by past experiences of learning. Their lack of preference...
for self-directing their learning and learning with others in their team seemed contradictory to the realities of working as an engineer or in any job – indicating that curriculum and teaching practice need to shift this mindset.

A majority of students (92%) seemed confident in looking for employment in engineering or related fields. We noted a contradiction between their reason for studying a postgraduate degree, where only 28% reported an interest in migrating to Australia, but all respondents expressed that applying for permanent residency after graduation was somewhat important to them. Eighty-seven percent of respondents felt that the course prepares them as required or more to work as a professional engineer. Finding a job as an engineer or a job in a field that requires application of their knowledge and skills were most important for students following graduation, and students were mostly confident that they will find a job within a year. Yet, we know that foreign born graduates are less likely to be working in engineering related jobs (Trevelyan & Tilli, 2010).

This finding highlights a multifaceted challenge for institutions and implications in the context of designing curricula for engineering coursework master programs that seek to best prepare students for the world of work, to present a realistic picture of post-graduation work opportunities (Australian Universities International Directors’ Forum, 2017), and to positively value the wide range of occupational outcomes actually likely (Jackson & Bridgstock, 2018). If the premise of engineering education is to support the gradual transformation from being a student in the classroom to a fully-fledged engineer, then there is no better time for Australian engineering education units to understand what international engineers want from our postgraduate degrees, and where they want to go after graduation.

Conclusion

In this paper, we present our initial findings from surveys looking deeply into what international students want from a coursework master’s degree offered at a regional campus of an Australian University. We unpacked the learning motivations, aspirations, experience, and perceptions of postgraduate international students to investigate two key questions: what does it mean to support international student engagement in learning engineering? and what does it mean to nurture their development for professional practice? While acknowledging the need to revise our survey instrument and continue data collection and research, here we discuss our initial findings from surveys conducted with the 2019 cohort of students. Our findings highlight a shared challenge for Australian Engineering Units is the development of global competence and experience relevant to their future careers.

References


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