

Strategies to Increase Equity of Access to Engineering Internships

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STRUCTURED ABSTRACT

CONTEXT

Internships, one type of Work Integrated Learning (WIL), are an important part of the development of employability competencies. Research across professions other than engineering has indicated that unpaid internships may be subject to class based privilege and induce financial stress. Educational practices in engineering enabling unpaid internships may further disadvantage students from equity groups: low socio economic status, disability, culturally or linguistically diverse, rural or remote students, and women in non-traditional areas.

PURPOSE

Funded by the National Centre for Student Equity in Higher Education, the extent of unpaid work placements, the role of positive social capital, accessibility and barriers to successful WIL for equity group students are being examined. We ask how the practices of the engineering industry and higher education community may embrace diversity by facilitating access to successful WIL opportunities. Successful WIL is identified by enhanced career, education or employability prospects, and positive student wellbeing.

APPROACH

The mixed-methods study includes: interviews; a survey including free-response questions and a resilience instrument; and analysis of students' reflective reports. Seven participants interviewed to date have related their experiences of engineering-related internships; how they secured positions, the quality of their experiences, whether they were paid, and the impact of these experiences on their approach to their engineering education, career progression and well-being. These seven participants shared perceptions of over 17 internships of which six were unpaid. Preliminary insights from these initial interviews and free-responses from the first round of surveys only are reported in this paper. The outcomes from an integrated data analysis process incorporating: further interviews; survey data including the resilience instrument data; and reflective reports, will be published by the funding body at the conclusion of the study.

RESULTS

Interviewees to date have largely capitalized on their family's or friends' engineering industry network (evidence of high social capital) to secure their first Internship. Survey respondents and interviewees described internship application processes as time consuming and stressful when combined with study commitments. Most accessed familial financial and social support to take up internships. All perceived their earliest internship(s) helped expand their industry network, enhanced their employability through immersion in the engineering workplace(s), and afforded them experiences they drew on in subsequent situational-analysis interviews. The benefits of exposure to professional practice included: opportunity to extend university-gained theoretical knowledge; appreciation of industry and sector drivers; identification of knowledge gaps; and enhanced professional skills.

CONCLUSIONS

Early findings suggest support for prior research indicating that internships have potential to be transformational experiences when those experiences are positive. An initial internship may not be easily accessible for students without high social capital. An unpaid internship may not be an option for students without financial support mechanisms including accrued savings, or familial, government or scholarship assistance. Recommendations for stakeholders are currently being developed.

KEYWORDS

Work integrated learning, diversity, engineering education, equity, internship.

Context

Work Integrated Learning (WIL), including internships, play an important role in the development of employability competencies. For this research, we used the Tertiary Education Quality and Standards Agency (TEQSA)'s definition of WIL as "any arrangement where students undertake learning in a workplace outside of their higher education provider (or one operated jointly with an external partner) as a part of their course of study" (TEQSA, 2017, p. 1). We drew from an Office for Learning and Teaching project definition of WIL placement; "a real workplace experience that forms a part of your studies, for example: a practicum, work placement, clinic..., internship, fieldwork, etc." (Smith, Ferns, Russell, & Cretchley, 2014, p. 90).

Research across professions other than engineering has indicated that unpaid internships may be subject to "class based privilege" (Shade & Jacobson, 2015, p. 188) and induce financial stresses (Grant-Smith, Gillett-Swan, & Chapman, 2017). There may be an increasing trend toward unpaid internships in engineering and this research sought to quantify anecdotal evidence of such. The Fair Work Australia Act Section 13 allows for vocational placements being unpaid, albeit, the section has been described as complex with a scarcity of case law (Wilson, 2015). The social capital of unpaid appointments may be inadequate to justify them since it may not account for those who are excluded (Siebert & Wilson, 2013). A review of unpaid work found that unpaid internships may fall into the "most diverse, complex and legally ambiguous" category of elective productive work due to the nature of work undertaken and (perceived) higher degree of student discretion to participate in such work (Grant-Smith & McDonald, 2018).

Educational practices enabling unpaid internships may further disadvantage student engineers from equity groups. Equity status is defined by the Australian Department of Education and Training (2016) to include students of (self-declared): Disability, Low-Socio Economic Status (SES), non-English Speaking Background (NESB) also referred to as Culturally and Linguistically Diverse (CALD), Women in Non-Traditional Areas (WINTA) or fields of study, and Regional or Remote students. The inclusion of women in non-traditional areas for this research is due to the low participation rates (of around 14%) for women in engineering undergraduate education; in line with the relatively static national rates of 12% women in the engineering profession (Kaspura, 2017). The career cycle of women engineers differs from male counterparts including a higher likelihood of leaving the profession, a higher likelihood of not being re-employed in the profession, and increased early-retirement pressure (Kaspura, 2017). The challenges as a visible minority thus span beyond higher education into the workforce and establish the need for women in engineering to remain identified as an equity group.

Purpose

The research purpose is to develop recommendations for the engineering industry and engineering higher education communities to facilitate access and success of equity group students in WIL. The extent of unpaid work placements, the role of positive social capital, accessibility and barriers to successful WIL for equity group students are being examined. We ask how the practices of the engineering industry and higher education community may embrace diversity by facilitating increased participation and successful WIL opportunities.

The research builds on previous equity and WIL research across allied-health and education disciplines that found "greater levels of institutional and community support are required to support WIL participant wellbeing" (Grant-Smith et al., 2017, p. 4). The authors' definitions of success drew from extensive research exploring indicators of successful WIL that include the "potential to enhance graduate employability through the development of interpersonal, social and professional skills" (Grant-Smith et al., 2017, p. 7). Success was further defined as an experience that did not diminish the socio-emotional and financial wellbeing of participants; based in part on an emerging body of research in unpaid work (Grant-Smith & McDonald, 2018).

Exposure to professional practice, and subsequent reflective reporting, may be mandatory for graduation and is widely recognised as having the potential to enhance the employability of graduates (Reddan & Rauchle, 2017; Smith et al., 2014). Some research indicates the most important strategy to improve graduate employability is participation in well-managed work experience, internships, and placements (Kinash, 2015). Engineers Australia's accreditation guidelines for engineering programs stipulate that accredited engineering programs expose students to engineering practice that must include some:

practical experience in an engineering environment outside the teaching establishment,...

The requirement for accreditation is that programs incorporate the above elements, and others – perhaps offering a variety of opportunities to different students – to a total that can reasonably be seen as equivalent to at least 12 weeks of full time exposure to professional practice in terms of the learning outcomes provided (Bradley, 2008, p. 18).

There is a diversity of opportunities recognised by universities as contributing to students' exposure to professional practice. For this research, internships are defined as WIL placements (of variable duration) that contribute to students' exposure to professional practice.

Approach

A consortium of cross disciplinary researchers is researching the impact of the community (engineering industry, professional bodies and higher education) on supporting equity students' participation and success (a positive experience contributing to student employability and wellbeing) in engineering internships. The study includes interviews; a survey including free-response questions and a resilience instrument; and analysis of students' reflective reports. Preliminary insights from seven initial interviews and free-responses from the first round of surveys only are reported in this paper. The outcomes from an integrated data analysis process incorporating: further interviews; survey data including the resilience instrument data; and reflective reports, will be published by the funding body at the conclusion of the study.

The research uses mixed methods (Creswell and Plano Clark, 2011) informed by ethnographic research methodology observing the culture of engineering internships from the perspective of the participants: student engineers. Data collection and analysis for the interviews and surveys were conducted in parallel in the first instance. Convergence will occur after data collection is complete to preserve the parallel structures (Creswell and Plano Clark, 2011). Student participants are being drawn from four Australian universities with different equity group representation and affiliations as shown in Table 1. In-depth interviews about their experiences of engineering-related internships explore the quality of their experiences, whether they were paid, and the impact of these experiences on their approach to their engineering education, career progression and well-being.

The initial deductive coding of data (Saldaña, 2013) from students' narratives from the initial seven interviews was conducted in NVivo® using nodes and sub nodes from WIL-equity research viz. positive and negative impacts of unpaid WIL (Grant-Smith et al., 2017). The nodes were: positive impacts of WIL (13 sub nodes); negative impacts and/or stressors (15 sub nodes). A further three nodes emerged from inductive analysis of the data: processes for acquiring WIL (6 sub nodes); coping and support mechanisms (5 sub nodes); and an internship characteristic node (9 sub nodes) aligned with a framework for classifying unpaid WIL based on the degrees of participatory discretion and purpose of experience (Grant-Smith & McDonald, 2018).

The combination of narratives and resilience data will be used to generate recommendations to enhance the accessibility and success of WIL for equity students. Interim recommendations based on initial interviews and open responses only are presented in this paper as a mechanism for seeking feedback from the community prior to completion of the final report for the funding body and publication to a wider audience.

Table 1: Equity Group Statics for Participants' Universities (NCSEHE 2018)

University	Affiliation	Year	Indigenous	Low SES	Regional	Remote	Students with Disabilities
V	ATN	2016	0.98%	11.74%	3.19%	0.07%	4.00%
X	ATN	2016	1.31%	6.98%	8.87%	1.82%	9.75%
Y	IRU	2016	1.65%	17.76%	9.18%	1.52%	10.02%
Z	Go8	2016	1.20%	13.51%	10.70%	1.70%	3.65%

Results and discussion

To date, seven in depth interviews describing 17 internships (of which, six were unpaid) have been conducted with engineering students/new graduates across three (X, Y and Z) of the four institutions. Additionally, 20 respondents provided data via the online survey. These participants have shared perceptions of paid and unpaid internships.

First Interviews

To date, four interviewees reflect multiple Australian Department of Education and Training (2016) equity group definitions: one regional participant, one NESB participant and two WINTA participants. Other interviewees, albeit outside these equity group definitions, included mature-age students.

The interviews have revealed the following for our study participants: almost all of the internships were 12 week blocks over summer (a traditional mode of delivery of internships for engineering). Six of the 17 internships were unpaid.

Unpaid internships were perceived as a last alternative when (i) a paid placement was not available or (ii) time to complete exposure to professional practice hours in order to graduate was expiring. Unpaid internships were also perceived as worth the risk if the unpaid opportunity was (i) likely to lead to potential employment, (ii) of such quality to outweigh the negative financial and perceived reputational impacts or (iii) was for a nonprofit organisation. Students had to relinquish or reduce hours of paid work to take up internships. For students who had social and familial support, this was not as onerous as for those who were self-supporting, who juggled both unpaid internships and paid work. One interviewee reported it was necessary to sell their business to fund their internship.

All but one of the interviewees capitalized on their family's or friends' engineering industry network (evidence of high social capital) to secure their first internship. Most accessed familial financial and social support during any unpaid internship. They perceived early internship(s) helped expand their industry network, enhanced their employability through immersion in the engineering workplace(s), and afforded them experiences they drew on in subsequent situational-analysis interviews. These positive outcomes were also perceived by the participants as helping them secure later paid internships, which is consistent with recent research in the UK that found internship experiences "if positive, lead directly to increased confidence and capability to engage in topics of conversation around the workplace that can be deployed at interviews and assessment centres" (Royal Academy of Engineering, 2018, p. 42).

A theme emerging from the interviews is the 'taste test', whereby students used their initial experiences to help them determine the kind of work they wanted to do, or not do, in subsequent internships, and when they graduate. The opportunity for this sort of taste was still afforded by connections to individuals already in industry. This incremental building of networks and connections is also evident where participants described unpaid internships that led directly to a paid internship resulting from establishing industry relationships beyond the company they interned at, or forming a relationship with an influential mentor. One student who was not connected to engineering by extant social or familial networks found that attendance at a university-organised networking event led to a mentor (not affiliated with an internship) who provided support and career guidance beyond internships.

Other benefits of internships for students included extension of university-gained theoretical knowledge; appreciation of industry and sector drivers; identification of knowledge gaps; and enhanced professional identity and skills. Participants often cited dissonance between their university learning and internship experiences, such as a lack of project management curriculum, and experiencing less complex or nuanced problems and documentation (including drawings) at university. Most, however, articulated that the theoretical foundation from university studies was essential and sufficient to cope with the demands of internships.

Initial Survey Data

Survey data have been collected from 20 participants. Of the 20 participants, five were international students and only 12 indicated their primary residence postcode. Of these 12, three were in the 3rd decile in Australia (3rd decile = ranked in lowest 30% for economic advantage), five were in the 8th to 10th decile and three were in the 5th to 7th decile.

Preliminary observations of the data suggest that unpaid work was taken due to the imperative to graduate or the perceived need to increase employability. Students' experiences were perceived to be beneficial in terms of career planning and progression, (re)focussing energies on education, and understanding the engineering workplace and profession.

Internships added to students' time and financial pressures; around one third of respondents studied simultaneously with internships i.e. the internship was during teaching weeks. Seventeen students reported having paid employment whilst studying. Seven of these had more than one job whilst studying. Around one half reported insufficient financial support to enable them to relinquish this paid work during their internship. Sources of financial support included parents, family, scholarships, and government. Survey respondents described application processes for internships as time consuming and stressful when combined with these study and work commitments, while high rates of unsuccessful applications adversely impacted confidence and motivation.

Limitations and further research

As a work in progress, these results must be considered to be preliminary. Further student interviews have been conducted at the fourth institution and more participants have been recruited from engineering cohorts and staff engaged in engineering internships processes including student advisors, professional staff and academics. The mixed methods approach, with the parallel survey and interviews, is developing insights which are to be further explored in subsequent interviews and convergent data analysis including the resilience measure data.

CONCLUSIONS

Early findings support prior research, indicating that internships have the potential to be transformational when the experiences are positive. An initial internship may not be easily accessible for students without high social capital (familial, social, mentor and/or industry connections and support), while unpaid internships may not be an option for students without financial support mechanisms including accrued savings, or familial, government or scholarship assistance.

Recommendations for stakeholders are currently being developed. At this early stage, interim recommendations for engineering WIL communities of practice (including higher education institutions, professional bodies, industry, and student societies) are presented for discussion:

- Employers should consider the impacts of unpaid internships, including the potential restriction of applicant pools.
- Employers should consider more streamlined application and recruitment processes acknowledging students' competing demands on their time.
- Students should proactively build industry networks.
- Universities, student societies and professional bodies should incubate increased opportunities and support for students to build their networks with industry.
- Academics should provide learning experiences that better reflect the complexity of the engineering practice.
- Universities, industry, professional bodies, and governments should explore options of increased financial support during unpaid internships including scholarships and advocating for paid internships.

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