Work Integrated Learning Rationale and Practices in Australian Information and Communications Technology Degrees

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Abstract
To obtain a better understanding of WIL rationale and practices in Australian ICT degrees, a survey of managers and educational leaders of ICT was undertaken. These survey results were analysed and informed by discussions at a forum of ICT educational leaders. Results indicate that WIL practices are broad with a wide range of internal (university) and external (industry) combinations to provide the student with appropriate professional experience. The majority of respondents indicated that their curricula are industry relevant, and that they offer an industry-linked final year project. Virtual or simulated work experiences also seem to be commonly practiced. The range of options is influenced by local context, staff approaches and resource availability. The majority of universities regard WIL as important and beneficial and apparently have practices that provide for industry contribution to the curriculum even though this may not be obvious to graduates in the workplace. Support provided to students for an industry placement is variable. Success measures of placements are that students have gained a variety of work perspectives. That the student is employable as a consequence is not seen as very important. There appears to be a tension between desired outcomes from academia and industry including those of ‘work readiness’ and lifelong learning. It seems that the range of options provided by universities need to be recognised by all stakeholders as contributing to the development of an ICT Professional.

Keywords: Work integrated learning, professional practice, student experience, industry, academia.

1 Introduction
A survey of management and educational leaders of Information and Communication Technology (ICT) departments and schools from Australian universities was carried out as part of a recent project funded by the Australian Learning and Teaching Council (ALTC) project (Ogunbona, 2009). One of the key aims of the project was to investigate the lack of real-world experience that was strongly felt by recent ICT graduates in the workplace as reported in a previous related ALTC project (Koppi and Naghdy, 2009). The previous project found a significant mismatch (88%) between what the graduates in the workplace considered important abilities for their work and how they perceived universities had prepared them for those abilities. The aim of the survey of management and educational leaders was to obtain an understanding of the representative views and practices of Work Integrated Learning in ICT in Australian universities. The findings from the survey complement those of the previous ALTC study which focused on the perceptions of recent graduates in the workplace therefore providing a comprehensive picture of WIL practices from each perspective.

The term ‘Work Integrated Learning’ (WIL) is now commonly regarded as an umbrella term that covers a “range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum” (Patrick et al, 2009). An alternative definition of WIL is “the process whereby students come to learn through experiences in educational and practice settings and reconcile and integrate the contributions of those experiences to develop the understandings, procedures and dispositions, including the criticality and reflexivity, required for effective professional practice” (Billett, 2011). The key characteristics drawn from these definitions are that WIL involves a range of models of learning experiences with the common aim of developing student’s professional capabilities and knowledge of the workplace to equip them for professional practice.

The benefits that WIL brings to all stakeholders, including students, universities, industry and the economy have been well documented (e.g., Poppins, and Singh, 2005; Pauling and Komisarczuk, 2007). WIL provides students with an opportunity to test the theoretical knowledge learnt at university and to put it into action in the “complex and pressurized environment of the real professional world” (Bates et al, 2007). Billett (2011) in his ALTC report on Integrating Practice-Based Experiences identified several reasons for integrating work-based learning experiences into the higher curriculum including learning about an occupation, extending the knowledge learnt in university settings, and building the capacities required to engage in and be an effective professional practitioner. WIL provides graduates with significant salary advantages with a reported median starting salary AUD$13,000 higher for those with previous work experience in computing (GCA, 2005; Pauling and Komisarczuk, 2007).
2010). University lecturers in Australia have identified Industry-Based Learning as the single best feature of their degrees because it realized the alignment of their programs to industry (Smith et al., 2008). Similarly, the previous related ALTC project (Koppi and Naghdy, 2009) found that ICT graduates in the workplace strongly believe that university courses should contain some form of work-integrated learning and also that ICT employers believe that students need more work placements to gain industry experience. The government also recognizes the value of WIL to the economy with the Minister for Employment Participation stating “By integrating practice and theory, students develop those important ‘softer’ skills greatly valued by employers, such as teamwork, self-management and initiative. Students are able to make an immediate and meaningful contribution to increasing productivity and prosperity—for industries, businesses and the nation as a whole” (O’Connor, 2008).

Whilst the University sector recognises and acknowledges the significant benefits of the objectives of WIL there remains some questions regarding the actual work readiness and professional preparation of graduates. For example, the related ALTC project (Koppi and Naghdy, 2009) identified deficiencies in the workplace readiness of new graduates particularly in relation to the development of essential generic skills such as interpersonal and professional communications, business awareness and problem-solving abilities. Likewise, the Business Council of Australia claim that graduates still lack the essential attributes especially in leadership, teamwork and communication, and that “Universities were failing to heed the call” (Hare, 2011; BCA, 2011).

This paper reports on a survey of academic leaders of ICT departments and schools in Australian universities regarding the rationale and practices of Work Integrated Learning. The results of this survey are contrasted with the results of a related project that surveyed recent graduates in the workplace and ICT employers. The perspectives and perceptions reported in this paper will assist in the development of a nationally coordinated approach to WIL in ICT educational programs that will benefit all stakeholders including students, employers and universities.

2 Survey and Analysis Methods

2.1 Survey Groups

The aim of the survey designed by the project team was to obtain an understanding of the representative views and practices of WIL in ICT in Australian universities. The first targeted group was the Heads of ICT organisational units at the Australian universities who were members of the Australian Council of Deans of ICT.

A series of four approaches was used in order to obtain their participation in the data-gathering exercise: a paper-based survey was mailed to each university representative on the Council; a fortnight later an emailed survey was sent to the same people; a telephone follow up was undertaken two weeks later and finally they were sent an invitation to complete the survey online. As a result of these efforts a total of 22 completed surveys were received from 18 universities (a few ICT heads had distributed the survey to other ICT heads internally).

The second group to complete the same survey was the Associate Deans for Learning and Teaching (or their equivalent) in ICT at a forum of 36 attendees representing 25 universities, and 30 completed surveys were received.

One workshop session at the forum was concerned with WIL issues and the recorded discussions were also used to inform the project. The total of 52 completed surveys and forum deliberations are considered as representative of WIL views and practices amongst Australian ICT academia.

2.2 Survey Analysis

The survey consisted of a number of questions to be rated on a 5-point Likert Scale where a tick was sufficient to indicate the response and an option to provide further comments. Entries to survey tick boxes were compiled to provide quantitative data. Free text entries were read repeatedly to enable the coding and categorisation of responses which were then counted to enable quantitative comparisons. This qualitative data analysis method was informed by the work of Boyatzis (1998), and Bogdan and Bicklen (2002).

2.3 Forum Discussions

Participants at the forum were broken into six small groups to facilitate workshop discussions on a broad range of WIL issues in ICT. Their deliberations were summarised on paper by each group, collected and later compiled. Plenary discussions were summarised and typed for the whole group to see on screen and edit at the time.

3 Findings

The significant benefits of WIL has incentivised universities to develop and implement a range of models of WIL extending from the traditional work experience placement or internship programs to innovative virtual or simulated WIL experiences. The range of models have also been acknowledge by the government with O’Connor (2008) noting that WIL comes in many different forms including "research, internships, studying abroad, student teaching, clinical rotations, community service or volunteer work, industry attachments or placements, sandwich programs, and professional work placements”. Boud and Symes (2000) regard all models of WIL, including those that occur in a workplace, in the community, within the university, and real or simulated, as valid “as long as the experience is authentic, relevant and meaningfully assessed and evaluated” (Boud and Symes, 2000).

<table>
<thead>
<tr>
<th>WIL Opportunity</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>12 month paid industry placement</td>
<td>16</td>
</tr>
<tr>
<td>6 month paid industry placement</td>
<td>17</td>
</tr>
<tr>
<td>Industry-linked final year project</td>
<td>43</td>
</tr>
<tr>
<td>Unpaid internships</td>
<td>23</td>
</tr>
<tr>
<td>Industry relevant curricula</td>
<td>44</td>
</tr>
<tr>
<td>Virtual or simulated work experience</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 1: Survey results showing the WIL opportunities available to students

Table 1 shows the tick-box results from the 52 respondents regarding the kinds of WIL opportunities
available to students at their institution. Respondents may have ticked more than one box. Most respondents indicated that their curricula are industry relevant and that the final year project is somehow linked to industry.

Virtual or simulated work experiences seem to be a common practice. Forum attendees were overwhelmingly in support of WIL models that provided authentic work experience for students. However the forum participants also discussed alternative opportunities for students unable to attend a workplace (such as by means of a placement). For those students, a virtual or simulated experience may be the next best option. Unpaid internships were also indicated by a similar number of respondents, and paid industry placements were the least available to students and there was little difference between the frequency of 6- or 12-month placements.

Survey respondents also had the opportunity to specify other options available to students or comment on the tick-box options, and these included:

- Funded placements through WIL scholarships
- Placements vary from a few weeks to about three months, and may be part-time, e.g., 2.5 days/week or a flexible 100 hours during the course
- Paid internships in research organisations
- Guest teaching by industry professionals
- Assignments requiring interviews and interaction with ICT professionals in industry
- Industry certified courses (e.g., CISCO)

The range of work integrated learning opportunities appears broad from a national perspective but the options at the local level will depend upon the university location (metropolitan or rural), local context, staff approaches and resource availability. The forum participants agreed that a range of models was required in order to provide the flexibility to accommodate the diversity of student capabilities, motivations and interests as well as different university resourcing models and priorities.

### 3.1 Local WIL Practices and Support: Survey Responses

Table 2 shows local practices within ICT schools or departments. Responses range from Strongly Disagree (SD) to Strongly Agree (SA) with the proportion (%) of entries per box and ranked according to the strength of agreement (A + SA) with the given statements.

According to the academic staff that completed the survey, the majority of universities have practices that provide for industry contribution to the curriculum. However, when ICT graduates in industry were asked about their curriculum and workplace preparation, the majority stated that an area in need of improvement concerned industry involvement in the curriculum (Koppi and Naghdy, 2009). This same study also found that ICT employers desired greater input to the curriculum, and is consistent with the wishes of ICT employers found in a survey by Hagan (2004). Greater industry and university liaison over the curriculum would appear to be a challenge.

The majority of universities regard WIL as a key feature of ICT degrees and actively encourage students to undertake a placement and will only approve such a placement if it provides the student with an appropriate learning experience. A little over half of the universities actively find and manage placements and believe that industry should support the management of such programs. About half of school or department academic staff provide support for industry engagement with WIL although less than half provide support for students with an induction program. A similar proportion emphasise the development of generic skills during WIL experiences. A minority of universities provide a high level of resources for WIL.

### 3.2 Local WIL Practices and Support: Forum Discussions

While recognising that industry placements provide benefits to students, it was acknowledged that they were not available to all for a variety of reasons. It was clear that placements were more readily available for the better students and there was uncertainty about whether or not the weaker students would benefit and that hard evidence was lacking. From the survey of ICT graduates in industry, Koppi and Naghdy (2009) reported that the graduates found that industry placements gave them a better appreciation of the relevance of university courses and provided them with a framework for their studies upon returning to university. It could be argued that these experiences are precisely what would benefit weaker students the most.

University location and the economic climate affect placement opportunities. Regional universities offering ICT courses may not be conveniently close to industries that could provide placements and in economic downturns, even metropolitan universities may find it difficult to place students in industries that could be shedding staff. Established relationships between universities and industry partners provide the most stable
circumstances for placements even though they may be restricted to relatively few students.

While universities may encourage placements in ICT jobs, students themselves may not avail themselves of such opportunities because they already have established part-time non-ICT jobs that are necessary to maintain themselves through university. This is supported by recent research that found half of Gen Y students in full-time study also have paid jobs (AMP-NATSEM 2007).

It was observed that the development of generic skills (sometimes called ‘soft skills’) in industry employment may occur in any workplace context and not necessarily ICT employment. This same observation was made by ICT graduates in industry who reported that they learned generic skills such as negotiation with clients, communication and teamwork in a variety of workplaces (Koppi and Naghdy, 2009). It may be that the Gen Y students in paid prolonged employment in any business may be developing generic skills (or employability skills) to at least the same level as they would in an ICT placement, especially where ICT positions are unavailable.

The point was also made that university administration of placements was a burden that demanded resources and constant effort to maintain relationships with relevant industries.

### 3.3 Success Measures of Placements

Table 3 shows the proportional responses (%) of academic staff to the statement: ‘The success of an Industry-Based Learning or internship placement is judged when the student:’. Responses range from Strongly Disagree (SD) to Strongly Agree (SA) with ranking according to the strength of agreement (A + SA) with the given statements.

<table>
<thead>
<tr>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has improved understanding of professional responsibility</td>
<td>2</td>
<td>9</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Gained a variety of work perspectives</td>
<td>4</td>
<td>7</td>
<td>62</td>
<td>27</td>
</tr>
<tr>
<td>Has completed work tasks as required</td>
<td>2</td>
<td>9</td>
<td>72</td>
<td>17</td>
</tr>
<tr>
<td>Has gained new technical skills and competencies</td>
<td>6</td>
<td>36</td>
<td>47</td>
<td>11</td>
</tr>
<tr>
<td>Did not disrupt normal company operations</td>
<td>7</td>
<td>15</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>Is now employable</td>
<td>7</td>
<td>22</td>
<td>35</td>
<td>26</td>
</tr>
<tr>
<td>Added value to the company’s profitability</td>
<td>38</td>
<td>40</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3: Success Measures of Placements**

The students who achieved an improved understanding of professional responsibility and gained a variety of work perspectives are regarded as having achieved the strongest learning outcomes. These outcomes would help with employability and would be difficult to obtain by any other means. However, these outcomes are generic and could be acquired from a number of professional employment situations; the context would determine ICT relevance. One of the benefits of workplace experience is employability, as many employers require such experience and ‘work readiness’ even in recent graduates (Forth and Mason, 2003; Pauling and Komisarczuk, 2007; Kennan et al., 2008), however this outcome is apparently of limited concern to most academic staff who did not rate the outcome of the student being employable as very high (Table 3).

Completion of work tasks is a strongly desired outcome but these are not necessarily related to gaining new technical skills and competencies because the proportion of responses to these two outcomes is different. On balance, not disrupting normal company operations is seen as a success but adding financial gain to the company is generally not.

Additional comments made by survey respondents with respect to success measures include the attainment of analytical skills, better interpersonal skills, more realistic views about the workplace and work politics, and improved self-organisation. In addition to not disrupting company operations, it was noted that the students should not harm university-industry relations.

Free text responses indicated that there is a broad range of placements with a variety of outcomes. Students may be on placements for lengthy full-time (6 months or more) or part-time periods, or just for a few weeks obtaining some form of relevant work experience with a report to prove it was carried out. Other placements are based on a learning plan with specific learning activities and outcomes.

The forum participants unanimously agreed that WIL is beneficial in developing certain ‘professional attributes’ in students and would improve student’s employment outcomes. The value of WIL beyond the direct employment benefits was discussed at the forum with some participants noting that employment outcomes should not necessarily be seen as the primary goal of university education. The tension between teaching theory and vocational practice when designing of curriculum for ICT degree programs has resulted in some employers believing that “universities are not interested in meeting industry requirements” (Koppi and Naghdy, 2009). An academic goal is to develop rounded graduates with life-long learning skills whereas some industries desire graduates who are trained in the contemporary tools and techniques used in current corporate and industry environments (Shoiikova & Dwischev, 2004).

Several respondents commented on this tension between academic and industry regarding placements and these have been summarised in Table 4.

Many academic staff consider placements as essential but recognise the limitations without university and industry support. This is particularly so for regional universities where there may be insufficient local places available to meet student demand. Several participants mentioned that an effective placement strategy should be at a national level managed by stakeholders including universities (especially administrative support), the Australian Computer Society, Engineers Australia, the Australian Information Industry Association, and government. The students themselves are key stakeholders and it is unfortunate that the value of placements to attain industry experience is often not appreciated until after graduation, as noted by survey respondents and found by Koppi and Naghdy (2009) in their survey of ICT graduates in industry.
The results of the survey and forum discussions indicate that the WIL model traditionally preferred by the ICT sector is the six-month paid industry-based learning placements which has been the WIL model traditionally preferred by the ICT sector. Fewer universities provided traditional 6 month or 12 month paid industry-based learning placements which has been the WIL model traditionally preferred by the ICT sector. Universities appear to advocate for more flexibility in WIL models to meet the educational and employment benefits of WIL and generally regard WIL as a key feature of ICT programs. Resourcing for WIL varies across the sector possibly influencing a variety of models of WIL that extend from the traditional work experience placement to new virtual or simulated WIL experiences. Universities appear to advocate for more flexibility in WIL models to meet the diversity of student capabilities and interests, including international students and those students with significant part-time jobs. Universities also indicated that appropriate models of WIL are required to suit different university resourcing models and priorities.

The results indicate that the most prevalent WIL models were the ‘Industry-Linked Final Year Project’ and ‘Industry Relevant Curricula’. These models may be classified as ‘internal’ using a continuum from the traditional ‘external’, industry-based WIL experiences such as work experience placements and internships to ‘internal’, university-based experiences such as project work, case studies and experiential learning opportunities. Fewer universities provided traditional 6 month or 12 month paid industry-based learning placements which has been the WIL model traditionally preferred by the ICT industry (Mather, 2010).

The use of Industry-Linked Final Year Projects as the key method of providing a WIL experience in ICT degrees is endorsed by the Australian Computer Society in their Accreditation Guidelines (ACS, 2009) which state that programs will “include a capstone unit in the final year to allow an assessment of the program objectives.” The guidelines contain a Policy on Capstone Units (Appendix 3) that indicate dual objectives for capstone units:

1. Integrate the skills and knowledge developed throughout the program;
2. Provide a structured learning experience to facilitate a smooth transition to professional practice or further study in the discipline.

The Policy does not provide details of the types of learning experiences that would be appropriate to achieve these objectives apart from a statement regarding the need for “authentic learning experiences in relation to its intended professional outcomes”.

The issue of the authenticity of learning experiences is central to the success of WIL programs; however agreement on what makes a WIL learning experience authentic appears to be split between academic and industry views. The results of the survey indicate that universities believe that a successful WIL experience provides students with an improved understanding of professional responsibility and the attainment of generic skills. The forum discussions however raised concerns from universities that industry also stresses the need for ‘work ready graduates’ (Mather, 2010) possibly at the expense of a more holistic education with a focus on lifelong learning. This issue was described as an ‘expectations gap’ in the ALTC WIL Project (Patrick et al, 2009) which recommended a “stakeholder integrated approach to the planning and conduct of WIL based on formalised, sustainable relationships and a common understanding of the procedures and commitment required by all those involved.”

An approach to develop a shared understanding regarding the authenticity of the range of learning experiences for WIL is required in order to achieve industry acceptance and recognition of innovative internal and virtual models of WIL.

The movement towards outcomes-based education in engineering education may provide a way forward to achieving a common understanding of the value of the full spectrum of WIL models. The focus on educational outcomes rather than learning methods is now endorsed by both universities and industry in international course accreditation processes for engineering and many other disciplines. The approach is based on the demonstrated student attainment of stated graduate attributes with the focus on outcomes rather than process. This approach encourages diversity and innovation in delivery and has brought significant benefits to engineering education (Palmer and Ferguson, 2009).

The outcomes-based approach generally requires a linking of course and unit level learning objectives with graduate outcomes. The use of taxonomies such as Bloom (1956) are commonly used in computer science education to describe learning outcomes and links to assessment (Lister, 2000) however the results of this survey and forum suggest there may be a lack of a shared understanding of the learning objectives for WIL experiences.

Learning objectives for WIL developed jointly by universities and industry (professional bodies and industry associations) will provide the basis for the development of a range of models of WIL each providing varying levels of authenticity (Figure 1). Models should include external forms where students go out to industry (e.g. industry placements, internships, field visits and community projects) as well as internal models where industry comes to students (e.g. guest speakers, case studies, industry linked projects and simulated experiences). The authenticity of each form of WIL should be evaluated according to the achievement of the

<table>
<thead>
<tr>
<th>Industry</th>
<th>Academia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work ready</td>
<td>Academia ready</td>
</tr>
<tr>
<td>High-level communication skills</td>
<td>Balance between communication skills and expression of knowledge</td>
</tr>
<tr>
<td>Profit-making environment</td>
<td>Knowledge-making environment</td>
</tr>
<tr>
<td>Want high-performing students</td>
<td>Have students with a wide range of abilities</td>
</tr>
<tr>
<td>Time for effective student contribution</td>
<td>Time away from formal teaching</td>
</tr>
<tr>
<td>Variable demand for students</td>
<td>Constant requirement for places</td>
</tr>
<tr>
<td>Expect universities to provide resources</td>
<td>Would like more industry contribution</td>
</tr>
</tbody>
</table>

Table 4: Tensions between Industry and Academia over Placements

4 Discussion
The results of the survey and forum discussions indicate that there is a range of rationale and practices for WIL in Australian universities. Universities recognise the educational and employment benefits of WIL and generally regard WIL as a key feature of ICT programs. Resourcing for WIL varies across the sector possibly influencing a variety of models of WIL that extend from the traditional work experience placement to new virtual or simulated WIL experiences. Universities appear to advocate for more flexibility in WIL models to meet the diversity of student capabilities and interests, including international students and those students with significant part-time jobs. Universities also indicated that appropriate models of WIL are required to suit different university resourcing models and priorities.

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agreed learning objectives rather than just relying on personal opinion which in some cases have only recognised formal industry placements as the only valid form of WIL. Industry acceptance of the value of innovative learning experiences to provide students with the necessary understanding of aspects of professional practice will benefit all stakeholders.

Figure 1: Learning Objectives and Models of WIL

This approach is similar to the current Engineering Australia accreditation requirements for professional engineering degrees (EA, 2008) which require “a minimum of 12 weeks of experience in an engineering-practice environment (or a satisfactory alternative)”. The EA requirements do state that there is “no real substitute for first-hand experience in an engineering-practice environment, outside the educational institution” however the requirements also state that “however it is recognised that this may not always be possible”, i.e., engineering students do not have to undertake 12 weeks of actual industry experience in an external organization in order to complete their degree but can achieve this requirement through alternative means. Valid learning experiences for professional practice include traditional placements as well as the “use of guest presenters, industry visits and inspections, an industry based final year project”. The EA requirements go on to indicate that: “The requirement for accreditation is that programs incorporate a mix of 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.”

This liberal interpretation of professional practice permits universities to provide a set of university-based learning experiences to achieve the ‘12 week experience’ requirement of EA accreditation. The professional practice requirement could be spread out over the duration of the degree program including providing a context to engage first year students as well as a professional preparation for final year students. The key requirement is that the experiences are authentic and can be documented to demonstrate targeted graduate capabilities set for the program.

Using the Engineering Australia experience as an example, consideration should be given in the current revision of the Australian Computer Society Course Accreditation Guidelines to incorporate detailed guidelines for professional practice including stated learning objectives that have been endorsed by industry. Whilst the 12 week requirement appears to work well in the context of engineering, it is accepted that a similar requirement might not map well to the ICT disciplines. However, there would be wide ranging benefits in implementing a similar professional practice requirement for ICT degrees where the requirement is visible, significant and readily understood by the prospective and current students, teachers, parents, industry, government and the community in general, and provides scope for universities to innovate in the design of learning experiences and approaches.

5 Conclusion
The survey and forum discussions have revealed strong academic support for students gaining professional practice through a variety of WIL options. While placements may be a desirable component of WIL, circumstances may dictate alternative practices that may not be recognised by industry as authentic.

The development of a shared set of learning outcomes for WIL between academe and industry may provide recognition of the authenticity of innovative internal models of WIL such as virtual and simulated experiences as well as Final Year Projects related to industry needs. Learning outcomes that include experience of industry practices should be mutually acceptable whatever the processes used to produce the desired outcomes.

Future work in this area may include the identification of learning outcomes for WIL in conjunction with industry and the incorporation of learning outcomes for WIL and/or professional practice into ACS accreditation guidelines.

6 Acknowledgements
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7 References


