Australian Council of Deans of Science

Teaching and Learning Centre

WIL Snapshot Study Report – September 2019

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Executive Summary

This report presents a snapshot of the state of work-integrated learning in science faculties (or equivalent organizational units) in Australian Universities. Findings are based on a desktop review of curriculum structures within Bachelor of Science (BSc) degrees drawn from public university websites, and a national survey that gathered information from 16 science faculties.

Provision of work-integrated learning in Bachelor of Science degrees has become common, although still less so than in other STEM disciplines associated with professional degrees. Information from public websites was corroborated by feedback from science faculties.

- Placements have become normalised: over 50% of the BSc degrees reviewed included an elective WIL unit offered through the Faculty of Science (or equivalent).
- The structure of WIL within BSc degrees varies considerably: WIL is most often offered as elective, but was a completion requirement in five degrees and a requirement associated with specific majors in others.

Science faculty reports suggest that **student participation and industry involvement in work-integrated learning** vary.

- Most faculties report participation across multiple forms of WIL.
- Most faculties report that the proportion of students that participate in placements is low (0-25%).
- industry partners are primarily involved in the provision of placements and projects, but sometimes also contribute to design of WIL experiences and are asked to contribute to assessment.

Building capability to deliver work-integrated learning is a focus of many science faculties.

- Most faculties primarily rely on institutional definitions and policies for WIL, and do not have additional faculty specific versions of these.
- The majority of faculties had allocated specific resources to work-integrated learning. This most often involved the appointment of partial roles related to WIL or dedicated staff. These resources were sometimes shared with other discipline areas.
- Industry partners were primarily involved in the delivery of work placements and projects, but sometimes also contributed to design. Most faculties encourage industry partners to contribute to the assessment of students.

This snapshot report suggests that awareness of WIL in science faculties is widespread, but substantial questions remain about how to best deliver successful WIL programs. Faculties have taken steps to increase access to WIL, and intent to normalise WIL within the study of science is clear. Low student participation remains an issue and requires specific focus to remove barriers (Johnson et al., 2019). The next challenge for science faculties is to ensure that WIL activities are offered in ways that are sustainable and valuable to students, employers and science faculties.

Context and approach

Work-integrated learning is a priority for the Australian Council of Deans of Science because it is a means by which to improve the employability of science graduates and advance links with industry. The ACDS has led two large-scale national projects to advance this agenda: Leadership for WIL in Science funded by the Office of the Chief Scientist (Johnson and Rice 2016) and Successful WIL in Science funded through the Office for Learning and Teaching (Johnson et al. 2019). This report presents findings from a snapshot study of WIL in BSc degrees conducted 2018-2019 to explore changes in provision of WIL.

Two recent studies have examined the provision of WIL by science faculties and student participation in WIL. However, the data collected by those studies is not comparable and a robust longitudinal data set does not yet exist.
In 2015, a national project commissioned by the Office of the Chief Scientist, examined work-integrated learning in STEM disciplines (Edwards et al., 2015). Edwards et al. (2015) focussed on placement and project activities because other WIL activities were too difficult to identify. The authors concluded that the provision of work-integrated learning and student participation in WIL activities in science degrees were low in comparison to allied STEM disciplines.

> *Within the traditional sciences a number of placement and project based WIL activities exist, but in most cases they are situated in elective units and their coverage of the student population is relatively small.*
>
> *The indicative data collected in this study suggest that almost three of every four ICT bachelor students in Australia experience an industry based project during their degree, compared with about one in four agriculture and environmental studies students and about one in seven science students.*
>
> *Figures on participation in placements or internships are substantially lower in the ICT field, and almost negligible in the natural and physical sciences.*
>
> *Edwards et al (2015), p v*

In 2018, the Australian Government commissioned Universities Australia to conduct a comprehensive audit of WIL in Australian Universities (Universities Australia, 2019). This audit investigated student participation in a broader range of work-integrated learning activities, including: placements (internships), projects, fieldwork and simulations. Data was collected by field of education for undergraduate and postgraduate coursework students. The authors note difficulties in collecting data related to different interpretations of 'what counts' as work-integrated learning. The challenges of defining WIL in a way that is meaningful across contexts has been noted previously (Oliver, 2015). The diversity of relevant activities is noted in the definition adopted in the National Statement on Work-integrated learning (ACEN et al., 2015), based on work by Patrick et al. (2014):

> *An umbrella term for a range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum.*

The findings of the 2018 audit indicate that 27.4% of natural and physical science students participate in WIL. However, the proportion of students reported to specifically participate in a placement or project was less than 10%. Disciplinary trends observed were consistent with those reported by Edwards et al. (2015) in that student participation in WIL was greater in other STEM disciplines, including the broad discipline areas of 'agriculture, environment and related studies' (56.5%), engineering and related technologies (34.7%), and information technology (32.3%). Breakdown of that data by WIL activity type, suggests that these vary between STEM disciplines and students in natural and physical sciences participate less in projects than other STEM students. The following caution is also noted in the final report:

Collecting the data for the survey revealed there is considerable variation across the sector in how WIL is conceptualised…
… there needs to be further work on clearly delineating between categories [of WIL]
(Universities Australia, 2019)

This echoes anecdotal feedback that universities had difficulty deciding which of their units (subjects) fit the criteria for reportable WIL during data collection for the national audit, and the approaches taken are likely to differ substantially.

There are also issues in the interpretation of the data presented. For example, the WIL participation rate reported for students studying in the field of education 'engineering and related technologies' was 34.7% (unique headcount). This is a surprisingly low rate of participation given that the (pre-2019) accreditation requirements of Engineers Australia strongly advocate inclusion of 'a minimum of 12 weeks of such experience (or a satisfactory alternative) as a requirement for the granting of qualifications' (Engineers Australia, 2019, p18). Edwards et al. (2015) note that the accreditation requirement for 'exposure to professional engineering practice almost always involved some form of engineering placement program'. If accurate, the data reported in the 2018 National WIL Audit would place natural and physical science students' participation rate in WIL much closer to that of information technology and engineering students than has previously been reported (Edwards et al., 2015). However, deeper interrogation of this data is needed to determine real progress in WIL participation.

Although the national WIL audit was envisioned as a baseline study to monitor progress towards universal provision of WIL, concerns with methodology remain. The study reported here is a snapshot and does not attempt to replace a recurrent comprehensive audit. However, it does explore some new indicators of progress and suggests a shift in the perceived role of WIL in science degrees.

Indicators of progress

Increasing participation in WIL is complex. It requires the provision of WIL opportunities, assurance that students can access and are aware of those, and student and employer appreciation of the value gained through their investment. Indicators of progress can be grouped as those measuring provision of WIL, participation in WIL and capability to successfully deliver WIL.

Provision of WIL is the creation and delivery of WIL experiences, either inside the curriculum as separate subjects/units, embedded within existing subjects or degrees, or offered as a co-curricular optional activity. Provision is a complex task as it requires co-ordination of three sets of stakeholders (students, employers and teachers) in diverse learning environments (individual workplaces, on-campus) as shown in the ACDS *Leading WIL in Science* study (Johnson and Rice, 2016). Provision must ensure the safety of students and employers and fair working conditions for students undertaking internships or placements. If offered within the curriculum, WIL subjects must meet University academic governance requirements including effective assessment of learning from a wide range of experiences.

Design of WIL experiences raises a number of questions: which WIL experiences are most valuable, how will they be offered and how will they be assessed? WIL experiences may be compulsory, elective or extra-curricular. While Faculties agree that experiencing WIL is a good thing, making space for it inside a crowded curriculum forces difficult decisions. What will be dropped from the degree to make space? Recent studies with science students show they are more likely to engage if WIL is explicit in the curriculum and if WIL is a core requirement of their course (Elliott et al., 2018). If offered as an elective, students need to be alerted to the opportunity early in their course planning.

Indicators for WIL provision include:

- number and range of WIL experiences available to BSc students;
- type of WIL: placement, project, on-campus/external, career education;
- how WIL is provided: core, elective or extra-curricular.

Participation in WIL measures the uptake of WIL by students and industry. It indicates the extent of WIL in practice.
Participation begins with access to WIL, which is more than providing an opportunity such as a WIL subject or an internship program. Elliott et al. (2018) conducted an extended study of science students which revealed a range of factors that affect participation. Students must be aware of WIL and how it is provided in their context before they can get started. Students usually need time to pre-plan for WIL units that include off-campus placement. WIL provided as electives are less visible that WIL required for course completion as core units or requirements. Awareness requires active support from enrolment or course advisors, and often from other staff teaching to target students.

Beyond space in the curriculum and student awareness, Elliott et al. (2018) also found many hurdles to participation in WIL for individuals. Students report that financial costs and lost earnings are challenges, as are other existing commitments such as carer duties. Disciplines and professionally registered courses that include compulsory placements – usually in professionally registered courses – have considerable experience to contribute. These areas may offer financial support or flexible placements to help students gain access.

Participation by industry partners is also influenced by many factors. Atkinson et al. (2015) reported on barriers for employer participation in WIL in STEM programs drawn from the literature:

- limited resources and time;
- inadequate information about the specific roles of employers, students and universities in setting up and implementing WIL programs;
- lack of clarity about objectives and outcomes.

(Atkinson et al., 2015, p10)

Capability for WIL describes the expertise and resources available to drive and deliver WIL. It includes leadership for WIL, specialists in WIL curriculum, industry relationships or student placement, and the engagement of teaching teams in supporting WIL throughout the curriculum.

Leadership for WIL is crucial in establishing WIL and making it sustainable (Johnson and Rice, 2016; Patrick et al., 2014). Active leadership creates impetus, builds engagement, provides resourcing and drives action. Leadership needs to be visible and supported by line managers to ensure consistent messages to staff, students and industry partners.

WIL specialists contribute experience and expertise in working with industry, managing placements and projects, and delivering effective WIL curriculum and assessment. Explicit recognition of WIL specialists helps to make their work sustainable and to invest in continuous improvement.

Good practice in WIL design follows from the principles for good learning and teaching. Scaffolding before and after WIL assists students to maximise value, iteration across the course fosters development and assessment for learning (formative assessment) focuses student's attention on progress (Cooper et al. 2010). While students and employers value placement highly (Jorre de St Jorre et al., 2019; Kinash et al., 2016; Qenani et al., 2014; Tymon, 2013), other types of WIL experiences are also valuable (Johnson et al., 2019; Smith et al., 2014). Diversity in WIL experiences helps students to build confidence in their skills and knowledge and adapt their learning to different environments. Opportunities to interact with industry, or peers and academics in new ways, in different contexts, also exposes students to difference perspectives and new influences.

Inclusion of industry partners and students in design increases the authenticity and relevance of teaching and learning. Stakeholders may contribute through co-design of activities and/or assessment, or through quality assurance and review such as course advisory boards (Atkinson et al., 2015). Mature relationships between industry and universities will support a range of roles for partners varying in depth and contribution (Atkinson, 2016).

Indicators for capability for WIL include:

- responsibility for provision: within the Faculty or discipline, or across the University;
- appointment of senior leaders with explicit responsibility for WIL;
- appointment of WIL specialists (including placement management);
- investment in enabling systems such as placement software, relationship management;
- learning design for WIL: scaffolded within courses, iterative experiences, assessment;
- industry design partnerships: number, allocation of responsibilities.

Methodology

Data for this report was collected in two phases.

1. A desktop review of BSc degree structures and related subject descriptions was conducted in May-June 2019. Data was sourced from university public websites and where available a keyword search of science subject/unit information was used to identify elective WIL units/subjects (keywords: science, placement, project). This analysis identifies placement or project-based WIL where this was a dominant feature of the unit/subject, but does not identify other embedded WIL activities.

2. Self-report of WIL activities collected through a survey that was distributed to thirty six science faculties (or equivalent) in Australian Universities (all those represented by ACDS members). The survey included questions about WIL policy and definition, quality assurance, provision, student participation, specialist roles and leadership, organization and industry partnerships. Seventeen responses were collected including fifteen complete surveys. The characteristics of responding Universities are presented in Table 1.

Table 1: Characteristics of survey respondents

Participating universities	Total 17: 5 x Go8; 2 x ATN; 2 x IRU; 3 x RUN; 5 x unaligned Enrolment range: 50 – 6000, median: 2250
Faculty structure	8 x science only faculty 1 x science split amongst multiple faculties 8 combined faculties, all with at least one of engineering, health, IT
Respondent roles	Faculty leadership (AD, HoS, Deputy Dean): 11 Academic WIL co-ordinator: 5 Professional WIL co-ordinator: 1

Findings

Provision of WIL

Provision of work-integrated learning in BSc degrees is widespread. Review of public web sites for BSc degrees in Australian universities indicated that most degrees offer access to WIL through the taught curriculum (Table 1) as placement. A small number of courses offer industry-based project units or feature career education. Only 10-15% of BSc degrees list WIL units as compulsory study.

Table 1: Availability of work-integrated learning units/subjects in B Science (or equivalent) degrees.

Type of WIL	Status in the degree		
	no science-specific unit	core to BSc	elective in BSc
placement	12 (32%)	5 (14%)	20 (54%)
industry/community project	29 (78%)	4 (11%)	4 (11%)
career education	31 (84%)	5 (14%)	1 (2%)

Feedback from science faculty leaders was consistent with the website search. Ten out of 15 respondents (66%) reported that all students in their faculty have access to WIL units. Two of those universities reported that WIL units were a core requirement in their BSc degree. Five others noted WIL units were core to specific majors or related specialist degrees. WIL embedded within units of study is difficult to identify, with provision and participation undetermined. The range of WIL experiences provided in BSc degrees from responding universities varies considerably (see Figure 1 below).

Design of WIL activities

All faculties that responded to the survey require students to complete induction or preparation modules (11 faculties) or individual orientation activities (4 faculties) before completing a placement. One faculty used a commercial provider to provide induction services and one other used university career services.

The primary format for assessment was reflection on the placement and project reports for industry-based projects. Other post-experience activities included career preparation tasks, portfolio or peer group presentations.

Student support

Ten faculties reported financial support for students is most often provided through access to schemes such as hardship grants, loans, merit awards or student mobility schemes for international placement. Of these, five faculties also reported some provision of industry funding through scholarships or paid internships.

Participation in WIL

Participation in WIL is difficult to determine given variability in the definition of WIL and lack of consistent record-keeping by universities. The proportion of students participating in a range of WIL offerings collected by institutions participating in the ACDS WIL survey is presented in Figure 1. These self-reported estimates from Faculty respondents were based on participation in BSc (or equivalent) courses. This is not directly comparable with data collected through the 2018 national survey of WIL in Australian Universities which is presented by field of education.

Self-reported **participation in work-integrated learning** by students and industry partners varies considerably between responding institutions. Feedback indicates:

- most faculties report participation across multiple forms of WIL;
- the proportion of students participating in placement WIL remains low (0-25%) for the majority of responding faculties;
- industry partners are primarily participating through work placement and projects but may also contribute to design of WIL experiences;
- most responding faculties ask industry partners to contribute to assessment of students.

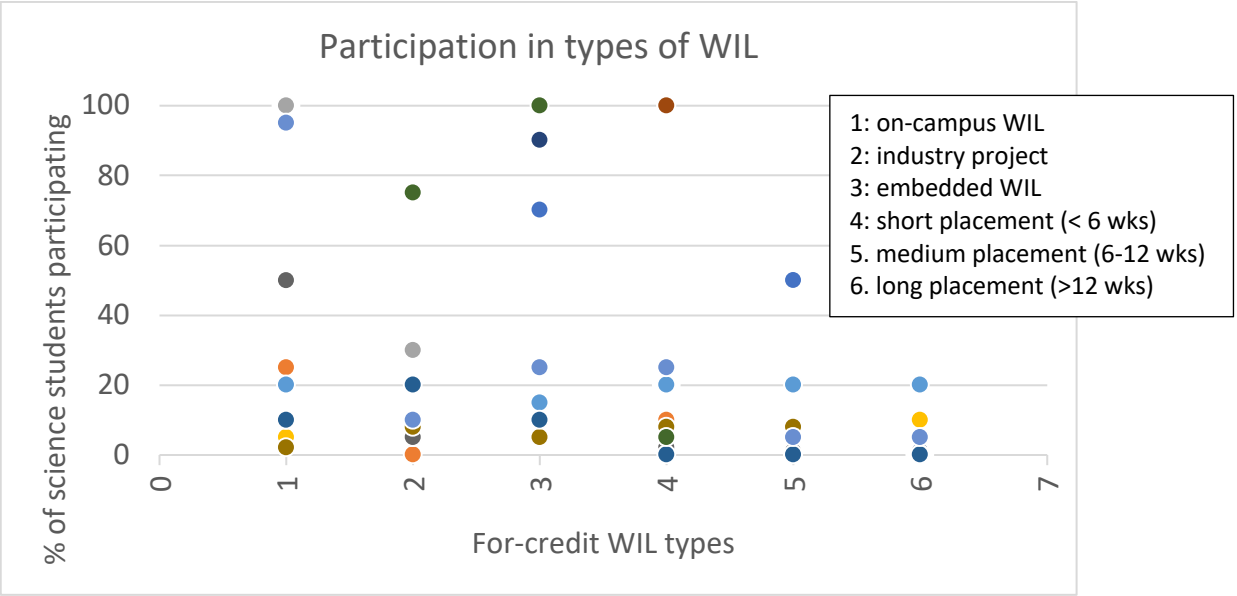

Figure 1: Participation in WIL activities, by type.

Capability for WIL

Capability, leadership and organizational support for work-integrated learning in science faculties are reported as a focus for many science faculties. The majority of responding faculties had allocated specific resources to work-integrated learning, most often through appointment of partial roles or dedicated staff. Relationships with industry partners appear simple and opportunistic with limited organization or support.

WIL governance

Science faculties rely substantially on institutional governance to provide definition and policy to govern work-integrated learning. Most survey respondents (75%) used university policies to guide WIL with a minority (3 universities) supplementing the university policy with local guidelines. Four respondents reported no policy framework. Of those faculties reporting a policy framework, all had governance for placement management covering legal requirements/compliance, roles and responsibilities and quality assurance with four faculties noting requirements for curriculum or learning design in either University policy or faculty guidelines.

Definitions of work-integrated learning generally recognize multiple forms of WIL and specify WIL as for-credit and/or linked to curriculum. Most definitions are set by the university with two universities adopting the definition used in the National WIL Statement (ACEN, 2015). Only two universities reference industry outcomes or benefits as part of the definition of WIL. Five universities report having no agreed upon definition.

WIL roles

Most responding science faculties have created roles for WIL specialists or leaders, with 9 faculties reporting allocation of salaries and 4 reporting specific administrative budgets. Some combined faculties noted that WIL costs are shared across multiple disciplines with teams ranging from 1 – 11 FTE.

WIL-focussed leadership roles have emerged in science disciplines (or been expanded to include science) recently such as Director of Experiential Learning, Assistant Dean WIL, Internship Convener, WIL Coordinator for Science. Specialist roles to support WIL delivery were most likely to focus on placement support. Support roles include professional roles (6 faculties) and occasionally academic WIL roles (3 faculties). Only four faculties reported no WIL roles beyond subject/unit coordinators.

Industry partnerships

Faculties had limited information on relationships with industry partners, with four faculties noting no centralized information or management. Most relationships appear to rely on individuals. Industry partners are diverse and faculties report working across not-for-profit, government and private industry. No clear pattern of engagement emerged from feedback on the distribution of partnerships with private industry across small, medium and large national and large international enterprises.

All responding universities collaborate with industry on provision of placements, and the large majority also work with industry partners on industry-based projects (11 out of 15 responses). Industry partners are also involved directly in assessment (n = 9) and some in design of WIL activities (n = 5).

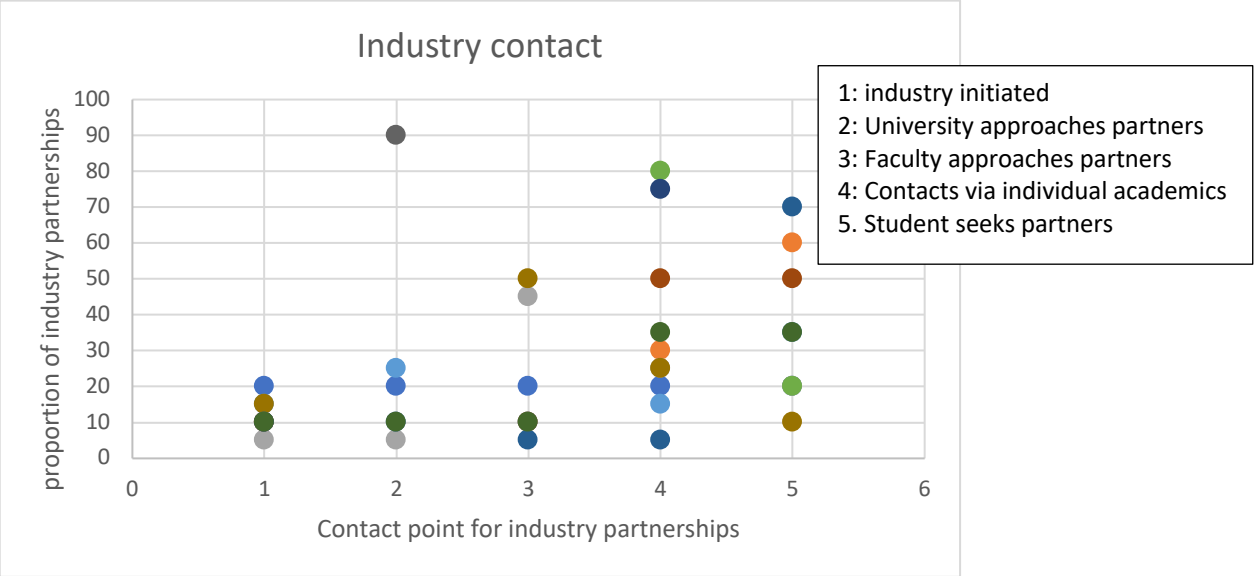

Figure 2: Contacts with industry, by type.

Conclusions

Work-integrated learning in science is widespread and has become more normalized in science courses. Although the snapshot data presented in this report is not comparable with previous studies, the spread of activity suggests increased faculty attention paid to work-integrated learning. The sector has moved from a lack of awareness to questions about how to deliver successful WIL programs. However, student participation in WIL is still likely less than that associated with professional degrees in which WIL is more often compulsory.

The majority of science faculties have embedded for-credit WIL experiences in their BSc degrees, but these are predominantly electives. This study did not examine how these are promoted to students or whether students are aware of these, but earlier work suggests many students either don't ever find out about these options, or find out too late to fit WIL units into their degree (Johnson et al., 2019). Some Faculties have dedicated information on websites suggesting there is local follow up with students, but information on public websites is often buried in the detail of degree rules. WIL is still not obvious to external view in most cases.

Infrastructure and resourcing for WIL remain challenging with a wide range of activity reported even across this sub-sample of science faculties. Some elements – definition of WIL and policy – have emerged at institutional level as universities engage with the National WIL agenda (ACEN, 2015).

Some composite faculties have drawn on provision for allied disciplines (engineering, IT, health) but this has not yet translated into comprehensive provision across the sector. This contrasts with laboratory or fieldwork experiences which are universally regarded as central to science degrees despite the significant cost of these to faculties.

Leadership for WIL does appear to be growing with emergence of dedicated senior roles in some universities. However, consistent models for resourcing are not apparent, with faculties still reliant on enthused individuals to deliver WIL units. Industry relationships are not systematic and documentation is generally poor. Despite these findings, developing industry interactions is a real opportunity to increase value to faculties as deep relationships span across research, teaching (including WIL) and service missions.

In 2015, the Edwards report (Edwards et al, 2015) prompted the ACDS and the Office of the Chief Scientist to fund national action to build capacity for work-integrated learning in science degrees in Australian universities (Johnson and Rice, 2016). The subsequent project (Johnson et al, 2019) continued this theme and linked the emerging community into parallel work in other disciplines. Science faculties have taken steps to increase WIL and there is clear intention to make WIL a normal part of studying science. The next challenge is to make WIL activities sustainable while providing value to students, employers and science faculties.

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