

Work-integrated-learning within undergraduate science degree programs: Case studies in assessment.

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Abstract

Employability is an important outcome for students enrolled in university degree programs. A challenge in generalist degrees like the Bachelor of Science (BSc) is that the program is not focused on qualifying graduates for a specific profession, and the curricula often feature limited transferable and employment skills. Work-integrated-learning (WIL) within BSc curriculums aims to develop graduates' employability skills, which are supported by authentic assessment tasks. This paper provides a number of case studies that highlight assessment within WIL subjects in BSc degrees at Australian universities. Across Queensland and Northern New South Wales universities, WIL is imbedded into the BSc curricula via placements, projects, field experience, work simulations, entrepreneurship and reflections on current work practices. Across different universities within this group, assessment typically contains multiple opportunities for reflection. In general, most assessment incorporates an early proposal outlining the tasks to be undertaken, reflection during the industry focused activity and a final written reflection that is often supported by an oral presentation. These case studies demonstrate the use of authentic assessment which is primarily focused on the link between transferable skills developed at university and the area of employability. Development of assessment, following reflection, should ensure that authentic, industry driven tasks are incorporated into any WIL subject.

Keywords: Work integrated learning, employability, science, assessment

Introduction

Australian Universities have been tasked to explicitly build graduate employability in Bachelor of Science (BSc) degree programs (Chubb et al., 2014). The benefit of specifically teaching employability skills within the science, technology, engineering and mathematics (STEM) curriculum is that it aligns skills and knowledge that employers seek for their industry (Rice & Johnson, 2016). Graduate outcomes that are focused on employability have been investigated as part of pedagogical research from multiple perspectives including whole of institute, graduates and employers (Yorke, 2006). Key workplace and transferable skills that employers require include effective communication skills, analytic and problem-solving skills, and professional and interpersonal capabilities (Hernández-March et al., 2009). Work-integrated learning (WIL) within the STEM curriculum is designed to develop employability skills within student learning that are STEM specific. Thus, WIL requires students to learn, apply or integrate established disciplinary knowledge within their workplace (Smith, 2012).

This paper will highlight the assessment practices in WIL subjects aligned with BSc degrees across Australian universities in Queensland and Northern New South Wales. For simplicity, despite the debate about what constitutes a WIL activity, we will assume that WIL encompasses a broad spectrum including industry placement, projects, field experience, work simulations, entrepreneurship and reflections on current work practices. Further, for simplicity, a subject, course, unit or program which is a fraction of the total degree undertaken by a student at university will be referred to as a subject.

Context

The Australian Council of Deans of Science (ACDS), the national peak body for Science Faculties in Australia, have been tasked to create a community of practice within Science Faculties to work collectively towards broad-scale adoption of WIL in BSc degrees (Rice & Johnson, 2016). Associated with this agenda, ACDS established a national network, WIL in Science, with nodes associated with Queensland, New South Wales, Victoria and Western Australia. The WIL-Queensland (QLD) node integrates universities from Queensland and Northern New South Wales. One focus of the WIL-QLD

node is the development of WIL whole of degree programs that are supported by authentic and appropriate assessment that are focused on key employability skills (Rice & Johnson, 2016). This paper provides case studies of current assessments in science degrees in the WIL-QLD node and highlights the focus of reflection in the assessment tasks.

Assessment tasks within the Bachelor of Science degree programs across Australian Universities

Central Queensland University

In the BSc degree at Central Queensland (CQ) University, the WIL subject is compulsory for two majors (Applied Biology and Applied Chemistry) and requires students to undertake a 15 day work placement in industry or an industry-related research project supervised by an academic staff member or industry partner. As such, the assessment has to be authentic yet flexible in its approach. This is facilitated by the subject not contributing to the students' final grade. The assessment items are a portfolio which includes a diary that reflects on daily activities and responsibilities, a supervisor's report and a final written word report. The final report details the nature of the work and gives a detailed description of the type of activities undertaken. Students are instructed to i) describe the knowledge gained and the skills learned; ii) reflect on how these knowledge and skills relate to their degree program of study and may be useful in their future career; iii) identify knowledge and skills that would have been useful to have before their placement. This reflection is key to enabling students to see the relevance of the placement to their degree, as well as identifying skills that are required in a particular industry.

One of the limitations of the present assessment is the lack of early engagement with assessment for work placement students. This will be rectified in the future by including submission of a curriculum vitae and placement application in this subject. Another limitation is the lack of self-reflection before undertaking the placement. To ensure that assessments are authentic, in future, all students will be required to submit a self-reflection item outlining how prepared they feel, what they consider their weaknesses are, and what they want to achieve with the placement or project.

University of Southern Queensland

The University of Southern Queensland offers a third year WIL subject to students enrolled in the BSc degree. This subject is compulsory for students studying the BSc (Wine Science major), however many students with other majors choose this subject as an elective. The assessment includes pre-emptive documentation (a curriculum vitae, cover letter and a “proposal” which is a reflection assessment task stating their expectations of the placement and one anticipatory diary), two reflective diaries (one half way through and a second following the completion of the WIL activity) and a final report in which students link the activities undertaken and graduate attributes. Finally, students present a brief verbal presentation summarizing their final report.

Following reflection of the alignment between the assessments and the links to industry activities, the final report has been modified to better support students close to graduation with vital work-ready skills and tools. Students develop and submit a number of assessment items including an ePortfolio (Eynon et al., 2014), an “Elevator Pitch” (Boisvenue, 2013) and a reflection (Crebert et al., 2007) on how they appreciate their placement has advanced their work readiness.

James Cook University

WIL in the BSc at James Cook University (JCU) is currently offered as an elective subject in the final year of a student’s undergraduate or postgraduate coursework degree. This WIL experience is based on an authentic practical professional placement/internship opportunity with government, industry, a research unit, or agency and located predominantly within the local North Queensland regional area. With support from JCU Careers and Employment, students are expected to self-source a relevant placement opportunity utilising conventional employment canvassing and application approaches. Successful applicants are required to complete a minimum of 140 hours with the proposed host organisation (volunteer or paid) and satisfy a variety of assessment requirements focused on demonstrated professional understanding, proficiency, critical reflection and adaptive learning.

Given the diversity of majors and academic disciplines offered in the BSc at JCU, the WIL subject has been premised on the Bandaranaike and Willison holistic Work Skills Development Framework (WSD) which provides a two dimensional rubric to assess facets of employability skill development relative to levels of student autonomy within the specific work experience context (Bandaranaike, 2017). Assessment components are designed to facilitate individual student development and learning throughout the placement experience. An initial placement description or proposal outlines mutually agreed requisite skills and knowledge, proposed activities and expected learnings and outcomes. The progress report and iterative reflective journal is designed to convey professional learning and engagement with the employability facets. It also provides a checking mechanism and opportunity for midplacement reflection and feedback. On finalisation of the placement, the student submits a journal, a reflective essay highlighting their overall learning from the placement experience and participates in a feedback interview. To ensure comprehensive and balanced feedback, the host organisation supervisor is also asked to assess the student's performance over the placement directly comparing commencement vs finalisation skills and capabilities.

The intentional integration of core concepts from the WSD framework in each of these assessment items provides a consistent, explicit process to assess levels of student learning, development and achievement over the entire WIL placement experience. This allows for a graded mark at the end of the placement which is irrespective of the disciplinary area. Having experienced significant growth and graduate employment success over the past five years, this WIL opportunity continues to be in high demand amongst local students and host organisations.

Southern Cross University

All BSc students enrolled at Southern Cross University (SCU) must complete either an independent project or a 280 hr work placement (Internship Study). Internship Study is designed to be the student's final subject and the assessment is designed to facilitate their transition into employment. To develop skills independent of a rating score, this subject is ungraded. An online blog, completed during the whole of the placement is used as an introspective opportunity to provide guidance for their job

application assessment task and reflective journal. The reflective journal is structured around Kolb's Cycle (Kolb & Kolb, 2009) and students are required to provide Observation, Reflection, Conceptualisation and Experimentation, with the areas of conceptualisation and experimentation challenging for the students.

An additional assessment is the host-supervisor assessment of the student's performance against generic descriptors developed by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education and the Department of Education, Employment and Workplace Relations (DIICC, SRTE & DEET, 2013). This ensures that the skills that are developed are aligned with the industry requirements, with an emphasis on 10 transferable skills (e.g. communication, identify and solve problems). Descriptions of the stages of performance (Novice, Advanced beginner, Capable, Proficient and Expert) from DIICC, SRTE and DEET (2013) are used. The evaluations can be used by the students as evidence of performance in their placement roles.

Finally, students complete an application for an advertised position, which is comprised of a cover letter, selection criteria and a resume. The rubrics used to assess their application were designed in consultation with the careers unit at the university. To further develop their employability skills, to support the application task, students are required to attend formal mock interview for the position. The assessor and staff from the careers unit conduct the interview in person or via the on-line platform Zoom. The students are provided with feedback at the end of the interview. The assessment in the subject is powerful and authentic, and builds on many skills that are required for employment. Many students use the assessment process to improve a real application and are receptive to critical feedback.

The University of Queensland

The University of Queensland (UQ) is a large, research-focused university with a BSc intake of approximately 1200 students per year. WIL is not compulsory in the BSc, however UQ has recently

released a new Student Strategy with WIL one focus of the strategy. Currently the university is reflecting on how to offer WIL to all of the BSc students.

UQ recognises six types of WIL; namely placements, projects, field experience, work simulations, entrepreneurship and reflections on current work. In the Faculty of Science the most common form of WIL is field experience, followed by placements and work simulations. At present, these offerings only serve a small proportion of the BSc students and the Faculty of Science is currently developing a series of new subjects that will imbed reflection on current work as a WIL model. These subjects do not rely on placements. Instead students will be able to use other science-relevant activities as the foundation for their WIL experience. For example, we considering how senior students could use their volunteer tutoring and mentoring of more junior students as a WIL activity.

Students will complete an employability-focused curriculum that helps them develop their knowledge, skills and attributes around employability. The curriculum will use literature readings, debate, peer mentoring, and reflection (both oral and written) to help students critically examine their own capacities and interests. Assessment will also include activities around job-seeking skills such as curriculum vitae writing, addressing selection criteria and interviewing. Where possible, students will complete these activities as part of the content of a subject. All outputs from these activities will be displayed in an ePortfolio and will be assessed as a pass or fail. Students will be assessed against the elements of the Aspects of Employability described by Yorke and Knight (2006).

Conclusion

Students enrolled in a BSc WIL subject across Queensland and Northern New South Wales typically are assessed by authentic and reflective practice that, at multiple points during their subject, focuses on the links between their studies and their future employability. The level of development of the programs varies, with some universities developing WIL opportunities while others have long standing WIL subjects with long term industry partners. Overall, these case studies highlight common methodology used for assessment. Future development of assessment should, where possible, integrate authentic

tasks that mirror activities currently undertaken in the workplace, to ensure that a valid experience is associated with the industry placement.

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