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Evaluating Alternative Work-Integrated Learning Opportunities: Student Perceptions of Interdisciplinary Industry-Based Projects

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Keywords

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Keywords

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Introduction

With the continued expansion of work-integrated learning (WIL) in the higher education sector, there is an increasing pressure on academics to develop innovative and sustainable WIL models. WIL has been defined as “an umbrella term for a range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum” (Patrick et al. 2008 p.9). While its origins stem from placements in the teaching, health and law professional degrees (Martin 1997), over time, WIL has evolved and adapted to the needs of a wide range of disciplines (Jackson 2013). Students from a range of disciplinary backgrounds have reported that WIL enhances their employability through fostering professionalism and improved confidence (Jackson 2013). Rowe, Winchester-Seeto and Mackaway (2012) have identified that alternatives to traditional, placement-based WIL can also provide students with the opportunity to apply what they have learnt in practice and develop transferable skills, which might include critical thinking, digital literacy, and teamwork. Further, they also identified numerous benefits unique to non-placement WIL, including reduced risk for client safety, cost-effectiveness and flexibility (Rowe, Winchester-Seeto & Mackaway 2012). The challenge however is to ensure that WIL is sustainable, while continuing to meet the needs of the students, the university, future employers, regulators and external partners.

Industry-based projects are an alternative, non-placement WIL opportunity that have demonstrable benefits to students, industry and higher education institutions. The involvement of industry partners has been identified as a value-add in WIL, helping students to consider the social, environmental, economic and cultural influences on real-world issues (Kricsfalussy, George & Reed 2018). Students have positively responded to the authenticity of industry-based projects, motivated by real-world problems and the desire to produce meaningful outputs (Marcketti & Karpova 2014). Industry partners also benefit from these non-placement WIL projects, establishing collaborative relationships with faculty, building a positive reputation with students, and identifying potential future employees (Johns-Boast & Patch 2010; Lawson et al. 2011). Implemented successfully, such projects improve the employability of graduates, attracting future students and improving rankings for universities (Lawson et al. 2011).

The University of Sydney has developed Industry and Community Project Units (ICPUs), providing an interdisciplinary, project-based experience for students based on real-world industry problems. ICPUs offer students the experience of working with their peers from across different faculties and disciplines. Projects are designed by the industry partner and project supervisor and the students work in diverse, interdisciplinary teams on their chosen project. Students gain an understanding of an authentic complex problem (such as issues related to climate change, big data, the impact of artificial intelligence, to name a few), through brainstorming, ideation, project planning, research and reporting, within a real-world setting and working with an actual industry partner.

However, with any new curriculum initiative, it is important to reflect on the delivery and undertake quality improvement. Brookfield (2017) has provided some foundation for improving the quality of teaching and learning, describing four alternative perspectives through which we can reflect on our teaching practice: educational literature, student feedback, colleagues' insights and self-study. Student views are essential for understanding how learning events are interpreted and experienced (Burkett 2012), and also the multifarious and at times conflicting nature of their perspectives (Brookfield 2017). While end of semester student evaluations can provide some insight, Brookfield (2017) advocates for methods that align with student-centred teaching, including Critical Incident Questionnaires (CIQs), one-minute papers, and Letters to Successors. Letters to Successors are useful at the completion of a course, for educators to explore the quality of teaching through a student

lens; students write a letter to future students reflecting on their experiences and providing advice (Brookfield 2017). In contrast to standardised questions in the commonly utilised student evaluation surveys, learner-centred approaches to evaluation can remove assumptions about what is valuable, or should be measured (Zerihun, Beishuizen & Van Os 2012).

Such approaches can help educators to gain valuable insight into their students' experience with learning, and help improve future course delivery (Burkett 2012; Koether 2018; Ndebele 2014). While research studies have explored student perceptions using CIQs (Gilstrap & Dupree 2008; Koether 2018; Phelan 2012), there is notably less literature employing student reflection on WIL through writing Letters to Successors. Therefore, this study aims to analyse the anonymous Letters to Successors penned by four separate ICPU cohorts, to understand students' reflections of undertaking interdisciplinary, industry-based projects.

Reflection in WIL

Reflection is a process that is used widely in WIL. Research acknowledges that reflection in WIL supports and enhances student learning and higher order thinking (Harvey et al. 2010; Zegwaard & Rowe 2019). As students engage in WIL, reflection can assist them to make links between content knowledge and experience (Correia & Bleicher 2008), facilitate change, and create “meaningful interpretations” of the work environment providing a link to praxis (Harvey, Coulson & McMaugh 2016; Knipfer et al. 2013). In developing an ecological theory of reflection, Harvey, Coulson and McMaugh (2016) substantiated eleven assumptions of reflection with evidence. In addition to the assumptions already mentioned, they verified that reflection is a process, which may be engaged with at different levels, purposes and perspectives, and may engage multiple ways of knowing (Harvey, Coulson & McMaugh 2016). Reflection can also occur before, during and after the WIL experience (Harvey, Coulson & McMaugh 2016).

There are also limitations to the use of reflection in WIL. Harvey et al. (2016) have identified an over-reliance on journals or diaries for recording student reflections, which may inhibit engagement. Reflective practice often lacks innovation (Barone & Eisner 2012), despite their being a diverse range of alternatives, including art, music, movement, and micro-blogging using social media (Harvey et al. 2012; Harvey et al. 2016). There is a dearth of theoretical frameworks or standards for planning, implementing, supporting and assessing reflection in practice (Harvey, Coulson & McMaugh 2016). Further, many reflections are assessed, and this can be a challenge given the diversity of students, educators and also learning experiences (de Schepper, Sotiriadou & Hill 2020). Given there are many styles of reflective writing, including analytical, personalistic, critical and creative, it should not be assumed that neither students nor educators recognise all styles or even when it is appropriate to use them (Winchester-Seeto et al. 2010).

Student reflections can not only benefit their own learning but can provide an insight into their learning by their educators. In WIL, much of the reflection is either student reflection for learning purposes, or educator reflection with the intention of improving course quality. There may be value in using student reflections in the quality improvement of WIL activities and courses, particularly where the reflection is engaging, innovative, reviews the experience, and is not constrained by assessment criteria. This paper explores the utility of a novel form of reflection in WIL through engaging students in a non-assessable writing activity, Letters to Successors.

Context

The University of Sydney's strategic plan is focused on transforming the learning experience for students. In order to achieve this, the University has made a commitment to provide every student with an opportunity for experiential learning, and as such increased its offering of WIL. ICPUs provide students the opportunity to work with students from other faculties, and together with industry and community partners, on real-world problems. Undergraduate students who have completed at least 72 credit points (a full-time student completes 48 credit points per year) are eligible to enrol in these elective units, which run as a three-hour sessions per week across a 13-week semester. The unit is available to students in all faculties; Arts and Social Sciences, Engineering and Information Technologies, Science, Medicine and Health, Health Sciences and Business. Students are provided with a list of industry partners and a paragraph on the real-world problem they are grappling with; students then can indicate their preference, which three problems capture their interest.

Project supervisors collaborate with industry partners to ensure the complex problems are suitable for undergraduate project work. A range of industry, community and government agencies are engaged as partners, including international professional services firms, energy companies, financial services providers and state health departments. The industry partners typically interact with the students at a minimum of three touch points during the unit; once to present the brief of the complex problem, once to hear the students pitch their ideas for the project work, and at the culmination of the unit with the final presentations.

The students work together in diverse teams to present outcomes and solutions that are not limited by a single discipline. Student groups are allocated by the Project Supervisor, to ensure an appropriate disciplinary, skills and experience mix (as well as gender and cultural mix). For students undertaking an ICPU, identifying and researching their problem-driven project includes defining a problem question, within a wider project framework, and formulating aims and objectives and determining evaluation criteria for the proposed solution. In addition, the ICPU students are required, including as part of assessment tasks, to specify their project approach and timeframes, and collaboration to determine the work process and outcomes. Appropriate scaffolding must occur during the semester to support students in their problem-driven projects. All students are provided with training on understanding ways of thinking, complex problem solving and systems thinking. The ICPUs do not require content experts as teachers, rather they need teachers to facilitate the problem-solving process, through questioning, guided discussion, and strategies to support their learning.

The learning outcomes for the ICPUs are focused on students developing the university-wide graduate qualities. At the University of Sydney, there are six attributes that all graduates are encouraged to develop during the course of their studies: disciplinary depth; broader skills such as communication, critical thinking and information/digital literacy; cultural competence; interdisciplinary effectiveness; integrated professional, ethical and personal identity; and influence (2016). These learning outcomes set this initiative apart from discipline-focused units which often focus on the development of content knowledge. Further, the graduate qualities align with current literature identifying the importance of these generic, non-technical skills in developing employability (Rowe & Zegwaard 2017).

The assessments in the ICPUs are authentic and based on usual workplace practices for project work, including a project plan, report and presentation. Students are provided with an assessment rubric

for each item. A Project Plan helps groups create a coherent plan for their project, which helps to support the students' learning as they work towards completing their project by the end of semester. The semester culminates with the completion of a project report and presentation. Dependent on the brief and the plan, the student-centred approach to the ICPUs means that students are free to choose an alternative format for the final Group Report, such as a performance, website, app, detailed business plan, or a prototype. Nevertheless, the final submission must include details of the project as well as a reflection of the process. These final assessments are presented to a range of stakeholders, including academics and industry partners.

Methods

Students from four ICPUs completed a Letter to Successors. The ICPUs spanned three study periods (semester one [1 unit], mid-year intensive [1 unit] and semester two [2 units]) each with a different industry partner and therefore distinct problems to solve. Across the four ICPUs students were engaged with a state health department, a consultancy firm, a recruitment agency and a computer software company, and focused on problems concerning creating a smoke-free environment at a health precinct, disrupting higher education, connecting human and machine learning and closing the digital skills gap. All four ICPUs had the same Project Supervisor (MH).

In the penultimate week of each ICPU, students were invited to pen a letter to future ICPU students, sharing their experiences. Students were provided with the following brief instructions:

I want you to write a letter to the new students who will be in this course next semester. I want you to tell them—in as helpful and specific a way as possible—what you think they should know about how to survive and flourish in the class. Some themes you might consider writing about are as follows:

- *What I know now about this course that I wish I'd known when I came in*
- *The most important things you need to do to keep your sanity in this class*
- *The most common and avoidable mistakes that I and others made in this class*

Feel free to discard these themes and just write about whatever comes into your head around the theme of surviving and flourishing (Brookfield, 2017).

Writing the letters was not promoted as a learning activity, rather, it was presented simply as an opportunity to share their insights with the future cohort. Three of the four cohorts had previously read letters in Week 1 of their ICPU, so they were aware they would be read by students in subsequent cohorts, and of the perceived usefulness for incoming students. Further, they were verbally advised that the Project Supervisor would read the letters, so that improvements might be made to the delivery of the ICPUs based on their perceptions.

The letters were handwritten, folded and/or placed in envelopes, and returned to the Project Supervisor. While this was not a compulsory task, students were given time during class to write their letters to encourage their involvement; with the exception of a single cohort due to a shorter schedule. Students were welcomed to hand in the letters immediately, or at a later time if they wanted more time to consider what they would write.

Ethics approval for this study was granted by the University of Sydney Human Research Ethics Committee (Project Number: 2019/940). Ethical approval was gained retrospectively, that is, after

the letters had been written, and consent waived. In order to seek specific approval for a waiver of the requirement of consent, the points in Section 2.3.10 of the National Statement were addressed with the Human Research Ethics Committee; the waiver was approved due to the anonymity of the letters, students' awareness that the Project Supervisor would read them and use them for continued course improvement, and the lack of perceived impact on student welfare. However, it was considered unethical to use direct quotes in published findings, given that hand-writing a letter can be a personal and intimate experience. Given the project supervisor was also the lead researcher, the letters were not analysed until all marking was completed and grades released to the students, to avoid any potential biases, despite them being written anonymously.

The text within the Letters to Successors was analysed adopting a thematic analysis, using the six phases and checklist as described by Braun and Clarke (2006). Given the aim of the study was to understand the students' perspective, a thematic analysis using a realist methodology was applied to reflect the reality of their experience. While the students were given specific prompts in the instructions, they were also invited to ignore these completely and write what they liked; as such, an inductive approach was chosen, in order to let the data 'speak for itself' and without the constraints of existing theories and frameworks. A single researcher (MH) read the letters, noting any preliminary ideas. The data were then coded and grouped together based on semantic patterns and mapped according to possible themes. On further review and revision of the data, some of these initial themes had common characteristics, and were grouped into 4 key themes.

Results

Of a possible 53 (n=53) enrolled students, 42 (n=42) wrote a reflective Letter to Successors. Four key themes were identified in the letters: working with others, focusing on tasks, having fun, and the unique experience. Within these themes a number of sub-themes were identified and are presented in Table 1.

Table 1. *Themes identified in ICPU student letters to successors*

Themes	Sub-themes (instances*)
Working with others	Teamwork (112) Interdisciplinarity (18) Project Supervisor (14) Work ethic (12)
Focusing on tasks	Time management (45) Problem solving (23) Project work (17)
Unique experience	Opportunity (23) Challenging (7)
Having fun	Enjoy (30) Make friends (7)

**Instances represent the number of times the sub-themes were identified across and within all 42 letters. The total number for some sub-themes is more than 42 as some letters mentioned a particular sub-theme on multiple occasions.*

The results of our study reveal that the most overwhelming common theme in the letters was about working with others. Given that the ICPU's focus is group work, with 80% of the assessments submitted as groups, this is unsurprising. While some students made generalisations about the

importance of positive teamwork, many explored specific facets of teamwork, including, but not limited to: recognising and dealing with conflict early; being an active participant; flexibility and willingness to adapt to change; positive communication skills such as listening, speaking up, openness, and honesty; offering and providing support for team members; showing respect; and building trust. Looking at the entire data set, the ability to compromise within the team was crucial. The students seemed to identify that there was a fine balance between not being passive, and knowing when to give up, while respecting others' ideas and also having confidence in their own opinions. Students also included reflections on the interdisciplinary nature of the ICPUs, and the value in understanding different cultures, disciplines and ways of thinking and broadening the team's perspective. The role of the Project Supervisor was mentioned too, particularly in terms of the importance of helpful support, encouragement and advice to the groups. Finally, students considered a good work ethic was crucial when working with others, and included making an equal contribution, applying consistent effort and being ambitious.

Another key theme identified by the students in their letters was the significance of focusing on tasks. Students reflected that to be successful in the ICPUs, they required time management skills, including some understanding about managing deadlines, delegating tasks, planning and starting assessment items early. Problem solving was also commonly mentioned, with the letters encouraging future ICPU students to have an open mind, to embrace outrageous or unconventional ideas, and to be innovative. This is not surprising, given the project requires students to work through authentic, complex problems impacting on industry. They also provided some practical advice regarding the project work, including that future cohorts should read widely, establish aims, ask questions of the industry partner and seek feedback on report writing.

Our findings highlighted that students recognised the ICPUs offered a unique opportunity, one that was distinctive to their university experience. Many articulated that it was unlike any previous units they had studied, and this was framed in a very positive tone, with students describing that they felt lucky to have such an extraordinary, rewarding and valuable learning experience. Many students also reflected that this unit was challenging for them, and again, this was communicated in a positive manner. Students who commented on the challenging nature of the ICPUs followed up with how they had developed as individuals (e.g. improved skills) or advised future students to enjoy the experience. Students stressed the importance of having fun when participating in the ICPUs, with many of the letters suggesting future students will have the opportunity to develop strong friendships.

Given the freedom afforded to the students completing this task, there was notable variety in the style of writing used. For example, some students wrote about the positive attributes required for success in the ICPUs, while others recognised the development of these attributes in themselves. For example, while some students described how they had improved or developed their communication skills (eg developed skills in presenting, improved listening skills), others provided advice for successful communication (eg importance of listening, inviting others to speak, speaking up).

Discussion

This study explored students' perceptions of undertaking interdisciplinary, industry-based projects, through the analysis of student-written Letters to Successors. This novel approach provided a student-centred lens for reflecting on the effectiveness of the ICPUs, without the usual pre-conceived topics prompted in student evaluations of teaching. Not only is the information valuable

when shared with incoming ICPU cohorts, but an analysis of the students' reflections has provided valuable insights into what students perceive to be the crucial elements of working on interdisciplinary, industry projects, in a self-directed learning setting.

It is not surprising that our study revealed that working with others was the most popular theme in the students' letters, given the interdisciplinary, team-based nature of the learning experience. While students do not always respond positively to group work experiences at university, our findings show that the ICPU students enjoyed their experiences and recognised the importance of positive teamwork, communication and conflict resolution behaviours. This is perhaps attributable to the range of team-building activities adopted by the Project Supervisor in the early weeks of the unit, which were designed to help to shape students' behaviours and, it seems from the students' letters, achieved their goals. Team-building activities included creating a team charter, defining a problem statement, information-sharing discussions, brainstorming and developing an industry pitch. The students' reflections also indicate that they recognised the value of group work as enabling them to see things from others' perspectives. The ICPUs are interdisciplinary and require the groups to work together on a real-world industry problem; this integrative pedagogical approach brings different disciplines together, and facilitates the use of procedural knowledge of seemingly unrelated disciplines, to promote critical and deeper cognitive analysis about a complex problem (Ivanitskaya & Primeau 2002). The students identify a positive experience of interdisciplinarity, through learning about and exchanging new and different points of view, and having their own perspectives challenged. While students did not provide specific examples in their letters, various classroom discussions highlighted this aspect. For example, group discussions on research created robust discussion on the methodology of a literature review (or even, what is a literature review?) and the values of qualitative vs quantitative data. The student-centred approach to the ICPUs meant that these discussions occurred organically. Although they were facilitated by the Project Supervisor, they were not explicitly prompted, and this may have been the key to the positive response to the students' interdisciplinary learning experiences.

Focusing on tasks was another key theme identified in the reflective letters, with specific reference to time management, problem solving and project work. It is clear from the letters though that this is closely linked with the experience of working with others. Van Woerden (1993) states that project work provides an effective learning environment in which to acquire both collaboration and management skills, given it requires an organisation of learning processes where learners have to work together in groups and submit a report documenting the learning process. Subsequently, Hansen (2006) has associated students experience in group work with team management and organisation. Integrative curriculum initiatives similar to the ICPUs have noted there is a real benefit in combining complex problem solving and teamwork, as the behaviours and skills required for success are analogous (Goltz et al. 2008).

While it was implied in many of the letters, it was surprising that the students did not explicitly reflect on the ICPU improving their employability. That being said, many of the themes identified in the letters aligned with skills and behaviours outlined in the Employability Skills Framework developed by Jackson (2013), particularly in relation to working effectively with others in a team setting, as well as learning to communicate effectively, both with peers and with industry partners. Similarly, Rowe and Zegwaard (2017) identify that graduate work-readiness requires the development of non-technical, 'soft' skills and attributes. Further, innovative thinking, complex problem solving, and project-based methodologies are all transferable skills that are not only demanded among current employers, but will continue to be essential skills into the foreseeable future (World Economic Forum 2018). The students have identified the importance of numerous transferable skills and as a result of completing the ICPU now have tangible experiences of

teamwork, organisation, conflict resolution and communication that they can share with potential employers. Many of the skills and behaviours the students attributed to success align with the transferable skills required to develop their employability.

There has been some criticism of industry projects and the perceived value of students working with real clients. While projects with real industry partners provide students with an opportunity to work in an unpredictable environment, and prepare them to work in dynamic, complex situations, Fitch (2011) asserts that students must be agentic learners in order to develop professional capacity. In the context of the current study, while the complex problem was posed by the industry partner, the projects themselves were student-led and students exercised autonomy in narrowing their focus, defining the scope of the problem, proposing and designing their solution.

Anecdotally, students in the classroom verbalised being motivated to impress their industry partner and provide a useful, tangible solution to the partner, however this was not reflected in their Letters. Previous research has reported that students' experience increased motivation to produce valuable outcomes when undertaking project work, as a result of their collaboration with an industry partner (Marcketti & Karpova 2014). In the same study, students also reflected on the value of the industry collaboration in improving their employability, as they developed skills in working on real-world problems (Marcketti & Karpova 2014). While students in the current study identified skills and behaviours necessary for successful teamwork, and the challenges of complex problem solving, they did not directly relate this to their collaboration with the industry partners.

The study revealed the students were clearly grateful for the opportunity to complete an ICPU. As an alternative to traditional and more common modes of WIL (eg clinical placements, internships), they recognised that this unit offered an experience unlike any other units in their degrees. This uniqueness may be attributed to the interdisciplinarity, to the project work, or to the complex, real-world, industry problems. We might suggest that it is actually the combination of these approaches that is innovative and distinctive and appealing to the students. While there are identified strengths to problem-based (Hung 2011; Savery 2006), project-based (Blumenfeld et al. 1991) and interdisciplinary pedagogies (Ivanitskaya & Primeau 2002; Lyall et al. 2015), combining these in a hybrid approach may create a learning environment where student engagement and the development of transferable 21st century skills will be more meaningful and relevant, including for the future of work.

While not the most common theme in this study, the importance of the students emphasising the need to enjoy themselves should not be understated. While learning is important, the mental health and wellbeing of students is also critical, and has gained increasing attention in contemporary educational literature (Baik, Larcombe & Brooker 2019; Galante et al. 2018). Student belonging is vital for determining student retention at University (O'Keeffe 2013); students were encouraging future students to foster a sense of belonging through developing friendships in the ICPUs, and saw this as important for a successful experience.

Limitations and future scope

There were some limitations to our study, primarily centring around the fact that our study focused on only one type of student reflection and evaluation, namely the Letters to Successors. In addition, the numbers of students across the cohorts of the four projects was relatively small (ranging from 5 to 17), and all four projects were under the supervision of the same Project Supervisor. However, evaluating the units of a single supervisor ensured that all units were facilitated with the same pedagogical frameworks and teaching and learning activities, which will have eliminated the effect

of such differences in their experiences. While this would be interesting to investigate in future research, in this study we were more concerned with the students' broader experiences of industry-based projects. We note there are other types of student evaluations that could be used to test student perceptions of interdisciplinary and industry-based projects, such as CIQs (mentioned earlier), focus group interviews, surveys and evaluation of comments in student feedback.

Another limitation is that at the time the study was undertaken, students self-selected to participate in the ICPUs, which were still operating in a 'pilot phase'. This may also explain the students' level of enthusiasm and positive responses to their ICPU learning experiences. As ICPUs become embedded into degree programs and all undergraduate students are eventually required to participate in these industry-based projects, students' perceptions may be more mixed.

Future research, undertaken on a broader scale, is therefore recommended. Further research might take the form of a wider study including ICPUs taught by a range of different Project Supervisors or using other types of interdisciplinary or industry-based work-integrated learning models, adopting the same research methods and tools. Further, prospective ethical approval to use the Letters for research purposes may authorise the use of direct quotes in research reports, overcoming the limitation of retrospective analysis in this study. Also, future research could complement the student perspective with the perceptions of academic staff or industry partners, to determine if their experiences are similar.

Conclusion

Industry-based projects are an alternative to traditional models of WIL that appear to provide a positive learning experience for students, as revealed from the Letters to Successors exercise. Through this novel reflective activity and the subsequent analysis of their letters, we identified that working with others, focusing on tasks, recognising the unique experience and having fun were critical for student's success in the units. The students were overwhelmingly positive in describing their experience and were grateful for the opportunity to participate in a unit unlike others in their degree programs. Many of the skills and behaviours that the students attributed to success align with the transferable skills required to develop their employability. This study used students' insights in the letters to reflect on teaching practice and to better understand the perceived value of this alternative WIL initiative. The ICPUs allowed students to apply theoretical knowledge in a workplace experience, without the need for lengthy placements or internships that can be burdensome for both student and industry, and without sacrificing student satisfaction or work-readiness. Further research to expand our findings, or to alternatively explore the views of staff and industry partners, would be valuable in ongoing evaluations of interdisciplinary, industry-based projects as an alternative model of WIL and their impact on graduate employability.

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