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Work-Integrated Learning New Zealand
*Tuia te ako, tuia te mahi, tuia te ara whaihua e*

# Work-Integrated Learning New Zealand

# 2021 Refereed Conference Proceedings

## *Work-Integrated Learning on the Rise 2.0*

***29-30 of April, 2021, University of Waikato, Hamilton, New Zealand (online)***

***Editors***
***Karsten E. Zegwaard & Katharine Hoskyn***
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**Front cover:** The Student Centre and the Aurei Sculpture, University of Waikato, Hamilton, New Zealand
Photo credit: University of Waikato, Hamilton, New Zealand

# Work-Integrated Learning New Zealand 2021 Refereed Conference Proceedings

**Refereed Proceedings of the 23rd Work-Integrated Learning New Zealand Conference, held online on the 29th to 30th of April, 2021, at the University of Waikato, Hamilton, New Zealand.**


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*Note 1*: The 2020 conference, WIL on the Rise, was cancelled due to the COVID-19 pandemic.
*Note 2*: In 2020, the name of New Zealand Association for Cooperative Education Inc (NZACE) changed to Work-Integrated Learning New Zealand Inc (WILNZ).


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# Developing soft skills to produce work-ready international graduate diploma students in engineering: A comparative study

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The final year project (FYP) in engineering provides an opportunity for students to both develop and demonstrate their professional capabilities and interpersonal skills which are key graduate attributes assessed by accreditors (in accordance with the Washington, International Engineering Alliance, or Sydney Accord), as well as solve complex problems with open-ended projects (Rasul et.al 2009). "Soft skills" are critical professional capabilities, required by the Engineering New Zealand professional body, that must be integrated into the FYP to meet the graduate profile for Graduate Diploma International (GDI) students. This demand comes at a time when engineers are increasingly called upon to play an active role in addressing global challenges facing humanity in the twenty-first century (Bernard 2019).

Therefore, our programmes must foster soft skills in GDI students to accommodate people-centric industry roles that are frequently engaged in all phases of the lifecycle of products that meet the needs of society (Crawley et al., 2007). Crawley et al. (2007) note that the objective of engineering educators must be to produce graduates that are "ready to engineer" with enhanced emphasis on the pre-professional skills of engineering, as well as a deep knowledge of the technical fundamentals.

Farr and Brazil (2009) note that leadership for engineers is more complicated than most other sectors due to the high skills required. For example, engineering managers are assessed based their ability to lead project cycles achieved in weeks not years; therefore, their technological knowledge and leadership qualities must be excellent. To begin developing proficiency, agility and confidence, it is necessary to challenge engineering students with different complex scenarios. The FYP, which includes oral presentations, is ideal to develop all these skills, including communication (Carter, Ro, Alcott, and Lattuca, 2016). Communication via oral presentations can be particularly stressful for EAL students, due to the additional impediment of speaking in a language with which they are less confident (Woodrow, 2006; Mak, 2011). However the FYP can be appreciated in retrospect as it provides students with opportunities to be challenged and pushed out of their comfort zone.

The graduate diploma international (GDI) for the engineering program is one-year full time course of study which attracts international students who will obtain a work visa after graduation. The academic entry criteria are to hold a degree in the field of engineering with a minimum AGPA of 6.5. We offer five strands of the Graduate Diploma for Engineering: Highway; Mechanical; Water and Waste Water; Mechatronics and Power Engineering. These strands have one common subject: the Engineering Development Project (30 credits) taught in two semesters. This project forms the capstone for the program, recognising that the GDI students have completed the earlier part of their studies overseas.

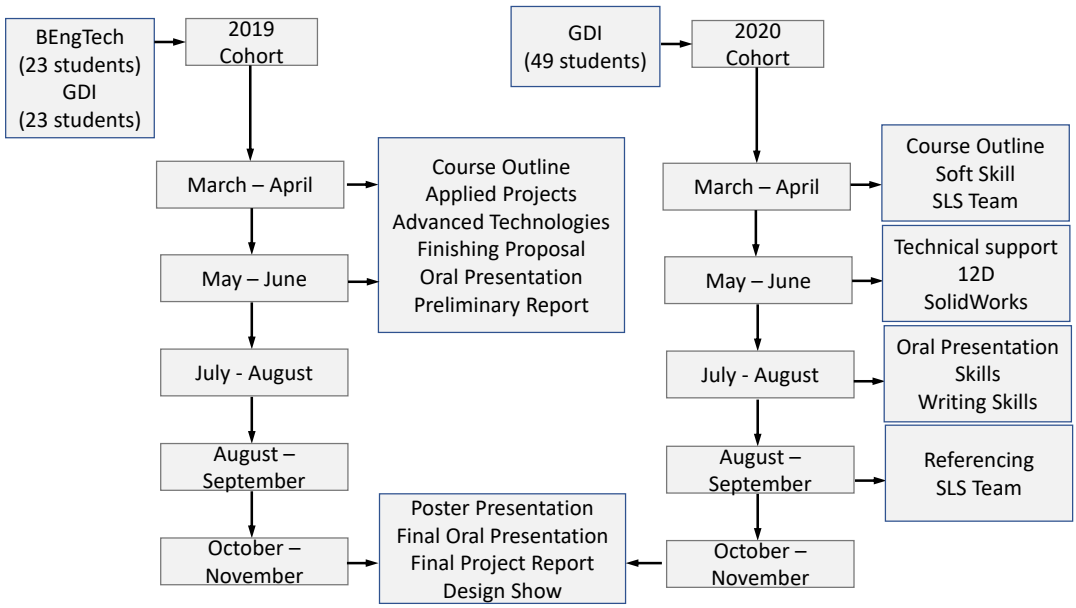
The main aim of this study is to assess whether EAL students do better when performing along with the main class, or when they are split from the main class. We will compare the oral presentation

performance for the GDI students (who are all EAL) in the 2020 cohort, which operated separately from the main class, compared with that of the GDI students in the 2019 cohort where the GDI and main class were integrated.

## METHODS

We compare the performance of GDI students across cohorts across two years (2019 and 2020) in two oral presentations for the Final Year Project (FYP) course: the early presentation occurring in April/May, and the final presentation, in November. Due to class size and staff availability, the students in the 2020 FYP course were split into two groups, one containing all international students (GDI students) and one which contained mainly domestic students (the BET). This resulted in some "field data" on the impact of such a split. We compare the performance of the 2020 cohort of GDI students (n = 49) in their FYP presentations to the performance of the 2019 cohort of GDI students (n = 23). Figure 1 shows the structure of the work done for both cohorts 2019 and 2020.

*FIGURE 1: The structure of the two cohorts for 2019 (BEngTech and GDI) and the 2020 GDI.*




## RESULTS AND DISCUSSION

GDI students in the 2020 cohort on average performed better in their oral presentations than GDI students in the 2019 cohort. Table 1 below provides the marks for the students across the two years for the two oral presentation and the final report:

*TABLE 1: Comparative performance of 2019 and 2020 Graduate Diploma International Students*

| Year Group | First Oral Presentation | | | Final Oral Presentation | | | Final Technical Report | | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Med. | Min. | Max. | Med. | Min. | Max. | Med. |
| 2019 | 51.00 | 93.50 | 76.75 | 52.62 | 93.00 | 79.50 | 57.37 | 98.66 | 75.66 |
| 2020 | 61.33 | 83.66 | 78.00 | 60.30 | 96.00 | 80.00 | 44.00 | 90.66 | 78.33 |

Students on average performed better in 2020 compared to 2019 in all three assessments, though the difference was not by a lot. The maximum mark was higher in 2019 for the first oral presentation and the final technical report; however the minimum mark for both oral presentations was higher in 2020 compared to 2019. Although the median mark was higher for the final technical report in the 2020 cohort, the spread was greater, with a lower minimum mark in 2020 compared to 2019. Therefore, on average for all assessments, the 2020 students performed better. Whilst we recognise that we had a different cohort in each of 2019 and 2020, we also had the COVID-19 pandemic in 2020 that was not the case in 2019.

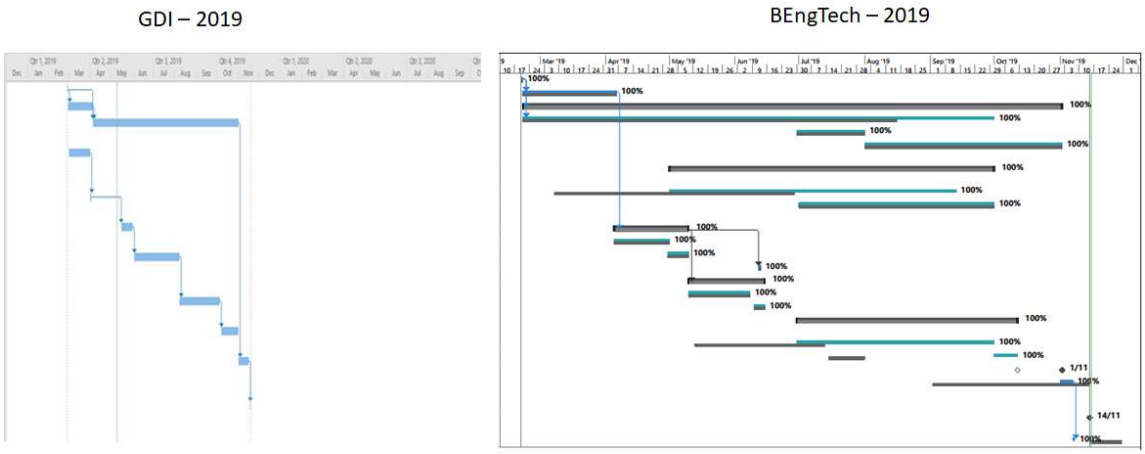
One of the major issues we face with every cohort of GDI students is that their written and oral communication skills, particularly technical presenting and technical report writing, are below the average of the BEngTech students. These weaker soft skills could be related to the fact that the GDI students come from a variety of countries such as India, South Korea, Brazil, Russia, Thailand, and China where the language of instruction is frequently not English. They require additional training on how to write about concepts in their own words, with proper citations supporting their arguments.

In 2018 and 2019 we ran the Engineering development project paper with both the GDI and BEngTech students in one class. In 2020, we decided to split the GDI cohort from the BEngTech for a variety of reasons, including resources and the observed additional assistance the GDI students required.

Issues we had observed with the GDI students prior to 2020 included:

1. The GDI seemed reticent to present in front of BEngTech (International and domestic students) as the latter group had more training in presentation activities in New Zealand due to having taken the Engineering Communication paper.
2. The BEngTech students had more familiarity with tools of technical reporting, such as Gantt charts, including using the software. Figure 2 below shows a comparison between the charts produced by a GDI student compared to a BEngTech (international) student.
3. The supervisors' feedback was that the GDI students were struggling with the Level 7 papers relating to their project, such as Robotics, Systems and Control, and Instrumentation and Control. In addition, they had less experience in using engineering software packages such as 12D, Solidworks, Matlab, and others. We observed that BEngTech students had more proficiency with these software than the GDI students.
4. The BEngTech students tended to meet deadlines and follow instructions more precisely than the GDI students. These instructions included to zip all files, use a specific naming convention and follow the marking rubric for the report.
5. There were more requests for extensions from GDI students compared to BEngTech students, which often led to time-management issues when all assessments became due at the same time.

*FIGURE 2: Gantt chart for GDI student and the BEngTech international students enrolled in 2019 cohorts.*




We presented these issues at our Program Committee meeting and attempted to find suitable solutions for the above issues, recognizing that the cohort would be a different group. In 2020, we ran the final year project with 49 GDI students separately from the BEngTech class, and were able to target support towards this group more effectively, including introducing: more intense work with student learning services and librarians, and supervisors to supervise the same strands. For example, the eight Power GDI students were supervised by one supervisor, the five GDI Highway students were with one supervisor. All the supervisors were reporting to the project coordinator monthly on the progress of these students and update as to the support needed for these students.

Whilst we observed that some students still had issues with following the instructions (related to points 4 and 5 above), we did observe that the soft-skills of presentation was better to the previous cohort 2019.

## CONCLUSION

In 2020, we changed the method of delivery the final year project to Graduate Diploma International students. We examined the GDI students' soft skills during the semester via oral presentations and technical report writing in 2020, when the students were put in their own class, and compared these results to those of the 2019 cohort, who did their class together with the BEngTech students. We found that separation of the two groups enabled more effective tailoring of support to the GDI students. Even though we had the COVID-19 pandemic, we observed an improvement to the students' average performance in the GDI oral presentations and technical report writing. This is beneficial, since the GDI serves as the preparation for those intending to enter the New Zealand workforce after successful completion of their Graduate Diploma.

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# Academic-graduate dialogue for building trusted work-integrated learning relationships

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Greater attention to Work-Integrated Learning (WIL) in Australian and New Zealand universities in recent years has highlighted the importance of effective relationships between academics and supervisors in host organizations (Fleming et al., 2018). This paper is situated within the context of an Australian study seeking to understand the role of academics in achieving engagement with WIL hosts. The research questions of that study asked about the impacts of context, how relationships are challenged, and how these challenges are addressed in WIL academic- host stakeholder engagement. Specifically, it focused on the communication practices and processes of Humanities and Social Sciences WIL academics. This paper focuses on one finding - how graduates help these WIL academics to build and nurture trusted and valued relationships between institutions and host organizations.

## RELATIONSHIPS, COMMUNICATION, AND ACADEMICS - KEY LITERATURE

This research adds a voice to the current state of research by occupying a space at the intersection of two areas of inquiry: current WIL research and the field of communication studies. WIL literature concerning relationships and engagement in WIL falls into three related themes of WIL practitioners' skills, roles, and knowledge. Research findings have largely not made a distinction between WIL academics or university professional staff working in WIL, instead, they are collectively referred to as WIL practitioners (for example, Ferns, 2014). Literature points to these WIL practitioners needing to develop skills in employer/host engagement (Zegwaard et al., 2019) and undertaking roles of boundary spanners (Peach et al., 2011). The smaller body of research focusing specifically on WIL academics has found that these academics possess unique knowledge and skills, as well as operating in unique contexts (Emslie 2011; Winchester-Seeto, Rowe & Mackaway 2016) with impacts on workload (Abery & Gunson, 2016; Bilgin et al., 2017; Jovanovic et al., 2018; Wenham et al., 2020). This research also complements a 2019 study which interviewed WIL graduates as WIL supervisors (Martin et al., 2019). Concepts from organizational communication were used to analyse the findings, specifically dialogic communication (Kent and Taylor, 2002) and sense-making & complexity (Weick, 1995; Dervin, Foreman-Wernet, & Lauterbach, 2003, p.262)

## METHODS AND METHODOLOGY

Fifteen academics were interviewed[1] across seven Australian universities in 2017 and 2018 with a focus on Humanities and Social disciplines that have had relatively fewer student numbers engaging with WIL compared with others such as nursing, teaching, or engineering. The study included academics from journalism, social work, psychology, advertising, media arts, recreation and sports, and communication. The methodology used the Micro-Moment Time-Line interview method which is a research design tool that uses sense-making to identify situations, gaps, bridges, and outcomes (Dervin, Foreman-Wernet, & Lauterbach, 2003). During the interviews, academics recounted specific

[1] UniSA ethics approval protocol number 200086

conversations between themselves and hosts, guided by questions focusing on micro-moments to help them make sense of the encounter and concentrate on the processes of communication that occurred.

## FINDINGS

Findings pointed to three main themes of *complex contexts, challenging risks, and trusted interactions* with graduates playing an important role in each of these themes. Linking together, these themes point towards how academics and graduates engage in dialogue to form trusted relationships with WIL hosts.

### *Complexity*

Applying organizational communication theories of sense-making and complexity theory to the data produced insights about the connections between academics, graduates, and hosts in complex environments. These complex systems create several conditions for communication. Firstly, there is a multiplexity of links indicating that academics are connected to hosts and graduates in a number of ways; as former lecturers, current WIL connections, and in some cases, research partners. There is also an interdependency in the connections between WIL academics and graduates. For example, Helen (a WIL academic) reported that she and Mary (a graduate and current WIL supervisor) must work collaboratively and communicate openly to ensure successful WIL outcomes for students-one cannot do their WIL job without the other. Findings point to academics needing to have open, reciprocal, and reflexive dialogue with former students because academics perceived these former students as sharing similar goals for the WIL endeavours, understanding the purpose of WIL, valuing higher education, and possessing analytical abilities to reflect on their own actions and communication.

Findings also indicated that graduates are key WIL boundary spanners, negotiating by engaging in communication and dialogue with stakeholders. Eleven of the 15 participants reported seeing former students as trusted boundary spanners who serve especially as conduits and brokers. For example, one WIL academic, on arranging a WIL project in a local prison said;

> I know a number of social work staff because they've come through and I've taught them and then they're now working in the department so that sort of trust I suppose can divert the bureaucracy of [the prison system] and their fear of you talking to the prisoners [or] something is going to get leaked. (Mary)

This statement from Mary is representative of how the links between academics and graduates can also create trust and divert risks as the next sections will demonstrate further.

### *Risk*

Risk, specifically communication about risks, arose as a key theme in the following ways: communicating to mitigate risks, and the risks inherent in communicating with others. WIL academics spoke how they communicated about strategic, reputational, and ethical risks and how these were discussed and mitigated with the help of graduates. Communication with former students helped to mitigate these risks in numerous ways – most salient were how alumni helped mitigate strategic and reputational risks. For example, effective dialogue and strong relationships depend on participants' ability and willingness to cope with unanticipated consequences (Carpenter et al., 2016; Kent and Taylor, 2002).

"Unanticipated circumstances" can be seen as strategic risks to university WIL success. One such circumstance was when a journalism academic was informed that all internships scheduled to start in two days' time at a major broadcaster had been cancelled. Belinda was able to arrange a number of new internships very quickly asserting that it was "because I do rely a lot on alumni. I've taught for 13 years … so I've got students everywhere and I often will put out a call for help".

An advertising academic spoke about an agency where a former student now employed at the agency, had invited her for a tour of the office. During this face-to-face visit, the academic met as many people within the organization as possible and followed up on those connections. She said;

> Walking through [the agency] … a really important thing is making connections because that's where I'm going to get my next gig [WIL opportunity] and if [my contact] leaves, who do I deal with? So I want to make sure that I'm well known by other people at [the host organization].

This academic reported that this resulted in the formation of three new organizational relationships. She had since invited one staff member to join a university advisory committee, was working on another WIL project with another staff member, and had invited another to participate in a research project. Graduates can help endorse academics' reputations, acting as gatekeepers into organizations who would be worried about reputational risks and embodying the skills and knowledge of graduates to provide reassurance to organizations worried about taking on inexperienced students.

Through their roles as gatekeepers and boundary spanners, alumni also help mitigate another strategic risk – that of shortages of host organizations for student placements. Because of the time already dedicated to building relationships with alumni when they were students through teaching them, the time taken to build up relationships with hosts can be shortened with alumni act as third-party endorsees or as hosts themselves. WIL academics using alumni connections can be seen as invoking a strategy known as "hedging" which serves to limit exposure to threats; by finding alternative solutions, being flexible, distancing oneself from the situation, or exiting the negotiations (Meyerson et al., 1996).

*How Trust and Risk are Actioned in Work-Integrated Learning Relationships*

Results indicated that relationships strengthen over time when a cyclical process of resolving vulnerability from risks via hedging and communication takes place. These patterns and processes point to another factor – that of trust to further explain how relationships are strengthened through acknowledgment and enactment of risk involving alumni in key roles. Findings showed how risk and trust are linked via a circular relationship of sense-making and action, which applied seminal complexity theorist, Luhmann's (2000) statement that "trust is based on a circular relation between risk and action" (p. 100).

This study reported that academics assessed WIL risks, then acted upon them often drawing on alumni due to the connections built over time as their teachers. A common theme in the data was the urge to future-proof WIL relationships, which created a need to build strong relationships with as many contacts as possible. As one participant said, the primary factor hindering relationship development was "I think time—finding people that you can connect with to build those relationships" (Mary).

Graduates, having built that relationship with WIL academics over the course of their degrees, were seen as being able to work collaboratively with academics to further build trust in their roles in host organizations. This communication served to not only mitigate risks, but strengthen trust between the

academics and the alumni, and between the institutions and the alumni's organizations. The transition from student to representative of host organizations was seen by the participants as one that benefitted WIL outcomes and built trust through a reciprocal process. Building trust between academics and graduates was facilitated by a shared commitment to the process of WIL where there was a shared respect of organizational cultures. This trust was built on foundations of making sense about complex environments and connections, communicating to mitigate risks and vulnerabilities, and creating shared meaning.

## CONCLUSION – HOPE AND TIME

Graduates were seen by WIL academics as key boundary spanners, instrumental in brokering and mediating relationships for sustainable and committed WIL engagement between institutions and host organizations over time. Alumni were also seen as embodying the reputation of the institution, as one participant stated, "our reputation is on the line [in] that we need to be producing good-quality graduates" (Helen). This study found that graduates are the future-focused "hope" for WIL academics - they are the success stories and the trusted links and conduits to navigate a complex, dynamic, risky, and interconnected world of interdependence.

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# Introducing simulated work-integrated learning in engineering diploma final projects

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As engineering education evolves, it has been placing greater emphasis on producing work ready graduates (Ferns, Campbell, & Zegwaard, 2014; Goodhew, 2010; Hay, 2020; International Engineering Alliance, 2021). Graduates need to possess a range of soft skills in addition to the standard technical skills and knowledge required in their engineering discipline. The soft and technical skills are often developed and improved via student work placements. Workplace learning implemented as a formal aspect of higher education curricula is often called Work-Integrated Learning (WIL) (Cooper, Orrell, & Bowden 2010).

Engineering education in New Zealand is credited with providing high quality outcomes, where emphasis is given on practical learning experiences, hands-on teaching environment (Boniface, 2018; Education New Zealand, 2017). The New Zealand engineering curriculum is designed to incorporate several study-practice approaches to enhance students' engineering knowledge acquisition and skill development to enable them to be creative engineers. This is done by encouraging them to practice engineering training via specialised teaching and learning approaches (Boniface, 2018; Education New Zealand, 2017; Higher Education, 2018). One such approach is project work. Proposals for final semester/year engineering projects mainly come from sources such as students, teaching staff, or industry collaborations. These project proposals are often formulated for individual students and can be limited to a single branch of engineering. This is usually done for easier assessment of student performance.

Among several teaching and learning approaches, WIL is a prominent approach, where students experience hands-on workplace environment, providing additional source of knowledge and skill development (Boniface, 2018; CEWIL, 2018; Heqco, 2017; Jackson, 2018; New Zealand Education, 2018). Work-Integrated Learning is a pedagogical practice whereby students come to learn by the cross-integration of learning experiences in educational and workplace settings (Ferns et al., 2014; Heqco, 2017; Nuninger & Châtelet, 2011).

One of the forms of WIL that is of interest in this study is simulated WIL. In simulated WIL, a scenario like workplace learning is created within an educational institution (Dean, Eady, & Yanamandram, 2020; Jollands, 2016; Masethe & Masethe, 2013; Rook & Mcmanus, 2020). This could incorporate a team of engineering professionals from diverse disciplines developing an engineering product. The final semester project course in the New Zealand Diploma in Engineering (NZDE) qualification provides an opportunity to develop WIL. Hence, this paper describes an innovative approach to developing simulated WIL via an interdisciplinary engineering project for final semester engineering diploma students at Waikato Institute of Technology (WINTEC).

## UNIQUE FEATURES OF THE PRACTICE

This simulated WIL practice combines the final semester project students in the mechanical and electrical engineering disciplines to develop an electro-mechanical product for a WINTEC client. The client was a tutor in the civil engineering discipline who required a soil drying oven for testing soil samples in one of the courses that he teaches. Hence, this practice essentially incorporates all three WINTEC engineering disciplines in a single engineering project.

The purpose of the NZDE capstone final semester engineering project course is to apply knowledge and problem-solving skills to plan and complete an engineering project (New Zealand Board of Engineering Diplomas, 2020). This project needs to be relevant to the engineering discipline studied and completed to accepted practice and standards from a given specification. Engineering New Zealand technician graduate attributes (New Zealand Board of Engineering Diplomas, 2020) are developed in the project course and these are based on the Dublin Accord (International Engineering Alliance, 2013) for accrediting two-year engineering technician qualifications. A WIL based interdisciplinary engineering project extends the development of teamwork and communication skills to facilitate cooperation and interaction between different fields of engineering. Sharing of design ideas and compatibility of solutions become crucial to the development of the final product.

Students from both the electrical and mechanical disciplines were organised into two teams to produce the design for a soil drying oven according to industry standards. This arrangement was intended to replicate a workplace scenario where engineering professionals from different specialisations work as a team to design a product. The assessment schedules were developed and adapted to suit the needs of both the mechanical and electrical engineering students. There were two parts to the project deliverables: Part A – Initial project planning and preliminary designs (30%) and Part B – Developing final choice into a prototype solution (70%). Part A was 4 weeks long while Part B was 10 weeks long. Table 1 summarises the key tasks and assessments (conducted via Mahara e-portfolio).

Members within each group produced individual design concepts in the first part of the project. The individual designs were then evaluated and combined into an overall group design for further development in the second part. Both groups had the opportunity to share their concepts and designs at the end of both stages. Individual reflections were utilised to gauge team dynamics and individual performance. A viva voce session was conducted at the end of the project to verify contributions made by the team members.

*TABLE 1: Summary of key tasks and assessments for the project course*

| | Part A – Initial project planning and preliminary designs (30%) | Part B – Developing final choice into a prototype solution (70%) |
|---|---|---|
| Key Tasks | Identify the stakeholders<br>Document an agreement for the work to be completed.<br>Develop a work plan (Parts A & B) & Develop a project tracking mechanism.<br>Address sustainability, cultural or ethical issues relevant to the project. (Individual work)<br>Sketches of at least three alternative ideas to provide solutions to the project. (Individual work)<br>Establish and agree the evaluation and selection criteria for the final choice. | Detailed calculations to support solution development<br>Cost estimates for the solution<br>Detailed engineering drawings for manufacture and construction<br>Short sales pitch presentation to the non-technical clients<br>Supply a design file with all details of development, final calculations, and drawings |
| Assessment | Weekly individual logbook entries (date, hours, work evidence, comms)<br>Weekly individual presentations/updates (team meetings)<br>Final group presentation (member's responsible for sections)<br>Final individual report (technical report)<br>Individual reflection (individual vs team dynamics) | Weekly individual logbook entries<br>Weekly team/group leader presentations/ updates (weekly leadership)<br>Final group presentation (member's responsible for sections)<br>Final group report (design file/ technical report – 1 per group)<br>Individual Reflection + Viva voce (team dynamics and verification of work)<br>Prototype demonstration (N/A in 2020 due to COVID) |

## DISCUSSION

A key benefit of learning environments over workplace internships/situations is that they can offer an environment with a less self-imposed pressurised set of expectations from the students. This can promote a greater degree of design thinking permitting scope for a variety of novel solutions. Students are also provided an opportunity to express greater leadership attributes and autonomy rather than perhaps being more guided by an industry professional. Exposure to the nuances of interdisciplinary and personal interactions also enhances teamwork and communication skills.

In terms of executing this interdisciplinary project course the following went well:

- Assigning students into balanced groups based on prior skills and experience. This was achieved by reviewing student performance in previous courses. Course with theoretical and practical emphasis were considered equally.
- The use of weekly logbook reviews and presentations facilitated closer supervision and rapid feedback on progress.

- Flexibility around planning due to COVID-19 enabled students to achieve the outcomes of the project with slight variations to the end product design.

After reviewing the outcomes and delivery, the following could improve the course:

- Additional Mahara training for students to enable faster uptake and improved file sharing skills. Digital literacy skills are important for graduates, especially with the rise in digital communications due to COVID-19.
- Improved digital literacy skills can also facilitate better organisation of the deliverables on Mahara. This would permit easier accessibility and visibility for both students and teachers.
- Some students recommended having stronger leadership in their team in the form an overall team leader.

## IMPLICATIONS OF THE PRACTICE FOR THE WIL COMMUNITY

Interdisciplinary final projects offer an opportunity for engineering diploma students to demonstrate simulated WIL. Projects can be proposed by people within an academic institution, industry, or the wider community. Running the project course on campus creates a less self-imposed pressurised environment that normally exists in the workplace. More flexibility in engineering solutions can be achieved. Important teamwork and communication skills for cross-discipline projects are also developed.

Student knowledge and skills can be harnessed to develop teaching equipment. Other equipment for teaching purposes could be designed and developed via multidisciplinary engineering projects.

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# On-campus collaborations and innovative work-integrated learning practice

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We applied a critical approach to the undergraduate Human Resource Management (HRM) course on career management and development that forms the context of this article. While having success in developing the critical reasoning of students (Dyer & Hurd, 2018, 2016) it became apparent that new student-cohorts were not enjoying the course nor seeing the practical connections between career theory and personal career aspirations or HRM practice. This reflexive insight led us to redesign the course with a view of making stronger connections between career theory and practice (Hayes, Bussey, & Graham, 2019). Indeed, as a topic, career falls within work-based learning and improves employability skills as this helps all students advance their 'work-related aspirations and interests' (Lester & Costley, 2010) and navigate education-to-work transitions (van Rensburg & Goede, 2020). In this paper, we present how the authorship team of two careers academics and an on-campus careers practitioner cooperatively redeveloped a career management and development course with the purpose of bringing career theory to life for our Human Resource Management students. The next section reviews how we applied critical pedagogy. This is followed by a description of the curricula redesign process and method used to gather data on student learning outcomes over a four-year period. We conclude by suggesting future research opportunities arising from our experience.

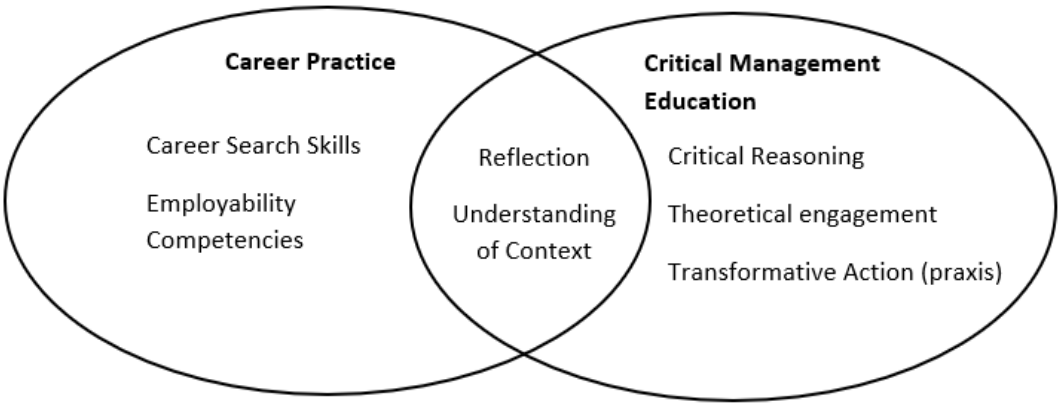
## BRIDGING THE GAP: CRITICALITY MEETS FUNCTIONALITY IN THE CAREERS SPACE

Informed by critical pedagogy, we endeavour to design courses that provide an emancipatory education experience (Freire, 1970, 1992), locate curricula within the broader historical, socio-cultural, political and economic context (Boje & Al Arkoubi, 2009), and critique systemic discrimination (Deetz, 1992). In practice, we adopt experiential and action learning techniques (Miller & Maellaro, 2016) and dialogic-based lectures (Paton et al., 2014) to facilitate students making deep connections between curricula and the context of their lives (Entwistle, 2000). While this pedagogical approach led to improved critical reasoning (Dyer & Hurd, 2018, 2016), over time, we observed our career management and development students demostrating a lack of interest, ability and willingness to enage critically in course material and at the same time, some expressed a disconnection between course content and their personal career aspirations as future HRM professionals. Based on these classroom observations and formative student feedback, we began a process of redesigning the course with the purpose of maintaining a critical edge while bringing career theory and practice to life for our students.

The most recent iteration of this redesign, and which forms the basis of this paper, began with seeking overlaps between the aims of critical pedagogy and the aims of career education by mapping Amoroso and Burke's (2018) discussion of career management competencies against critical pedagogical goals. This mapping, illustrated in Figure 1 below, shows that both career competencies and critical pedagogy

highlight the importance of reflection/reflexivity and understanding the wider meso and macro context in which careers are played out.

*FIGURE 1: Overlap between career as practice and critical management education aims (adapted from Amoroso & Burke, 2018, and Dyer & Hurd, 2016).*




Recognising the alignments between critical pedagogy and careers education uncovered the opportunity to collaborate with the campus careers service to redevelop the course with the dual purpose of enhancing critical reasoning skills of students and the practical relevance of the course. Important features of this redesign included new experiential learning exercises and accompanying written assessments designed to help students learn about and reflect on some of the elements of career management practice, and techniques required for managing career. The first of these exercises, presented in Lecture 1, requires students to write down their definition of career and then draw a picture of their career. In pairs, students then discuss their career definitions and consider if and how their pictures depict family and community responsibility, potential career breaks, interest and skill development and leisure time activities; all features embedded in the Career Rainbow model (Super, 1980). The supportive assessment requires students to write a reflection of their learning from this exercise.

The second exercise involves students attending a 45-minute career planning session with a professionally accredited Career Counsellor. To prepare, students complete Assignment 1 and, using their career picture as the starting point, consider what they would like to discuss in their session. As a positive career intervention technique, these individualised sessions focus on career planning and offer students follow-up tasks to help progress their career plans.

In week six, the Career Counsellor presents a guest lecture summarising the themes to emerge from the career planning sessions. Importantly, this lecture makes explicit links between the career theories covered in the preceding lectures with career practice, as experienced in their individual planning sessions. The final assessment, due at the end of semester, asks students to reflect on whether their definition of career has changed, what issues they might now include or exclude in an updated career picture, and what course material challenged, affirmed, or changed their view on career.

Along with our commitment to criticality, the above activities and engagement with career services were supported by classroom sessions structured around a deep exploration of traditional and contemporary career theory and the socio-cultural and political-economic context of careers. Thus, classroom discussions continued to explore the meaning and power associated with career, and the wider political-economic context within which careers occur.

## DISCUSSION

Student challenge to our approach to critical pedagogy within the context of a careers course led us to redesign the course with the purpose of bringing career theory and practice to life for our students. Throughout this process, our commitment to critical pedagogy remained, however, we also wanted to create a learning experience that had a practical outcome for students. Our exploration of critical and practice relevant aspirations revealed some overlap between careers education and critical pedagogy.

Early analysis of student reflections revealed that the course design facilitated achieving the practical objective of developing career competencies (Amoroso & Burke, 2018), and the critical objective of developing reflexivity (Cunliffe, 2003). Indeed, we did not anticipate that the seemingly contradictory pedagogical approaches imbedded in critical reflectivity and practical relevancy would work together to improve collective learning outcomes. Paton et al. (2014) describes the potential of business schools to offer 'counterintuitive viewpoints that challenge business mindsets' (p. 267), and calls for learning that helps 'managers understand the potentially disruptive power of ideas or theory' (Wall, 2016, p. 6). Our experience has provided an example of curriculum development that encourages the development of this critical reasoning, situating the theory and practice of careers within this broader context. Thus our experience provides further insight into the process of integrating theory and practice (Hayes, Bussey, & Graham, 2019), and in particular, offers an example of how course design can facilitate integrating practical and critical perspective within industry-based action-learning. Moreover, this course design also provides an effective example of work-based learning (Paton et al., 2014).

## CONCLUSION

Through this reflexive experience, we have come to appreciate that bringing practice relevant learning into the critical management classroom does not negate the importance of critique or the development of critical reasoning; rather, this approach makes critique within a business school context both more tenable and more tangible. Thus, we have observed that the new course design provides practical relevance, alongside deep critique, which according to Paton et al. (2014) is a key goal of 'developing people as reflective, self-managing practitioners' (p.563).

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# Using personal development plans to encourage reflective practice, and to support employability skills development in Design Factory New Zealand

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Established in 2017, Design Factory New Zealand is a co-creation space where multidisciplinary groups of students work with industry partners to solve complex problems. Learning outcomes of the Level 7 undergraduate Design Factory module not only focus on problem-solving and innovation, but also on communication strategies, human-centred approaches, efficacy, self-motivation, and future-focused skills for employability.

Personal Development Plans are introduced to encourage meaningful goal setting and reflection. Students set up to three goals for personal development, based on future-focused skills (developed from Tertiary Education Commission, 2018; Bakhshi, Downing, Osborne, & Schneider, 2017; Jackson & Chapman, 2012). Over the semester, students work and reflect on these goals. While students participate in a WIL group project, they are also encouraged to leverage the team, the industry contacts, and the wholistic Design Factory environment, as opportunities to work on goals.

This discussion outlines research findings from a two-year investigation into students' perceptions of value of personal development planning as a tool within the Design Factory environment.

## RESEARCH SETTING AND CONTEXT

Design Factory New Zealand (DFNZ) is part of the Design Factory Global Network – "a network of innovation hubs in universities and research organisations…on a mission to create change in the world of learning and research through passion-based culture and effective problem solving" (Design Factory Global Network, 2020). While Design Factories around the globe function independently, there are common features that underpin Design Factory as a pedagogical platform (Björklund, Nordström, & Clavert, 2013); an experiential pedagogy that emphasises a student-centred approach, passion-based learning, and linking theory to practice in project-based work (Björklund, Laakso, Kirjavainen, & Ekman, 2017).

Design Factory functions as a physical space, but also a social and mental environment (Mattila, 2014). The environment is open and co-creation takes a non-hierarchical approach. The Design Factory experience for students extends past the multidisciplinary industry co-created group project, with the space playing host to industry events (often hosted by students), research, and industry and community interactions. It is this wholistic understanding and experience of Design Factory New Zealand that our students are encouraged to leverage to help achieve Personal Development goals.

## WORK-INTEGRATED LEARNING AND FUTURE-FOCUSED SKILLS

The potential impact of Work-Integrated Learning (WIL) on students' development is not a new proposition. As Sachs, Rowe, & Wilson (2016) contend, "there is an extensive body of literature reporting the benefits of WIL" (p.12). Outcomes for students often identify development of transferable,

generic or professional skills, employability, work-readiness, and 'graduateness' (Jackson, 2013; Hill, Walkington, & France, 2016; Sachs et. al., 2016).

The desirability of such outcomes is evident – in New Zealand and elsewhere – in policy, research, and development of education models and systems (Bakhshi et. al, 2017; Davies, Fidler, & Gorbis, 2011; New Zealand Productivity Commission, 2017), which in turn are driven by broader workplace demands for less focus on technical training, and greater focus on attitudes and behaviours, communication, problem solving, and resilience (Rowe, 2019).

In a 2011 report on *Future Work Skills 2020*, Davies et. al. (2011), predicted ten skills for future workforces over the decade: sense-making, social intelligence, novel and adaptive thinking, cross cultural competency, computational thinking, new-media literacy, transdisciplinarity, design mindset, cognitive load management, and virtual collaboration. More recently, van Laar, Deursen, van Dijk, & de Haan (2019) lead their discussion on twenty-first century skills to include "skills related to the use of ICTs, collaboration and communication, creativity, critical thinking, problem-solving, being productive, and acting in a socially and culturally responsible manner" (2.1). They also outline a framework of 'core' and 'contextual' skills, including information management, communication, collaboration, creativity, critical thinking, problem solving, ethical and cultural awareness, flexibility, and lifelong learning (van Laar et al. 2019).

## REFLECTIVE PRACTICE AND PERSONAL DEVELOPMENT PLANS

WIL is posited to "provide an effective platform upon which to develop effective skills, traits, and behaviours" (Rowe, 2019, p.10, reviewing the Confederation of British Industry Education and Skills Annual Report, 2018). However, as Jackson (2015) notes, often the attention remains on the focus of *what* students acquire from WIL, rather than *how.* Jackson (2015) suggests that competencies and skills are "shaped as much by a sensitivity to 'processes' of learning" (p.351) as by the outcomes of the learning.

In an attempt to pay attention to the *process*, this research focuses on a best-practice element within WIL design – Reflective Practice (Coll, Lay, & Zegwaard, 2002; Jackson, 2015; Rowe, 2019). In this case, reflection occurs through the Personal Development Plans, with the aim of providing a meaningful and self-driven approach to reflect on learning through a WIL experience. The focus of this research is on the perceived value, from students' perspectives, of Personal Development Planning as a tool for future-focused skills acquisition.

## METHOD

As a purposive sample, all students from DFNZ's undergraduate module were invited to take part in this project in 2019 and 2020. As part of the Personal Development Plan process, students completed two questionnaires – pre and post-course. Only respondents who completed both questionnaires (pre- and post-course), and who consented to data being used for research, have been included in this analysis. In total, 47 students' responses were analysed from 2019, and 39 students' responses were analysed from 2020.

The survey instrument comprised a combination of closed and open questions, focusing on students' self-rating of their competence in six future-focused skills areas. Some questions also specifically asked

students about their perceptions of the impact of (1) the DFNZ environment on their self-development, and (2) of the Personal Development Planning process.

The six future-focused skills areas used in the assessment were derived from various sources – including Tertiary Education Commission (2018); Careers NZ (2020); Bakhshi et al. (2017); Jackson and Chapman (2012); van Laar et al., 2019): Problem Solving, Teamwork and Collaboration, Social Intelligence, Motivation and Can-do Attitude, Critical Thinking, and Professional Communication.

## DISCUSSION OF FINDINGS

*Self-Rating of Skills, Pre- and Post-Course*

While there is some variance between years and occurrences, on average, students in both 2019 and 2020 semesters provided higher self-ratings at the end of the module, for all six skill areas, than at the start of the module:

| **Future-Focused Skills Area** | **Average self-rating at start of course.** | | **Average self-rating at end of course.** | |
|---|---|---|---|---|
| | **2019** | **2020** | **2019** | **2020** |
| Problem Solving Skills | 7.1 | 7.3 | 8.2 | 8.0 |
| Teamwork and Collaboration | 6.9 | 7.4 | 8.3 | 8.2 |
| Social Intelligence | 6.8 | 7.0 | 8.0 | 7.6 |
| Motivation and 'can do' attitude | 7.5 | 7.2 | 8.2 | 7.9 |
| Critical Thinking Skills | 7.0 | 6.9 | 7.9 | 8.0 |
| Professional Communication | 6.9 | 7.1 | 8.3 | 8.1 |

While there was individual variance in the marked improvement (or not) in self-ratings for these skills, the overall averages might suggest some students perceive greater confidence in their own abilities after participation in WIL through DFNZ. From this small study, however, and without a control sample, it is not possible to conclude specifically that participation in the WIL environment within DFNZ is the key contributor to self-perceived development in these skills areas. However, the findings do align with other studies on students or alumni perception of WIL programmes – for example, Mikkonen, Tuulos, and Björklund (2018) conducted a survey of alumni from a Design Factory-based programme (Product Development Project course) at Aalto University in Finland and found that alumni identified interpersonal skills as the most important learnings from the course.

*Perceptions of Effectiveness of Personal Development Planning as a Tool for Self-Development within the Design Factory Module:*

Students were asked to rate and comment on the effectiveness of the Personal Development Plan as a tool for self-development. On average, the rating for the tool was 7.6/10 in 2019, and 7.8/10 in 2020, with several positive comments relating to the ability to focus on self-reflection, and self-awareness. For example:

> "I think it is interesting to have this sort of structured assignment within the Design Factory class because it gives people the opportunity to look into themselves and use the best of who they are to provide behaviours and discussions that are beneficial to others." [Student 1, 2019]

> "I like the PDP assignment as it helps to achieve more out of the Design Factory. I could just be there to complete the tasks that are given to me, but I feel like I am getting more out of having this assignment as it helps to develop me as a person." [Student 12, 2020*]*

Several respondents also lamented, however, the impact of time (or lack thereof) for focusing on the task, self-management issues, and the need for more encouragement/reminders.

Finally, students were asked how the Design Factory – project, people, and place – impacted, if at all, their development of future-focused skills. Overwhelmingly, responses were positive. For example:

> "Design Factory has been great! Being exposed to such unfamiliar environments, topics and people is an amazing cocktail for personal growth." [Student 3, 2019]

> "It showed me how crucial these skills are when working in a professional setting with established businesses and how much of a difference these skills make when working in groups to establish real life solutions to real world problems..." [Student 4, 2019]

## CONCLUDING THOUGHTS

In general, the findings indicate that the use of Personal Development Plans as a tool future-focussed skills development seem beneficial to students of the module outlined in this research – particularly in relation to self-awareness and reflective practice.

It also seems possible that there is a correlation to students' confidence and development of future-focussed skills and working within the Design Factory as a whole. One can hope, as proposed by Jackson (2015, citing Kirwan & Birchall, 2006), that this confidence will positively impact students' ability to transfer their acquired in future employment.

While there are a few comments that hint at it, what is not fully determined from this brief snapshot of findings is whether the Personal Development Plan as a tool does drive an *intentional* focus on how to leverage the *holistic Design Factory environment* to achieve goals.

> "For me at least, I found that the self-development goals aligned perfectly to this paper. It gave me chances to improve upon them. I found a lot of the in-class activities we did that related to them…." [Student 11, 2020]

Some student responses indicate that the personal development plan perhaps serves as a useful anchor point to reflect on development during the process.

> "It helped me to look at myself in a new way, reflecting is a great way to see any struggles and growth I have done as a person; it gives in-depth look into my personality and my strengths and weaknesses." [Student 26, 2020]

The usefulness of this reflection, however, may also be dependent on the time allocated to it – particularly due to time constraints around group activities. Rowe (2019) warns that there is "a risk that poorly managed reflection can adversely affect levels of confidence and subsequently weaken resilience" (p.12); therefore, a challenge is presented for the next phase of research: developing the programme to allow more in-class 'space and time' for the intentional focus on Personal Development Planning.

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# Understanding and managing risk in work-integrated learning: A New Zealand universities perspective

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The purpose of Work-Integrated Learning (WIL) is to enable students to have authentic experiences in relevant learning environments with a focus on the integration of theory into practice contexts (Fleming & Haigh, 2017). WIL often occurs in host organizations external to the university as part of a student's course requirements. While there are numerous benefits (Cooper et al., 2010), WIL has been identified as an activity with inherent risks that are different from those that might occur with on-campus learning experiences (Cameron, 2017; Newhook, 2013).

In New Zealand, recent changes to health and safety legislation (New Zealand Government, 2016) has altered the legal responsibilities for all organizations. In the context of WIL, this includes not only the host organization but also the university and individuals such as students. These developments have led to increased attention on risk in WIL in New Zealand universities.

Maximising the value of WIL, but minimising risk is a challenge that is not unique to the New Zealand context. While research has been undertaken in Australian and Canadian universities (Cameron & Klopper, 2015; Cameron et al., 2019; Newhook, 2013, 2016), no previous empirical research on understanding risks associated with WIL in New Zealand universities has been located. The aim of this study was to examine risks in placement-based WIL in New Zealand universities. The research questions were:

1. What do WIL staff understand about risks associated with WIL?
2. How are risks in WIL placements managed by WIL staff?

## BACKGROUND

Risk can be simply defined as "any issues that might affect, either positively or negatively, the achievement of WIL objectives for students, host organizations and the university" (Fleming & Hay, 2021, p.177). A social constructionist approach to risk was adopted in the study whereby risk was understood as a phenomenon interpreted and constructed by the individual and thus influenced by their experiences, understandings and relationships. Risks are therefore dynamic, fluid and negotiated within contexts and history (Newhook, 2013).

Risks in WIL may, broadly, relate to ethics, operations, health and safety, conduct, law and liability, finance, strategy and reputation (Cameron, 2017; Cameron et al., 2019). If manifested, these risks can have serious consequences for the university, WIL staff, and host organizations (Cameron et al., 2019). Newhook (2016) pointedly argued that while there may be risks for the university and the host organizations, the student has both the greatest exposure to risk and faces the most serious potential

consequences. Despite this, actual cases of injury or harm due to risk factors have been minimal (Newhook, 2016).

Responsibility for assessing and managing risk in WIL is largely a shared function; however, the boundaries can blur depending on factors such as the length of placement, whether a student is also an employee of the host organization and who is organising the placement (Newhook, 2013). The importance of WIL staff in ensuring positive placement experiences for students has been canvassed (Coll & Eames, 2000) although, interestingly, their role in mitigating or managing risk has received minimal attention (Newhook, 2013, 2016).

The challenge for universities generally, and WIL staff specifically, is to enable student learning outcomes to be achieved successfully through WIL, while concurrently minimizing or managing the potential risks. Given the limited literature on this topic, particularly in the New Zealand context, this study adds to the research endeavour on university WIL staff understandings of and responses to risk in WIL.

## METHODS

A mixed methods approach was used for this study. This approach enabled data triangulation through surveys and interviews, and methodological triangulation by collecting both qualitative and quantitative data (Johnson et al., 2007). This paper briefly presents key findings from a survey with WIL staff.

The survey participants were staff (faculty/ academic or professional/ administrative) involved in WIL in New Zealand universities. Participants were recruited through the researchers' professional networks and a snowball technique, where participants were able to share the invitation. Surveys were completed by 64 WIL staff in 2019. The roles of the staff included: placement coordinators; WIL course leaders; and academic supervisors. The majority of participants (59%) had been in their role for over 5 years, with 4.6% for less than 2 years. Twenty-eight disciplines were represented with the most common being: business; health-related; sport and recreation; arts; science; and social work.

The online survey included 5-point Likert scales, with descriptors dependent on the nature of the question. Open-ended questions allowed participants to provide comments. Focus areas included: identifying current and emerging risks in WIL; understanding of different types of risk and the consequences for stakeholders; and strategies for managing risk. The scales were analysed using descriptive techniques. The Statistical Package for the Social Sciences (SPSS) was used to generate chi-square tests of independence (Gratton & Jones, 2010) to examine associations between variables. Thematic analysis was used for the qualitative responses from the open-ended questions (Braun & Clarke, 2006). Ethics approval was gained from the authors' two university ethics committees.

## FINDINGS

The findings are presented under the following areas: understanding of risk; identifying risk; and strategies for managing risk.

*Understanding of Risk*

Participants indicated their understanding of different risk areas. Table 1 indicates the means for each area of risk (using a scale of 1, being no understanding, 3, moderate level of understanding and 5, a very high level of understanding).

*TABLE 1: Perceived understanding of risk associated with work-integrated learning*

| **Risk area** | **Mean (S.D)** | **% high or very high level of understanding** | **% little or no understanding** |
|---|---|---|---|
| Risks for WIL students | 3.89 (0.86) | 69 | 6 |
| Risks for host organizations | 3.82 (0.80) | 66 | 5 |
| Risks for the university | 3.83 (0.81) | 72 | 8 |
| Risk for university WIL staff | 3.75 (1.02) | 64 | 11 |
| University policies for managing risks associated with WIL | 3.06 (1.18) | 37 | 37 |
| Strategies for managing risks in WIL | 3.32(1.11) | 46 | 28 |
| Host organization policies for managing risks in WIL | 3.00(1.05) | 31 | 34 |

The descriptive analysis indicated that most staff perceived they had a high or very high level of understanding of the risks for WIL students, the risks for host organizations and the risks for the university. However, a high percentage of staff had little or no understanding of university policies for managing risk, strategies for managing risk or host organization policies for managing risks in WIL.

Associations between the risk areas listed in Table 1 and demographic variables were considered: length of time in the role; length of the placement; placement process; student payment; payment of the host organization. Pearson Chi-square analysis indicated a significant association for perceived understanding of the risks for WIL students with the length of time in the role ($p= 0.023$). There was also a significant association for understanding risks for university WIL staff and the placement process ($p= 0.001$), with a higher level of perceived understanding of risk when the students were placed by the university (as opposed to finding their own placement). A higher level of understanding of university policies for managing risk in WIL was significantly associated with the length of the placement ($p=0.047$).

*Identifying Risks*

Survey participants signalled, on a list provided, their perceptions of the level of perceived risk related to their WIL programme.

*TABLE 2: Level of perceived risk as % of participants*

| Type of risk | Low or no risk | Moderate risk | High or very high risk |
|---|---|---|---|
| Health and safety | 22 | 43 | 35 |
| Intellectual property | 48 | 22 | 26 |
| Breach of confidentiality | 24 | 30 | 46 |
| Contracts or agreements | 34 | 28 | 28 |
| Student characteristics | 26 | 43 | 26 |
| Conduct of student on placement | 22 | 50 | 28 |
| Conduct of host organization | 22 | 46 | 28 |
| Sexual and other forms of workplace harassment | 39 | 35 | 19 |
| Conduct of university pre-placement | 63 | 22 | 13 |
| Conduct of university during placement | 63 | 22 | 13 |
| Discrimination, equity and accessibility | 41 | 41 | 13 |
| The educational quality of the WIL experience | 43 | 38 | 17 |
| Insurance coverage | 39 | 26 | 17 |
| Compliance with legislation or policy | 43 | 24 | 22 |
| Compliance with the Vulnerable Children's Act | 66 | 13 | 8 |
| Issues with wages and payment | 72 | 6 | 6 |
| Reputation of the university | 32 | 32 | 36 |

As indicated in Table 2, the perception of the level of risk was variable. The areas that were perceived by at least 25% of WIL staff to be high risk were: reputation of the university; breach of confidentiality; health and safety; conduct of student on placement; conduct of host organization; contracts or agreements; and intellectual property issues. The areas that at least 50% of participants considered low risk were: issues with wages and payment; compliance with the Vulnerable Children's Act (2014); and conduct of the university pre- or during placement.

Participants were also invited to identify their perceptions of the consequences of the risks. For the high-risk areas identified in Table 2, the perceived consequences of risk areas are summarized in Table 3.

Not all participants were sure of the consequences of the risks, particularly those related to contracts or agreements, intellectual property agreements, and breach of confidentiality. Health and safety was identified as the most significant future risk for WIL in the university. The reputation of the university, competition for placements, student conduct and student safety were also highlighted as future risks.

*TABLE 3: Perceived consequences of risk as % participants*

| Type of risk | No consequence | Minor consequences | Severe consequences | Unsure of consequences |
|---|---|---|---|---|
| Health and safety | 8 | 42 | 39 | 11 |
| Intellectual property issues | 15 | 43 | 17 | 25 |
| Breach of confidentiality | 6 | 30 | 47 | 17 |
| Contracts or agreements | 9 | 43 | 23 | 25 |
| Conduct of student on placement | 4 | 34 | 57 | 6 |
| Conduct of host organization | 2 | 43 | 45 | 9 |
| Reputation of the university | 6 | 38 | 47 | 9 |

*Strategies for Managing Risk*

Seventy one percent of WIL staff had sought advice in relation to identifying or managing risks in WIL. Lawyers, health and safety officers or other WIL or university staff were approached most frequently. Advice was typically related to processes and systems; clarification about risks and how to address these; or clarity on university policy. Very few indicated they sought advice external to the university or from host organizations. The following resources were helpful: conferences, webinars, workshops, journals, texts, online resources, legislation, policies, government websites, and networking although fifty nine percent of WIL staff had not used any specific resources to help them identify or manage risk.

A list of risk management strategies was provided to participants to indicate their frequency of use. Seventy eight percent of participants always used placement agreements or learning agreements. Other strategies were codes of conduct (always =54%), privacy guidelines (always= 51%) and health and safety assessments (always=45%). The least common strategies were guidelines on harassment (never = 41%), and equity and inclusion (never =35%). Other useful strategies included clear communication, developing strong relationships with host organizations and effective pre-placement preparation.

## SUMMARY

Students are considered the stakeholder most at risk during WIL (Newhook, 2016) and so it is perhaps reassuring that WIL staff indicated a moderate understanding of the risks for students. That said, they demonstrated variable understanding about risks associated with WIL, even those with considerable experience. In contrast to previous research (Newhook, 2013) many WIL staff indicated limited understanding of university policies or strategies that could assist with managing risk.

Perceived high levels of risks associated with WIL included health and safety, the reputation of the university and the conduct of students and organizations. The use of formal strategies such as learning agreements, policies and guidelines was inconsistent and at times non-existent. Instead, participants aligned themselves with a relational approach to managing risk with students (for example in pre-placement preparation) and host organizations. The mitigation and management of different risks appeared to be somewhat ad hoc, individualized and discipline-specific rather than university-wide. Therefore, there is a pressing need to develop resources and guidelines to further support staff in managing risk in WIL.

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# Enabling engineering students learning through the use of work-integrated learning projects within a COVID-19 context: Learning success and challenges

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The New Zealand Ministry of Education has increased the focus on the linking of employability outcomes with the engagement with tertiary education, mirroring similar increase in focus in other countries such as Australia, Canada, and the US. This government-level focus has prompted research activity and scholarly debate around enhancing employability skills, transferable skills, and employability outcomes (Rowe & Zegwaard, 2017; Zegwaard & Rowe, 2019) and the mapping of curricular learning activities to employability outcomes with the assumption that enhanced employability outcomes results in increased employment (Bates & Hayes, 2017; Jackson, 2013; Kaider et al., 2017; Smith et al., 2022). Many universities are adopting the educational approach of Work-Integrated Learning (WIL) as a way of directly evidencing enhanced employability outcomes (Campbell et al., 2022).

In 2014, the University of Waikato commenced a major curricular review and redesign with the first year of rollout of the new curriculum framework occurring in 2018. As part of the new curriculum framework, all students enrolled in an undergraduate degree must complete at least one offering/paper/course in WIL (15pt credits out of either a 360 or 480 credit degree). These WIL offerings could be work placements or non-placement WIL learning activities. The compulsory WIL offering was for most degrees structured to occur in the third year, meaning the first cohort of students requiring to complete their compulsory WIL requirements was in 2020.

The engineering curriculum already included 800 hours (two lots of 400 hours) of work placements, thus exceeding the minimum Waikato requirements for WIL. Because COVID-19 pandemic caused restricted access to engineering workplaces, Engineering New Zealand (the accrediting professional body) reduced the requirement from 800 hours to 400 hours, essentially wavering engineering students at the end of their second year the requirement to complete a WIL experience. Albeit, this reduced the issue of limited opportunity for engineering work placements, it created an issue for international engineering students who had expected to be undertaking work experience over the summer of 2020/2021. These students were able to return to their home country for the summer period, however, if they did so they would be unable to return to New Zealand to continue their studies in 2021. Therefore, a special offering of non-placement WIL (Summer Projects) was developed for these students, allowing to complete a credit-bearing offering and keep them engaged with learning during the summer period. There were eight projects generated for 33 students, where projects ranged from creating a desalination plant constructed from material commonly found in Pacific Islands through to a weather predication app. The projects were group-work projects with students randomly allocated to each of the project.

The research here was an investigation of these student learning experience as part of engaging in non-placement WIL. The focus of the research was to investigate student perceptions of the value of the learning experience and to investigate what skills these students perceive have been developed through engaging with this learning experience.

## METHODS

An anonymous online survey was undertaking using Qualtrics that included nine 7-point Likert scale agreement statements related to learning and career readiness and eight open ended questions. This survey was undertaken after the completion of the Summer Projects. The class cohort size was 33, with 16 students completing the survey (48% return rate). The Likert scale data was analysed through descriptive statistics using Microsoft Excel and the open ended questions were thematically analysed using word counts and groupings. The research is ongoing, with document analysis still to be completed and published in a later publication.

The sampling cohort consisted of international students, mostly from the Middle East, with little to no family connection to New Zealand, studying on an international student visa. These students were able to return to their home country for the 2020/2021 summer period, however, would have been unable to return to New Zealand to continue their studies due to the New Zealand COVID-19 border restrictions. This research obtained human research ethics approval from the University of Waikato (HREC(HECS)2020#68).

## RESULTS

The agreement statements explored aspects of the student learning and their perceived the value of the learning. The students provided a range of views regarding the agreement statements, with a moderate degree of variability within the responses (Table 1).

*TABLE 1: Student average responses to agreement statements using a 7 point Likert Scale (1 strongly disagree, 7 strongly agree) with standard deviations (SD).*

| | Mean | SD |
|---|---|---|
| I feel well prepared to start a career in engineering | 4.94 | 1.124 |
| I feel that the Summer Project helped prepare me for a career in engineering | 5.25 | 1.209 |
| I believe the Summer Project furthered my learning on how to be an engineer | 5.56 | 0.946 |
| I thought the Summer Projects provided an authentic learning experience | 5.63 | 1.138 |
| Having completed the Summer Project, I now feel more confident to apply my engineering skills to engineering projects | 5.69 | 0.500 |
| I feel that I have much more learning to do before I am prepared for a career as an engineer | 5.69 | 0.806 |
| I believe the Summer Project furthered my learning of the practice of engineering | 5.75 | 1.341 |
| I valued the community/business focus of the Summer Project | 5.88 | 1.340 |
| I valued working as a group | 6.38 | 1.195 |

Participants generally provided positive responses (above Likert of >4) for all agreement statements, however, within the responses there was considerable variability (mean SD = 1.067). The response to the statement if students felt prepared for a career in engineering gave a modest positive but variable response, with three students neither agreeing or disagreeing and one student disagreeing. However, when asked if the summer project further prepared them for a career in engineering and stronger positive response was provided. The agreement statement which provided the most consistent response from participants was related to a having greater confidence of applying skills after having completed the Summer Project, and the most positive response was to a statement asking if they valued working as a team.

An open ended question asked participants to list three skills they believed they had developed during the Summer Project. This question resulted in a list of 44 individual skills that were then thematically analysed and grouped.

*TABLE 2: Grouping of skills participants identified they had developed with frequency counts (n = 44).*

| Skill grouping | Frequency count | Skill grouping | Frequency count |
|---|---|---|---|
| Communication and networking | 12 | Commitment | 2 |
| Teamwork | 9 | Leadership | 1 |
| Time management | 7 | Thinking (critical) | 1 |
| An engineering technical skill | 6 | Health and safety | 1 |
| Research skills | 5 | | |

The frequency counts of skills student identified indicated 'communication and networking' as the most common skill identified (n=12) with 'teamwork' being the second most frequent skill identified (n=9). Only six skills were identified as engineering-specific technical skills (e.g., programming, using Aspen Plus, engineering design, or simply 'technical skills') whilst the remaining skills are groupings of skills non-technical skills. The groupings presented in Table 2 may not be fully independent domains as it is likely, for example, that when students thought of communication they may have been thinking of communication within a teamwork context.

## DISCUSSION

### *Use of Non-Placement Work-Integrated Learning to Develop Career Readiness*

The WIL literature tends to be dominated by work placement forms of WIL practice, with a low level of attention given to non-placement forms of WIL (Rowe et al., 2022; Zegwaard et al., 2022). There have been calls to expand research and scholarly discussion around non-placement forms of WIL (Dean et al., 2020; Jackson & Greenwood, 2015; Kay et al., 2018; Zegwaard & Rowe, 2019) and the 2020 COVID-19 pandemic provided a strong driver of expanding the practice of non-placement forms of WIL (Dean & Campbell, 2022; Zegwaard et al., 2022).

Evident in the study presented in this paper, student reported positive learning experiences of engaging with non-placement WIL (Summer Projects) and skills the literature has identified as important skills

of engineer entering the engineering workplace. The students identified *communication* and *teamwork* as the main skills developed by engaging with non-placement WIL. These particular skills have been identified in the literature as skills that are highly valued by employers of recently graduated engineers. A 2020 study indicated that science and engineering employers thought *teamwork*, *written communication*, *problem solving*, and *oral communication* as the top four most important skills (out of 26) required for engineers entering the workplace, with oral communication being perceived as becoming most important skill in 10 years' time (Khoo et al., 2020). Furthermore, the study in this paper showed that *self-management* was the third most common skills students identified as having being developed through this practice of non-placement WIL, a skill that the Khoo et al. (2020) study found employers rated as 6th most important.

The study in this paper indicated that student strongly valued the group work aspect of the Summer Projects (6.38). In New Zealand, an accredited engineering degrees require adherence to the Washington Accord principles (International Engineering Alliance, 2020), which identifies teamwork skills as one of the required learning outcomes. However, teamwork often elicits mixed and, at times, negative views from students (Burdett, 2003). Even though there were a few challenging team dynamics that required management, evident from Summer Projects was that a highly engaging, authentic, and meaningful teamwork project assists in creating positive and productive teamwork experiences.

An interesting observation of the skills students listed as having been developed during Summer Projects was the relatively low number of mentions of engineering-specific technical skills (six out of 44 skills provided by students). This is particularly noteworthy in that engineering is a highly technical discipline, the Summer Projects required hands-on engineering skills, and a technical report was required at the completion of the Summer Projects. The non-technical skills are traditionally difficult to 'teach' within classroom settings, therefore, should be an important student learning focal area when engaging in non-classroom-based learning. It is likely that students interpreted the Summer Projects learning experience as a holistic learning experience where 'how a project comes together as a whole' provided the greater perceived learning outcome rather than the application of engineering-specific skills. Albeit, this highlights one of the unique learning aspects of a WIL experience, it is important to remain mindful that the application and development of engineering-specific skills may have been a 'given' or assumed by students due to the engineering nature of the Summer Projects.

*Confidence and Awareness of Skills*

All students involved with this study had not undertaking a prior WIL project (i.e., this was their first WIL experience). A challenging aspect of non-placement WIL is a low proximity to the workplace compared to the learning experience a full-immersion work placement (Kaider et al., 2017). Furthermore, at times, non-placement WIL is perceived as having low level of authenticity, despite that the projects may be highly authentic, and can be seen as a 'lesser cousin' of placement WIL. However, the students believed the learning experience through Summer Projects had a high level of authenticity (5.63) and that it furthered their learning on how to 'be an engineer' (5.56) despite the low proximity to an engineering workplace.

Even though these results need to be interpreted within a context that these students had not yet undertaken a full immersion work placement in an engineering workplace, it is evident that students thought essential career-required skills were developed. Of the agreement statements students responded to, two related agreement statements yielded particularly strong responses with a low

degree of variability. Students believed that by engaging with non-placement WIL had significantly increased their confidence to apply engineering skills to engineering projects (Likert 5.69, SD 0.500) and students strongly agreed that they still require further learning in order to commence their career as an engineering. Understanding the level of learning achieved and, simultaneously, indicating awareness of the need for further learning suggests students are engaged in active self-reflection of their skill development and skill needs. The ability to critically self-reflect on one's own skill level is crucially important to becoming a successful professional.

*Future Considerations*

The Summer Projects consisted of eight projects and included the use of a final year student to mentor the students and manage elements around the project. However, 2020/2021 was the first offering of Summer Projects, arranged within a relatively short time period, with limited physical and staff resourcing, and within a context of severe institutional financial restraints and staff reductions, which created some significant challenges around resourcing and staffing the Summer Projects. Despite these restraints, students in general reported positive learning experiences. For future offerings, students recommended a greater level of support by a dedicated academic supervisor(s), whilst staff identified the need for greater access to engineering-specific resources and greater time allowance to more directly oversee student learning and group dynamics. Ideally, the more direct coupling with an external provider will include resourcing of engineering material. Assessment structure to measure student learning progression needs to remain flexible to allow for the different contexts of each student project as well as the group-work nature of the Summer Projects. Consideration could be given to broadening the make-up of the student groups to beyond engineering students. These Summer Projects here were limited to engineering students as that reflected the immediate need at the time, however, including non-engineering students within each group to manage and develop non-engineering aspects of the projects, would strengthen the overall group learning experience for the students.

## CONCLUSION

The findings of the research here indicates that group-based, non-placement WIL can enable valuable learning of non-technical skills required to be a successful engineer. Despite the low proximity to a relevant workplace, students believed the learning experience was had a high level of authenticity. It is important that appropriate support staffing and resourcing is made available to assist with the student learning activity. Students identified learning outcomes that were mostly non-technical skills that were consistent with what the literature identifies as being important for engineering graduates to be successful as engineering professionals. Albeit this study here provides valuable insight to student learning through non-placement WIL, the study is limited by the small sampling population (16 out of 33 student participated in the study) and the small scale of the investigation. The authors encourage further large scale research of student learning experiences through non-placement WIL, including improving approaches that could enhance the student learning outcomes.

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# Developing institutional-wide practice of work-integrated learning

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The University of Waikato Strategy 2014-2017 signalled the intention to build on the University's strong reputation and to forge new pathways into the future. An important activity in realising this plan was undertaking a university-wide review referred to as the Curriculum Enhancement Programme (CEP). A key purpose of this review was to examine the curriculum across the university and consider what education was to be offered, why, how, when, and where. In the context of the global, national, and local environments, a major objective of the CEP was to design and deliver a more future-focused curriculum that is responsive to changing student, employment, and societal needs. The review process was carried out between 2014-2016. This involved an examination of the University of Waikato's distinctive values and culminated in the Curriculum Design Framework (CDF), which currently continues to shape our curriculum and institutional pedagogy. Ideal Graduate Attributes were defined and are the following:

1. Application of discipline-specific and profession-specific knowledge;
2. Application of critical thinking in systematic, innovative, and creative ways;
3. Effective communication and collaboration;
4. Competent in culturally diverse local and global contexts; and
5. Professional and personal integrity.

Three compulsory subjects (referred to as 'papers' at the University of Waikato) were introduced to all undergraduate degrees to support these concepts:

1. Disciplinary foundations paper (100 level – to address Attributes 1,2,3,5),
2. Cultural perspectives paper (100, 200, or 300 level – to address Attributes 2,3,4), and
3. Industry, Employer, and Community Engagement paper, (200 or 300 level – to address Attributes 1,2,3,5) – subsequently renamed as a Work-Integrated Learning (WIL) paper.

To support the implementation of WIL across the undergraduate curriculum, the WIL Working Group was established in 2016, chaired by the Deputy Vice-Chancellor Academic and included the Pro-Vice Chancellor Teaching and Learning along with key WIL research and academic staff and administrative leaders from key areas (e.g., external engagement, health & safety, Careers, etc.) to provide advice and recommendations to Executive and Senior Leadership Teams. Strategic decisions were made over the following years on the nomenclature (adopting the term Work-Integrated Learning), what characterises WIL at Waikato, the 'types' of WIL offered (work-related projects or work placements), and a WIL paper template with specific criteria and learning outcomes. The institutional model the university would implement was also selected.

## WORK-INTEGRATED LEARNING: INSTITUTIONAL MODELS

An investigative approach was undertaken to explore various models already in place in educational institutes around the world with established institutional-wide WIL programmes (Arsenault & Johnston, 2016). Expert staff from these institutes were hosted to discuss merits of each model, including a highly centralised model (as that of the University of Waterloo, Canada), a hybrid model with mostly faculty-based work-placement units supported by semi-centralised units (as that of the University of Toronto, Canada), and an embedded model (as that of Curtin University, Australia). An overview of the different institutional models is presented in Table 1.

The successful implementation of WIL programmes must incorporate the following aspects:

- *Academic*; design of paper, including learning outcomes, assessment schedule and taught aspects of the paper, including student preparedness, supervision, and grading
- *Administration/Coordination*; including from the use of a Student Placement Package (or alternative), centralised reporting, workflow management, communication between academic staff and students, resource development (forms, guides, process, etc)
- *Organisation Relationship Management*; scouting for new opportunities, managing existing relationships, coordinated communication with external partners, ensuring risk profiling and agreements are in place, communication.

## OPERATIONALISATION OF THE HYBRID MODEL AT THE UNIVERSITY OF WAIKATO

### *University Organisational Structure*

The organisational structure at the University of Waikato separates the central administrative structure from the academic structure, where the Schools are responsible of the delivery of the academic content and conducting the assessment of the student learning. The Schools were clustered into eight Faculties (hence the term Faculty is used in this paper) and, as of 2019, the eight Faculties were disestablished, with the Schools being reorganised into four Divisions.

### *Work-Integrated Learning Paper Development*

WIL papers were developed or, if needed, modified in each School, to fit with an institutional-wide WIL Criteria Template. This template required the developer to consider the proposed external partners, expected outputs and assessments, and what student preparation measures would be implemented. The Curriculum Committee (a pan-university panel) approved the proposed WIL papers or provided suggestions for improvement.

### *Staff Resourcing*

While some Schools were already resourced (e.g., the Coop Unit in the Faculty of Science and Engineering, the Professional Experience Team in the Faculty of Education), other Schools created new administration roles or rebranded staff titles and change position descriptions to incorporate WIL.

*TABLE 1: An outline of the range of tasks and roles that are, or could, be included in the three studied institutional models.*

| Role | Embedded | Hybrid | Centralised |
|---|---|---|---|
| ***Administration Tasks*** | | | |
| Student advice, information, enrolment into paper | Faculties | Faculties | Central |
| Manage WIL activities in Student WIL Platform (or equivalent) | Faculties | Faculties | Central |
| Pastoral care of WIL Students | Faculties | Faculties | Central |
| Resource development (WIL processes and procedures, agreements, forms, guides, etc) | Faculties | Central | Central |
| Report on WIL activity | Faculties | Central | Central |
| Overseeing and supporting the Student WIL Platform | Central | Central | Central |
| ***Academic Tasks*** | | | |
| Design of WIL paper | Faculties | Faculties | Central and/or Faculties |
| Convene and delivery of WIL paper, including Learning Management System, face-to-face and online aspects | Faculties | Faculties | Central and/or Faculties |
| Student preparation for WIL activities | Faculties | Central and/or Faculties | Central |
| Ensure WIL activity meets learning outcomes | Faculties | Faculties | Central |
| Delegate academic supervision | Faculties | Faculties | Central |
| WIL paper assessment and grading | Faculties | Faculties | Central |
| Enabling and supporting best practice of WIL | Faculties | Central | Central |
| Academic audit | Central | Central | Central |
| ***Partner Organisation Relationship Management*** | | | |
| Develop new relationships | Faculties | Central and Faculties | Central |
| Manage existing relationships | Faculties | Central and/or Faculties | Central |
| Ensure risk profiling and agreements are in place | Faculties | Central and/or Faculties | Central |
| Placement visits | Faculties | Faculties | Central |
| Communication | Faculties | Central and/or Faculties | Central |

*Establishment of the Work-Integrated Learning Central Unit*

A central unit located within the Office of the Vice-Chancellor was established, initially resourced with a Manager and an Administrator. The unit's role is to support the functions of academic and administrative WIL staff, students, and partner organisations to ensure safe, professional, legal, and ethical WIL activities. Activities the WIL Central Unit are responsible for include: advising on WIL paper development, implementing and facilitating a Staff Community of Practice, holding annual WIL Symposiums, developing an online WIL Guide for students, and creating a WIL Handbook for students and partner organisations. The WIL Central Unit continues work on institutional risk and ethical practice, including risk profiling of workplaces, agreement forms for partner organisations, developing

a low risk human research ethics approval process for WIL activities. The WIL Central Unit also undertakes projects to enable good practice of WIL, including facilitating relationship management with partner organisations and the tracking of relationships centrally, implementing and maintaining a student WIL platform (SONIA, branded as MyWIL at Waikato) that is now embedded university-wide, and developing and facilitating a university-wide, multi-disciplinary WIL project programme (The Impact Lab) where projects are selected based on their impact on our environment, economy, or society (aligning with the UN Sustainability Goals).

## CHALLENGES

*Resource Requirements*

It is widely recognised that WIL Programmes require more resourcing (Bilgin et al., 2017; Rowe & Zegwaard, 2017; Winchester-Seeto et al., 2016), which has been a challenge for Faculty to overcome. This challenge has meant some Schools preferred the less resource-demanding project-based WIL in favour of work placements. Events such as the Staff Community of Practice (coffee forums) have been important with enabling discussion of creative and workload-efficient approaches to assessment in WIL amongst WIL practitioners. .

*Relationship Management*

With WIL being implemented throughout the undergraduate curriculum, there are now 'new' external relationships being developed by staff not previously involved with WIL. This raises the challenge of who now 'owns' these relationships and who manages these. This information is stored and shared with others through the use of a Client Relationship Management (CRM) platform. The active use of the CRM allows WIL practitioners to see if there are established relationships between the external stakeholder and the university, and who is managing this relationship. Having this information transparent is important as it allows for a coordinated approach to external relationship building and prevents multiple people from the university approaching the same external stakeholder for similar reasons. However, it is important that all WIL practitioners use the CRM and upload their external relationship contact details in order for this approach to be successful.

*Risk-Profiling and Work-Integrated Learning Agreements*

Risk literacy of WIL staff is fundamentally important for ensure safe practice of WIL (Cameron, 2017, 2019). It is important that staff who, are expected to undertake risk profiling of an organisation, are sufficiently trained, competent, and confident (Cameron & Orrell, 2022). Support and training has been provided from an internal Health and Safety team, and the WIL Central Unit is also providing support, especially in regards to setting up agreements with already established WIL partners. A challenging aspect has been arranging agreements with already established partner organisations who had not previously been asked to have an agreement in place for student placements and, therefore, were reluctant to engage with the agreement process. This challenge can be overcome with careful discussion around the purpose of clarifying expectations for everyone's interest and keeping the agreement form simple and user-friendly.

## SUCCESSES

*All Undergraduate Degrees with at least one Work-Integrated Learning Paper*

The CDF took effect in 2018, where every student first enrolled in 2018 will be required to complete at least one WIL paper before graduating. Most WIL papers are offered in the third year of study, meaning that the first cohort of students requiring to complete the first compulsory WIL papers was in 2020. The subsequent 2020 COVID-19 pandemic and lockdown caused significant disruption to WIL activities internationally (Dean & Campbell, 2022; Kay et al., 2022; Zegwaard et al., 2022), and presented a phenomenal challenge to the WIL requirement at Waikato. However, through creative and flexible repositioning of WIL activities, all effected students had the opportunity to complete WIL. A number of students chose to defer the WIL paper as they had the opportunity to do so, and if the student selected to do so, the university supported them.

*Support of Executive Team to Drive Change*

The University of Waikato began with the bold vision of all students experiencing WIL as a way of enhancing employability outcomes and achieving the graduate attributes set within the new CDF. Compulsory WIL across the undergraduate curriculum can only be achieved with full support and resourcing from the Executive Leader Team (Dean et al., 2022; Rowe et al., 2022; Sachs et al., 2017). Key to the success of WIL at Waikato has been the unwavering support from Executive Leadership, including supporting the procurement of the MyWIL platform. The support of Executive Leadership Team also allowed for the centralised development of a consistent and coordinated approach to the developing the process for administering, resourcing, delivery, and tracking of WIL across the institution rather than a piecemeal approach leading to different practice between the schools.

*Student Work-Integrated Learning Platform*

The implementation of the MyWIL platform has been important in managing work flow and track of students as part of WIL (Bayerlein et al., 2022). Technological solutions to managing workflow associated with student learning and enabling student learning remotely is a developing space within WIL (Hay & Dale, 2014; Rowe & Zegwaard, 2017; Zegwaard & Rowe, 2019). The MyWIL platform allows for centralised tracking of the location of student WIL projects/placements that reduces the institutional risk exposure caused by unforeseen events such as natural disasters, terrorist activities, and pandemic events. When such events occur, central can quickly identify which students are likely to be near the event and communicate directly with them through email, phone, or social media to ensure their safety and provide instructions if needed. The MyWIL platform also allows for efficiencies for managing workflow associated with WIL, reducing the administrative burden of WIL and freeing up WIL practitioners time to build relationships with external stakeholders. MyWIL also allows of archiving of past WIL activity locations and external partners, and can link with the CRM.

## CONCLUSION

The development of institution-wide WIL has been a process that started in 2014 (seven years ago) and has been, and continues to be, a significant institutional undertaking. Crucial to the success of introducing institutional-wide WIL has been the Executive Leadership-driven curriculum review process, which engaged all academic staff, and embedding WIL into the new curriculum design framework. Fundamental to the successful implementation of WIL is the ongoing support from

Executive Leadership, the appropriate resourcing of WIL activities within the Schools, the development of a WIL Central Unit to support WIL staff in the Schools, and develop central resources around process, forms, agreements, and risk. The centralised introduction of the student WIL platform (Sonia, MyWIL) is important in efficiently managing workflow and resources, as well as recognising and reducing institutional risk . It is important to note that institutional-wide good practice of WIL is an ongoing process requiring continual development and (re)review (Campbell et al., 2019), especially in the first few years of introduction.

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# Graduate mechanical engineering perceptions on the value of learning from work placements and engineering projects

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The current education system of New Zealand gives importance to both practical and theoretical learning and training, that is, to gain knowledge and skills via classroom learning, work placements, internships, apprenticeships, and such like (Murrihy, 2017). Innovative teaching and learning approaches are utilized in the education structures of many developed countries including New Zealand, which makes the educational degree, knowledge, and skill globally recognisable and valid (Education New Zealand, 2017). New Zealand universities focus on practical, hands-on teaching-learning approach, through various versions of work-integrated learning (WIL), such as work-placements, internships, and apprenticeships, and through problem-based learning (PBL) like engineering projects being undertaken in universities (Education New Zealand, 2017). These provide additional source of knowledge and skill development in addition to classroom learning. WIL refers to on-campus learning applied through work experiences (on/off-campus learning) that relates theory with practice in academic learning curriculums (Drysdale, McBeath, Johansson, Dressler, & Zaitseva, 2016).

It provides learning through practice or learning by experience, in a real-world environment, through undertaking work placements (Stirling, Kerr, Banwell, MacPherson, & Heron, 2018). PBL is an organized educational approach that involves students in learning knowledge and skills/competencies through a prolonged analysis around complex, carefully designed authentic questions, products or tasks, followed by its resolution (Hitt, 2010; Pearlman, 2010). In PBL, the main emphasis is given to self-directed learning, research and practice through solving a problem (Hitt, 2010). Learning through the act of discovery as students examine the problem, study its background, analyses possible solutions, develop a solution, and then presents ideas to with others (Delisle, 1997). Thus, both WIL and PBL, have positive influences that can enhance students' learning, knowledge and skill development. However, knowledge and skills acquired by each of these approaches might be different, and accordingly, impact of WIL on the students might be different to that of PBL's impact on students. The research here explores the linkages between WIL and PBL in engineering education through the views of graduate mechanical engineers. The research reported here is a part of a larger project investigating WIL and PBL in engineering education.

## METHOD

Detailed insight was explored by using mixed method research design, comprising both quantitative and qualitative research methods. The methodology design was such that, in order to get an overview or brief knowledge, quantitative data collection was planned first, followed by qualitative data

collection in order to get detailed explanation of the findings from the quantitative data. Surveys were used to collect quantitative data (n=63), and interviews were used to collect qualitative data (n=3).

The participants were the alumni from the Bachelor of Engineering with Honours from the School of Engineering at the University of Waikato. The survey data was subject to descriptive analysis followed by inferential analysis. The interview data was subject to thematic analysis using NVivo software, which involved generating initial codes, followed by creating and reviewing themes. The study was granted ethics approval from the university's ethics committee (FEDU065/18).

## RESULTS AND DISCUSSION

The participants (Mechanical Engineering graduates) indicated enthusiasm for taking part in the research study, in order to give back something to the university and industry. The main themes that emerged from the data are:

1. Engineering knowledge and skill development
2. Quantity of projects, and
3. Quality of work placement.

The first theme "engineering knowledge and skill development" centres around WIL and PBL. Most of the graduate participants reported that engineering projects were more involved in deepening their engineering knowledge than work placements. As the projects were directly and explicitly linked to classroom taught engineering theories and concepts, providing them practical understanding of the engineering knowledge, and created linkage between engineering knowledge and practical knowledge:

> The engineering projects helped more in obtaining deep engineering knowledge since the project were purely established based on what have been taught. (GS.2)

Engineering projects also helped them to polish their core engineering skills, that is, problem solving, critical thinking, research, analysis, etc. They were provided problems in the form of projects for which engineering concepts, simulations, model prototype were needed in order to solve the problem posed project and helped them to sharpen their core engineering skills. One of the interview questions "Which approach (project or work placement) had maximum impact on their engineering education", to which the graduate participant's response recorded was:

> I would say it would been the practical projects, because it really challenges you, depending on the problem which challenges you to think critically and evaluate how to solve a problem in a more inventive and more inventive way and sort of try and think outside the box when problem solving. (GS.1)

The engineering projects were developed using the engineering curriculum; therefore, projects were directly linked to engineering theories/concepts and, consequently, helped students to enhance corresponding practical knowledge related to respective engineering theorem/concept:

> These projects convert taught engineering theories into practical engineering work. For example, steam engine project that I did involve much practical work including operating machines (lathe, milling, drilling, etc.), hand working using tools. (GS.3)

The second theme "quantity of projects" relates to graduate participants' response to the quantity of PBL within their courses. Participants felt more engineering projects should be included into the engineering curriculum, because projects gave them more understanding of the classroom learnt engineering concepts, and gave them challenges that were of problems, and enhances skills such as problem solving, critical thinking etc. Thus, they felt engineering projects helped to establish linkage between engineering knowledge and its practical applications:

> Yes, more projects will be good, but not large scale projects, but sort of smallish one because it applies the skills that you have learnt in the paper, going like this is how you apply your skills to solve this problem. I almost think, as that is better than sitting in exam, because it is a real-world way of applying your knowledge and getting you to think about a solution and solving a problem. (GS.1)

Apart from the benefits of practical projects, the graduate participants also expressed benefits of undertaking work placements. While they studied at university, they recognized that they lacked aspects of fundamental knowledge, which was mostly around ISO (International Organization for Standardisation) standards towards technical drawing using CAD (Computer Aided Design) software. They gained much knowledge of this process while on their work placement, as work placements provided them real-world to work relevance to their theoretical understanding. One of the graduate participants stated this:

> Work placements give you more of a real-world application, so you can do all sorts of practical stuffs. When you are in the University environment, you will be marked on based on the particular criteria, while in work placements, you are working almost like in a chain, and so having other people to talk, if you have any trouble or doubts, so having that sort of things. In addition, it also gives you experience in those environments; how does an engineering team work together to solve a problem. How they sort of organisations work in problem solving the engineering problems, something like that stuff the university might not be able to teach us. (GS.1)

This indicates that work placements helped the engineering students gain more practical knowledge compared to the university studies and helped them understand more about workplace practices and work culture. In addition, it helped them to develop team working skills, communication skills, and practical hands-on experiences. However, in regard to engineering projects, graduates reacted more positively. They said that engineering projects provided them with more challenges, authentic problems to work on, and more hands-on experiences. The project works were directly and transparently linked to the engineering syllabus, and, thus, created a direct connection between the engineering theoretical knowledge and practical real-world applications than work placements. Projects helped students to encourage critical thinking, researching skills, problem analysis, problem solving, team working skills, and hands-on experiences.

Two graduates suggested that they would have liked more engineering projects than work placements in university's engineering curriculum, as they perceived greater understanding of theory and skills development while immersed in their projects. However, they added that doing work placements also helped them to build their work experiences for their CV, thus they would have liked work placements for giving them a point-of-difference from their peers and enhance their employment prospects:

> I would probably go for Work Placement, just because it looks good on your CV, saying you had worked for this engineering firm, etc. It indirectly says that you had an exposure of workplace environment, and thus knows about the work practices and work culture. And so, after you have left the University, you had gone to your first full-time job, your University grades and everything else don't matter at all after that point. So, having experience in work is more useful n the long term. (GS.2)

The third theme "quality of work placement" relates to graduate participants' desire of having work placement that challenges their engineering knowledge further. That is, the participants thought work placements should have a greater focus on the learning experiences, where it integrates both theoretical and practical knowledge. By experiencing the workplace, the students should be able to relate their classroom learnt theories with the real-world applications at the workplace, and able to enhance their practical knowledge and skill development. The work placement should bring more learning practice, where the students can relate the engineering concepts/theories with their practical real-world applications, and should provide students maximum exposure "my work placements did not provide much practical knowledge learning, as it did not do much into learning practices. (GS.2)".

Graduates believed engineering projects were more relevant to engineering theories and concepts than work placements, because projects were more directly and transparently linked to engineering knowledge. Most work placements were not transparently linked to engineering knowledge as taught in the classroom, so could not establish the link between the classroom theories and real-world applications in workplaces. This finding is contradictory with the WIL literature, because most of the research around WIL indicates that work placements help students to understand the classroom learnt theories, link it with their real-life applications available at workplace, and accordingly enhances their practical knowledge. In this research, most of the graduate participants reported that they were having to do some office tasks and were not doing hands-on technical tasks all the time. Also, they felt they were repeating the same tasks during their work placement. Students indicated that they would have preferred a greater diversity of work to gain wider understanding of the work placement. Students indicated that they were not able to link the workplace applications to the classroom learnt theories, which likely was caused by their perceptions of the relationships between their tasks and engineering theory. Most of the work placements do not practice all of the engineering theories, and so students felt they could not establish that linkage between classroom learnt theories and workplace real-world applications. Whereas in engineering projects, they were more theoretically specific, directly and transparently related, thus, it helped them in enhancing their engineering knowledge and skills when compared to work placements.

## CONCLUSION

The findings from this research show that there are ongoing benefits of WIL (work placements) and problem-based learning (engineering projects) in engineering education in New Zealand. The benefits included development of engineering knowledge, practical knowledge (hands-on experiences), development of various technical and non-technical skills, etc. Many graduates found both WIL and PBL approaches are useful and helpful, however, their primary interest was for engineering projects more than work placements because, as engineering projects were more directly and transparently linked to the engineering knowledge, more challenging, encouraged critical thinking, researching skills,

problem analysis, problem-solving skills, practical knowledge, and hands-on experiences. The research showed that students perceived that engineering projects developed students' engineering knowledge and skills and provided benefits for career progression. In addition, work placements do help them to develop some technical and non-technical skills, but students felt that they struggled to link the workplace practice with their discipline specific engineering knowledge, and thus failed to establish link between the engineering theory and practical applications. Graduates suggest that the work placements should be more related to engineering knowledge and syllabus (more closely linked to classroom studies), and should unpack much of their engineering theories, so that it can help students to understand the engineering knowledge by working under its real-world application. Thus, it would be useful to structure a learning exercise that help link classroom knowledge to the workplace practice on engineering. Thus, such a framework should integrate work placements better with the engineering curriculum in university whilst compliment the learning through projects.

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# Mechanical engineering students' perceptions on key graduate attributes before and after work-integrated learning

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The developing modern knowledge, advancing technical competences, high productivity and amplified global progress requires an intellectual, driven and skilled work force (Ferns, Campbell, & Zegwaard, 2014). To incorporate these 21st century demands in engineering field, the present engineering education system should provide both theoretical and practical knowledge, and training, for modern world requirements (Borikov et al., 2016; Kozinski & Evans, 2017). Engineering education in New Zealand is of high quality, where learning happens in practical, hands-on teaching environment (Boniface, 2018; Education New Zealand, 2017). The New Zealand engineering curriculum is designed to incorporate several study-practice approaches to enhance students' knowledge and skill development, and enable them to be creative engineers by encouraging them to practice engineering trainings (Boniface, 2018; Education New Zealand, 2017; Higher Education, 2018).

Among several teaching and learning approaches, Work-Integrated Learning (WIL) is a prominent where students experience hands-on workplace environment, providing additional source of knowledge and skill development (Boniface, 2018; New Zealand Education, 2018). WIL is an internationally acknowledged andragogical approach, where students are exposed to authentic learning experiences through work placements, internships etc., in order to apply theoretical concepts to practice-based tasks, ultimately enhancing graduate employability (Ferns et al., 2014; Nuninger & Châtelet, 2011).

Deploying engineering knowledge and skills together develops the graduate attributes/qualities. WIL has the potential to do this. It also assists graduates to familiarize with the work environment and build up self-confidence (Martin & Hughes, 2009). This research here explores mechanical engineering students' perceptions on key graduate qualities for their profession, before and after work placements. The research reported here is a part of a larger project investigating WIL and problem-based learning (PBL) in engineering education.

## METHOD

A mixed method research approach was used. Quantitative data collection occurred first, followed by qualitative data to obtain detailed understanding of the findings from the quantitative data. This approach is known as explanatory sequential mixed methods (ESMM), as the researcher collects data from quantitative and qualitative information sequentially in two different phases (Creswell, 2012). This ESMM method was applied twice on students, before and after their work placements. Surveys were used as quantitative method (n = 36), and interviews, observations, and document analysis as qualitative methods (n = 5).

The participants were the students from the School of Engineering at the University of Waikato, majoring in Mechanical engineering, who were interviewed about their views of future placements and actual placement experiences. The survey data was subject to descriptive analysis followed by inferential analysis. The interview data was subject to thematic analysis using NVivo software, which involved generating initial codes, followed by creating and reviewing themes. The study was granted ethics approval from this university's ethics committee (FEDU065/18).

## RESULTS AND DISCUSSION

The participants in this research study came up with variety of responses, which helped to build the following themes from the data:

1. Engineering knowledge and skill development
2. Lifelong skills (also known as soft or generic)
3. Familiarization with workplace environment

These themes are ranked based on the outcomes provided by the participants' perceptions. The first theme "Engineering knowledge and skill development" centres around work placements. Most participants reported that work placements helped them to understand engineering theories and concepts by working in their real-life applications. It is exemplified by the quote below:

> The work placement increases my engineering knowledge by taking fundamental engineering concepts that had been taught in university, and adding a real-world comparison solidifying the base knowledge, and applying a visual and practical sense to my concepts. (PS.1)

The participants stated that they were able to apply their engineering concepts to the real-world applications at their workplaces:

> Work placement gives student the fundamental engineering knowledge, which is enough for further self-learning within an engineering project in university and provides opportunity for student to use knowledge and experiences from both classroom learning and projects in the actual work situations. (PS.2)

Students also learned a range of skills differentiated as engineering technical skills. The engineering technical skills the students felt they has gained included computer aided drawing (CAD) drawings, welding, assembly, critical thinking and problem solving.

> I understood importance of CAD 3D drawing, laser cutting, clearances, bearings, lubricants, mechanical failure, adding gaskets to block out air and especially how to handle workplace tools. (PS. 3)

The second theme "Lifelong skills" centre around different skills the participants learnt during their work placement. Participants felt that while working in an engineering surrounding/work placement, they enhanced skills like communication skills, project management, time management, professional ethics etc. This was additional to the engineering technical skills and practice learned during their work placement.

> Working in work placements helped to enhance communication skills, problem solving skills, critical thinking, time and project management, and gave me more idea about how to work in a

workplace and familiarized me with the engineering practice that happens in an engineering workplace. (PS. 1)

The third theme "Familiarization with workplace environment" is the theme that appeared to be most significant for the students. Work placements gave them an experience about how work is undertaken in an engineering firm, how to tackle challenges while working, gave them ideas about the complexity of engineering practice. Participants stated that they felt confident enough for their future work placements/workplace as they had gained knowledge of workplace practices, professional ethics, communication skills and management skills (time and project):

> All the things that I had learnt from my 2nd year's work placement made my 3rd year's work placement learning much easier, which gave me the understanding of what I am required from my employer. (PS.3)

Participants shared their expectations regarding work placements before undertaking them. Most of the responses suggested gaining work experience and gaining ideas about how to work in an engineering workplace were their expectations from work placements.

> From work placements, I just wanted to get work experiences, which was the main thing for me. And apply some of the stuff that I have learned in university to actual engineering workplace. (PS.2)

In summary, they wanted in-depth knowledge of work experience and practices, and engineering knowledge. They reported learning additional skills, other than just those technical in nature:

> I applied some of the stuff that I had learned from the university in my engineering workplace. And I also learned couple of things that helps me in my paper that I am doing now in university, which is related to design of machines, tolerances, and shaft specifications. And obviously working to a tight schedule made me stick to my plans, and enhanced my management, planning and organizing skills. (PS.2)

It is evident from the responses that work placements did help them to gain knowledge regarding handling technical tools like 3D CAD drawing and design process. There were some participants who had experiences of two work placements. The extracts below indicate how two work placements helped them:

> Being in the same workplace for my 1st and 2nd work placement, I got familiarized with the teamwork culture, and developed good relationship, and accordingly enhanced communication skills, knowledge related to fluid mechanics, 3D printing, laser cutting, MS Excel and designing skills. (PS.4)

These responses show that when undertaking two work placement participants gained a lot in terms of specific engineering knowledge, core technical skills and life-long learning skills. As each work placement was different, and related to different applications, not all of them worked on same engineering principles, and so each work placement gave them different specific engineering knowledge. It seems like with placements variety across different engineering applications, students may get more specific engineering knowledge, and thus it may help them to transfer that engineering knowledge to their engineering discipline. This is exemplified by one of the interviewees below.

> The work placement isn't going to cram you with that much information in that short amount of time, and university does work placement as more kind of testing the combination of everything like theory and practice, and test whether you retain that knowledge. (PS.4)

Work placements are specific in their applications, and provide specific engineering knowledge, or limited engineering knowledge. Apart from limited engineering knowledge, participants shared that they learnt many skills related to designing, fabrication and manufacturing, as well as lifelong skills:

> Work placement learning included very specific engineering knowledge, related to respective engineering firm/applications. So, not all knowledge from work placement is transferrable to engineering discipline. (PS.1)

These responses indicate that what the participants had expected to learn from their work placements, and what they had actually learnt from their work placements. Based on the collected data, it can be perceived that the participants obtained much more than their expectations. As work placements vary in nature, thus participants developed different specific engineering concepts, and engineering knowledge, limited for some participants and specific in-depth for others. If given opportunity to work in a range of different work placements working on different engineering concepts it would assist deepening their classroom learnt engineering knowledge. Apart from technical skills like designing, fabrication and manufacturing, participants felt the importance of proper skills to communicate professionally within a team/company, effective planning and organizing skills were gained as well as how to tackle problems thus enhancing their problem-solving skills. The participants also expressed that they considered work placements as a crucial part, because they believed that doing work placements will give them the opportunity to add more work experiences in their CV, and thus help them to stand out of the crowd. They believe that having more work placement experiences will help them to make their CV look stronger and attractive.

## CONCLUSION

The findings from this research shows that what are the expectations of students before work placements, and what are their actual outcomes from the work placements. The data states that most participants expected to gain work experience, so that they can add that to their CV, and enhance their chances of future employment chances. Apart from work experience, they also expected to learn more engineering knowledge, relate theory with practical applications, and enhance technical skills. After their work placements, they had different outcomes, like, firstly, the work placements cannot provide them with all the knowledge, as they work on specific engineering fields and applications. Thus, they can get specific engineering knowledge from that work placement which employs specific engineering concept/theory. Secondly, apart from enhancing their technical skills like 3D CAD drawing, designing, fabrication, laser cutting, problem-solving etc., they also enhanced some life-long generic skills. These life-long generic skills include communication skills, time management, project management, self-learning etc. Thirdly, work placements helped them to realize their future employment chances in their respective field of engineering study and gave them idea about different workplace options that they can look for to enhance specific engineering knowledge/theories/concepts. Based on this findings, it can be concluded that work placements gave the students more than from just work experience, and gave them insight that not all engineering knowledge they can get from a work placement, since each works on different specific engineering concept. Thus, it might be helpful for students if they are able to work

in different engineering work placements, so that they can maximise knowledge transfer to their respective engineering discipline.

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# Wash, soak, rinse, spin: Adaptivity and evolution in a work-integrated learning programme

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Work-Integrated Learning (WIL) is considered by many to be a central component of tertiary education that has the capacity to empower graduates with comprehensive skill sets needed by employers and industry (e.g., Coll et al., 2009; Coll & Zegwaard, 2006). However, the term WIL is a complex concept to articulate, and therefore case studies, such as that presented here, are required to develop best practices. We believe it is crucial that WIL programmes across a range of varied subject areas present in modern tertiary education critically review their offerings to ensure the experience is valuable for students and their future employers.

There are numerous models for implementing WIL programmes (Kay et al., 2019). Rowe et al. (2012) outline a typology of the types of WIL and levels of engagement in the workplace or community that are common. Their model highlights the complexity of a single definition for WIL and acknowledges the complex nature of the numerous variables that contribute to meaningful WIL experiences. Similarly, Kay et al. (2019) report insights into emerging models of WIL that they believe are important given the changing nature of work and workplaces. Perhaps the key takeaway of the WIL literature presently is that these models need to be adaptable and relevant to students and the needs of their industry and community partners (e.g., Khampirat & Bandaranaike, 2019).

As is argued by many researchers (e.g., Holt et al., 2004, Kay et al., 2019, Khampirat & Bandaranaike, 2019) we believe that successful WIL is one that ensures experiential learning while providing students spaces to develop relevant industry skills and knowledge before completion of their qualification. We use the remainder of this paper to describe the insights for WIL from a course that has run for approximately 15 years as part of the Bachelor of Design (BDes) programme at the University of Waikato. This WIL course has adapted over those 15 years to the changing needs of the students, degree, community, and industry and we case study here the evolution of our WIL offering and the challenges that motivated those changes.

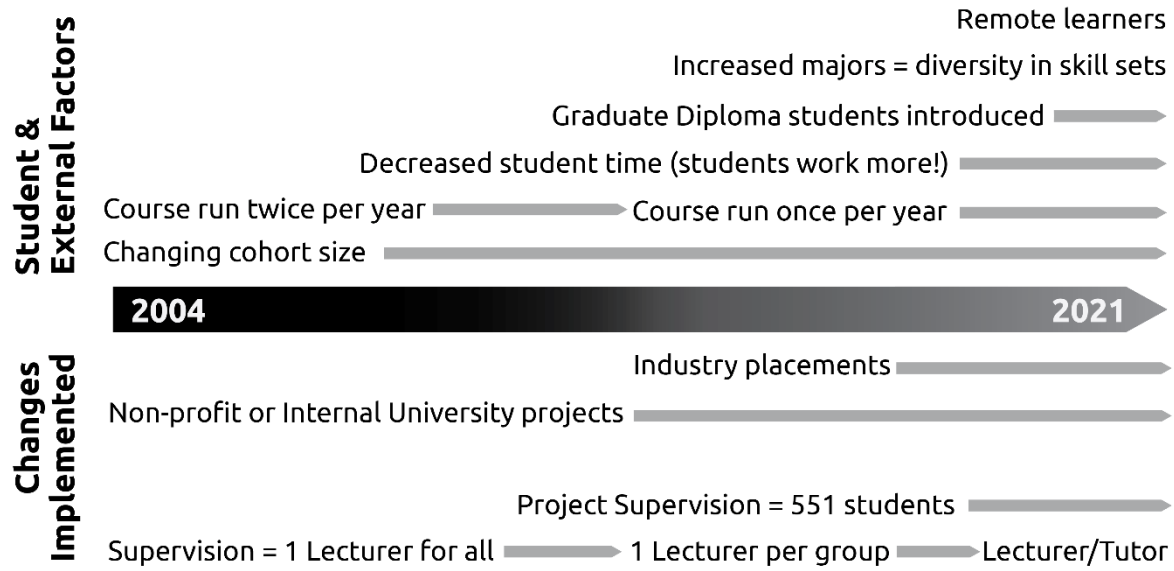
## THE UNIVERSITY OF WAIKATO DESIGN WORK-INTEGRATED LEARNING EXPERIENCE

Assisting students with developing professional practice skills through classroom-based activities as well as internship opportunities has long been a core component of design education (Shin et al., 2013), and has been a core component of the Design qualifications at the University of Waikato since its inception. Bachelor of Design students undertake their internship in the first semester of their third year. This is a 15 point course undertaken as part of a total of 120 points during a full year. Students are expected to spend 80 to 100 hours unpaid, over the course of the semester on the design practice for their internship which is supported by a lecture series and reflective assessment items. During the history of the internship programme, the Department of Design has engaged industry stakeholders in a variety of ways. The stakeholders have always been integral to the success of our internship

programme with the goal being not to compete with the local design industry but to support them as well as local not-for-profit organisations and internal university clients.

Over the years adaptivity and evolution of the delivery model for this course has been necessary to meet the changing needs of different stakeholders. When the course began in 2004 it used an in-studio model whereby groups of students worked collaboratively on not-for-profit projects supervised by academic staff. This has evolved over the years to a model where students increasingly complete the requirements for the course at industry-based placements. The changing delivery model of the WIL component of the degree has needed to adapt and evolve as it attempts to find the optimal model that best meets the changing needs of all those involved. The changes in focus and scope of the WIL course are visualised in Figure 1, where both student and external factors are shown as well as the changes implemented in the WIL course.

*FIGURE 1: Summary timeline of the student and external factors influencing change*




As illustrated in the top of Figure 1, the students enrolled, the structure of the qualification, and the creative industry in which the degree is situated has changed. Increasingly in recent years, we have seen that the nature of students' expectations and attitudes toward their education has shifted. Students are increasingly working more in paid work outside of their University study meaning that the number of hours they are available per week is reduced and the number of students working remotely has also increased. This has resulted in the internship programme needing to be more flexible and provide a greater range of placement offerings, including work from home placements or placements in cities other than Hamilton.

In the early stages of the qualification, the WIL course ran twice a year which allowed for projects and industry collaborations that occurred at different times in the year and also required a smaller number of projects at any one time. Various factors have resulted in the course only being offered in the first semester of a given year that provides some more limited flexibility in comparison to a course offered twice yearly.

The degree has also evolved with the introduction of four different majors within the BDes (Communication Design, Industrial Design, Interface Design and Media Design), giving a need for more

diverse project types and stakeholders to collaborate with. The changes to the degree have meant that the skills that students enter the internship programme with has changed. Similarly, the introduction of students undertaking a Graduate Diploma in Design (students with an undergraduate qualification outside of the design or the creative industries) has resulted in the need to provide WIL opportunities for students with more limited design experience. Given these changes within the qualification, the unique skill set that each student can provide to placement or in-studio projects has broadened, resulting in increased complexity when matching and managing placement allocation. A more diverse range of placements and internal projects is now required due to the broader range of student specialisation.

Over the course of 15 years, it is unsurprising that the many course convenors, and academic and industry mentors have contributed to and shaped the course. The model for running the course has had many incarnations with differing levels of input from a range of mentorship models for the students to achieve the best they can in the projects they are assigned to. As can be seen in the bottom of Figure 1, in the beginning, the model used for the course was as a mock studio running in an on-campus studio session for a block of 8 hours on a single day. In this studio session, the students met as teams to complete both short and semester-long projects for community-based organisations (internal and external) under the guidance of an academic supervisor (a University of Waikato Design lecturer). Depending on cohort size this has involved single lecturer oversight or oversight from numerous lecturers in the department.

Over the years the model of supervision has changed with the introduction of a graduate-level course on project management so that senior students gain experience supervising and managing undergraduate WIL teams and projects. In this model, the lecturer focuses more on supporting the graduate level students. The inclusion of an in-studio model of support from graduate students as project managers is one tool that has been especially beneficial for accommodating Graduate Diploma students. Project management by a graduate student gaining course credits can often provide more time and individualised support than an industry mentor can, providing a more positive learning experience for the Graduate Diploma student. Most recently the course has evolved to introduce industry-based placements where students complete the practical component of their WIL course off-campus under the guidance of mentors within for-profit as well as not-for-profit organisations.

As we have shown, no single factor or student situation has been a driver for change, but the culmination of these factors at given points in time have inspired change, evolution and growth and that at the University of Waikato, design education has had to adapt the style of washing machine and the powder we use to become more automated and efficient. We are still learning how to press the buttons right. We believe that the changes we have made in relation to these challenges are unique features of our practice.

## DISCUSSION AND CONCLUSIONS

The aim of the internship course has always been to deliver the most effective industry-based learning to design students in a relevant context. In reality, for a creative industries qualification, the goal-posts are constantly changing as we attempt to prepare students for a technology-driven industry that is constantly evolving. The structure and delivery of the internship course has therefore needed to constantly evolve and adapt as the needs of all those involved also changed. The factors that have necessitated the adaptation of the delivery are related predominantly to the changing nature of the

students we cater to as well as external factors of the industry stakeholders that we have supported and who have supported our programme.

The experience over 15 years of WIL delivery has taught that there is a strong need for being adaptable to meet the needs of all students. Having a cohesive, range of options for students with varying strengths is essential. Broadly we believe our experiences show that those delivering WIL courses need to implement course structures that support the ability to be adaptable and foresee ways that the WIL programmes can respond quickly and effectively to the changing needs of all stakeholders. The small case study we present here reinforces the need for WIL courses to be adaptable and relevant to a student cohort and the needs of their industry and community partners.

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