Work-integrated learning in science, technology, engineering and mathematics: Drivers of innovation for students

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Internationally, innovation represents the lifeblood of modern economies. In particular, there is growing recognition of the vital role of Science, Technology, Engineering and Mathematics (STEM) educators in developing students' innovation skills for the jobs of the future. Work-integrated learning (WIL) has emerged as an important pedagogical approach for developing innovation capabilities. This paper is based on a quantitative study that examines the key factors driving innovation in STEM WIL students. The study undertakes a comparative analysis of students by age, gender, degree type, and placement duration. It found that students participating in longer durations of 20 weeks compared to 12 weeks had higher perceived levels of innovation skills. The study shows how feedback on skills can be provided to students and employers, with output from the tool used in this study. Therefore, it has implications for student career literacy, industry outreach and WIL program development.

Keywords: Innovation, STEM, curriculum design, employability, work-integrated learning

Innovation is critically important in creating products and services needed to be internationally competitive in a knowledge based global economy. Many countries have developed national policies to foster innovation including high labor cost countries such as Australia, the United States and European countries as well as emerging economies such as China and India. The *National Innovation and Science Agenda* developed by the Australian Commonwealth Government (2015) has recognized the importance of STEM educators in developing students' innovation skills. This emphasis reflects a global movement that seeks to promote STEM areas as necessary for the jobs of the future. Additionally, innovation skills are increasingly seen as pertinent to not only STEM areas but are viewed as transferable to a broader range of areas. There is growing recognition that innovation skills are necessary in helping young people negotiate the challenges of the future workplace, including automation and the transformation to new industries.

WIL is both beneficial to students and crucial in facilitating innovation. It benefits students in developing industry-relevant skills needed, thereby boosting employability (Billett, 2011; Rowe & Zegwaard, 2017). It enables innovation as it provides an experiential approach in nurturing innovation skills by creating new products and services. The highly immersive industry placement has been deemed more effective compared to traditional approaches applied in entrepreneurship education involving presentations by entrepreneurs, case studies and business planning competitions (Rampersad, 2014).

This study marries two important pillars of WIL and STEM education research, related to employability (Atwood & Pretz, 2016; Billett, 2011; Daly, Mosyjowski & Seifert, 2014). It advances existing employability literature by offering a quantitative perspective and by integrating research conducted on the development of innovation skills. In improving the understanding of innovation and employability of STEM WIL students, the study builds on and extends previous WIL employability research in several ways. Past research have predominantly investigated employability from non-

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STEM student perspectives (Atwood & Pretz, 2016; Jackson, 2013; Mamaril, Usher, Li, Economy, & Kennedy, 2016) or that of university educators (Billett, Bennett, Jollands, Kinash, & Lee., 2014; Jackson & Chapman, 2012) or have generally been based on qualitative research (Daly, et al., 2014; Rampersad & Jarvis, 2012). Furthermore, while some previous research have examined the STEM context, such research has predominantly been qualitative or have not included a focus on innovation. For instance, a commissioned report published by the Office of the Chief Scientist in 2015 on *WIL in STEM disciplines: Employer perspectives* (Atkinson, Misko, & Stanwick, 2015) involved a qualitative study and was useful in providing an overview of employers' motivations, expectations, benefits and barriers to participating in WIL. However, future work is needed on examining innovation and employability skills. Similarly, Bennett, Figueroa, Gardner, and Khan (2015) and Male, Bennett, Figueroa, Gardner, Khan, et al. (2017) have contributed valuable perspectives on gender and self-identity to the engineering profession, but more research is needed to incorporate the important focus on innovation. Moreover, unlike previous studies, the research is longitudinal and measures skill levels before and after the placement to determine the extent to which there has been a change in skill development.

Therefore, the research question of this study is 'What are the key factors influencing the innovation of STEM WIL students'? It will undertake pre-placement and post-placement measurement of innovation skills. Findings of the study are important in (1) offering feedback on career literacy to students on the development of innovation skills; (2) enhancing WIL program development by uncovering areas of skill deficiency which can then be used to inform corrective action in subsequent WIL preparation programs and offer further support to students; and (3) informing industry engagement efforts to STEM WIL hosts through evidence-based communication on the capabilities and benefits of WIL students.

KEY FACTORS DRIVING INNOVATION

Innovation refers to not only idea generation and invention but the full range of activities and processes involved in commercially developing the idea and putting it into use, including technology development, manufacturing, marketing and commercialization (Rampersad 2014; Trott, 2008).

In offering quantitative evidence around the innovation of WIL STEM students, this study built on the quantitative employability survey of Jackson (2013) which broadly represents typical industry skill requirements in new graduates and it encapsulates those defined in Australia's national skills framework. The study adapted and extended measures of innovation skills so that they are applicable in the STEM context. It did so by building on previous qualitative work that confirmed relevant innovation skills in STEM students through WIL (Rampersad 2015; Rampersad & Patel, 2014; Rampersad & Jarvis, 2012). The project extended that qualitative research by developing quantitative measures and contributing a model for developing innovation skills for STEM WIL students. Quantitative measurement is important because it facilitates comparisons and aids in monitoring changes in the skill level through time.

There is much rhetoric and anecdotes on innovation skills needed for the jobs of the future, but there is little empirical evidence substantiating what are the key factors or determinants of such skills. The Foundation of Young Australians produced a report entitled *The new basics: Big data reveals the skills young people need for the New Work Order* where they suggested skills that Australian youths need for jobs of the future for innovation, including problem solving, critical thinking, communication and teamwork (Foundation for Young Australians, 2016). However, these skills are yet to be empirically tested for their impact on innovation. Additionally, within the WIL employability literature, Jackson

(2013) identifies a number of employability skills, common in a range of disciplines, including problem solving, critical thinking, communication, and teamwork. The impact of these skills on innovation have been examined in this study as highlighted in Figure 1 and discussed further in this section.

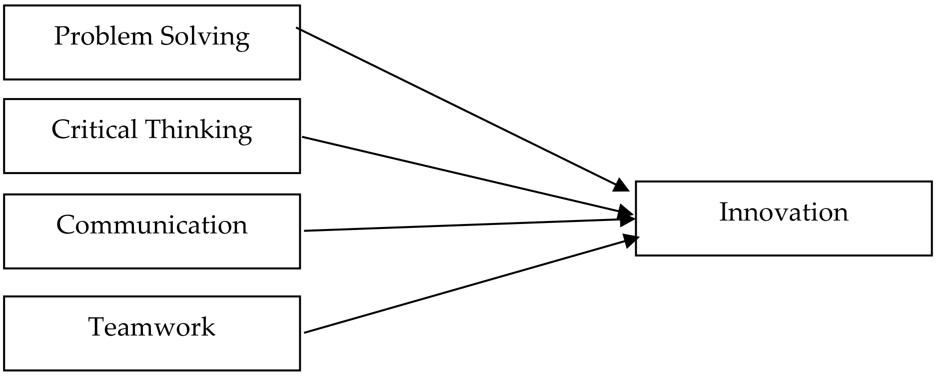

FIGURE 1: Conceptual model for drivers of innovation in STEM WIL students.

Problem Solving

Although there are numerous definitions of problem solving two of the most comprehensive are "an ability to analyze and transform information as a basis for making decisions and progress toward the solution of practical problems" (Hambur et al., 2002, p.2) and "a selection and use of appropriate methods to find solution" (Knight & Yorke, 2004, p.8). According to the Australian Department of Education, Training and Youth Affairs (DETYA, 2000) it is found to be the most important deficient skill seen in Australian graduates, while Australia Industry Group (AIG, 2016) sees it as the most innovative skill rated by Australian employers.

Critical Thinking

Critical thinking is a commonly used term which broadly refers to "logical and analytical reasoning" (Hager & Holland, 2006). It is more explicitly defined as "the capacity for critical, conceptual and reflective thinking in all aspects of intellectual and practical activity" (DETYA, 2000, p. 12). Phillips and Bond (2004) recognize it as the most important aim of higher education, while Braun (2004) and Phillips and Bond (2004) recognize it as a worldwide graduate skill deficiency. Graduate Careers Australia (GCA, 2007) surveyed 271 Australian employers and revealed that critical thinking is the second top selection criteria used in the graduate recruitment process, while DETYA (2000) ranked it the third out of 25 skills and competencies required by Australian employers.

Communication

Communication has emerged as an important factor influencing innovation. It includes "the ability to use language, symbols and text interactively" (Rychen, 2002). Two of the most common forms of human interaction are verbal and written communication, but these do not exclude public speaking and meeting participation (Jackson & Chapman, 2012). Although communication was rated as the second most relevant innovative skill, paradoxically is the most lacking skill within Australian public and private organizations (Messum et al., 2017). It is extremely concerning that communication is ranked the 16th most satisfying skill in recent graduates (William & Davison, 2008). In the WIL context, communication can be a significant issue as language problems, confusing terminology and different frames of reference of understanding around various terms may create challenges between students and WIL hosts (Rounce et al., 2007). Further research is needed to quantitatively evaluate the impact of communication on innovation.

Teamwork

Teamwork refers to the ability to develop and optimize group effort and it can be described as the building of collaborative relationships with customers and colleagues and the ability of negotiate and manage conflicts (Casner-Lotto & Barrington, 2006, p. 16) or simply "the ability to work constructively with others on a task" (Knight & Yorke, 2004, p. 8). Australian employers ranked it the fourth most important soft skill for development of innovation (AIG, 2006). The capacity to form collaborative relationships or effective networks is a fundamental driver of innovation (Rampersad et al., 2010).

METHOD

A quantitative approach was deemed suitable for this study to determine key factors associated with innovation of STEM WIL students. STEM WIL students were asked to complete a questionnaire to comment on their innovation skills and its drivers. STEM students enrolled in the WIL program at a mid-sized university in Australia were recruited for this research. The Australian Council of Deans of Science (ACDS) released 2017 statistics reflecting that fewer than 3% of computing students nationally undertake placements of 12-weeks or more. The program under investigation provides placements of 12-20 weeks (full-time equivalent) and includes engineering (20-week placement) and computing students (12-week placements). Table 1 provides demographic data on respondents.

TABLE 1: Demographic data on respondents.

Age Group	19-21 years	40	36.0
	22-25 years	42	37.8
	26+ years	29	26.1
Gender	Female	11	9.9
	Male	100	90.1
	Other	0	0
Degree type	Information Technology/Computer Science	31	27.9
	Engineering	80	72.1
Placement Duration	450 hours (12 weeks Full-time)	31	27.9
	750 hours (20 weeks Full-time)	80	72.1
Organization Size	Small (1-49 employees)	38	34.2
	Medium (50 – 149 employees)	14	12.6
	Large (150+ employees)	59	53.2

The nature of placements in this program involved project-based-learning in collaboration with industry, whereby students completed a project of value and negotiated with an industry partner. Ethics approval was obtained to conduct the study (ethics ID 7564, approval date February 22, 2017). Data collection occurred at two points. Pre-placement data was collected from April-July 2017. Post-placement data was collected from December 2017 to February 2018. One hundred and eleven students returned both the pre- and post-placement questionnaires which were administered via email and completed online. The questionnaire was based upon and adapted from Jackson (2013) which stemmed from an extensive review of studies on skills requirements in undergraduates (Jackson, 2010) and innovation measures were adapted using conceptualizations of innovation stemming from the literature (Rampersad, 2015; Rampersad & Patel, 2014; Rampersad & Jarvis, 2012). The Appendix A provides a list of the questions that asked students to rate each statement on an 11-point Likert State from strongly agree to strongly disagree. Likert scales were used as they are straightforward and easy to administer while also capturing sufficient nuances in responses (Kinnear et al., 1996). A multi-item scale is also justified over single item measures as it is more reliable and has less measurement error, distinctions can be made among respondents and it combines specific single measures, and thus, reflects more attributes of a construct (Churchill, 1979).

Comparative analysis was then conducted by analyzing the data by age group, gender, degree type, and placement length. Skills analysis was also undertaken to provide feedback to students on their career literacy and also to feedback into WIL program development.

RESULTS

Skills Assessment Feedback to Students

Feedback was provided to each student to demonstrate changes in their perceived skill levels before and after their placements through a spider diagram as shown in Figure 2. They were also provided with a spreadsheet of their raw data pre- and post-placement and asked to complete a reflection on any changes (similar to Table 2). Table 2 shows that on average, students expressed consistent increases in all skill categories. Innovation skills had the highest improvements (including 12% and 13%) This reflects the perceived development of innovation skills through the WIL process.

TABLE 2: Average student self-assessment before and after placement

Factor	Dimension	Before	After	Change
Problem Solving	Reasoning	7.97	8.72	9%
	Analyzing and diagnosing	7.86	8.75	11%
	Decision making	7.61	8.41	10%
Critical Thinking	Conceptualization	7.78	8.63	11%
	Evaluation	7.66	8.41	10%
Communication	Verbal communication	7.90	8.55	8%
	Giving and receiving feedback	7.70	8.46	10%
	Meeting participation	7.61	8.39	10%
	Written communication	7.84	8.43	8%
Teamwork	Task collaboration	8.11	8.77	8%
	Social intelligence	7.91	8.59	9%
	Influencing others	7.20	8.00	11%
	Conflict resolution	7.31	8.08	11%
Innovation	Innovation	7.18	8.14	13%
	Entrepreneurship/ Intrapreneurship	7.11	7.99	12%
	Lateral thinking/ creativity	7.47	8.22	10%

-Placement Comparative Analysis by Group: Feedback into WIL Program Development

A comparative analysis was undertaken by group, namely by gender, age and degree type/ placement duration. Pre-placement and post-placement comparison by gender reflects perceived improvements by both genders in most skill categories. In some categories such as evaluation and social intelligence, females had stronger self-perceptions while in other categories such as conflict resolution and task collaboration, males rated themselves higher. Overall, the differences in gender self-assessment were marginal. See Table 3 for further details.

TABLE 3: Comparative data by gender of average scores before and after placement

Factor	**Dimension**	Female before	Female after	Male before	Male after
Problem Solving	Reasoning	7.91	8.64	7.98	8.73
	Analyzing and diagnosing	8.18	8.36	7.83	8.79
	Decision making	7.55	8.36	7.62	8.41
Critical Thinking	Conceptualization	8.00	8.27	7.76	8.67
	Evaluation	8.00	8.64	7.62	8.39
Communication	Verbal communication	8.00	8.27	7.89	8.58
	Giving and receiving feedback	7.64	8.27	7.71	8.48
	Meeting participation	7.55	8.36	7.62	8.39
	Written communication	8.73	8.55	7.74	8.42
Teamwork	Task collaboration	8.00	8.64	8.12	8.78
	Social intelligence	8.27	9.09	7.87	8.56
	Influencing others	6.73	7.64	7.25	8.04
	Conflict resolution	7.00	7.91	7.34	8.10
Innovation	Innovation	6.91	7.82	7.21	8.18
	Entrepreneurship/ Intrapreneurship	7.09	7.91	7.11	8.00
	Lateral thinking/ creativity	8.00	8.09	7.41	8.23

A comparative analysis by age showed a perceived improvement in skill levels in all skill categories consistently across all age groups. For most skills, older students rated themselves higher post-placement, with the exception by various communication dimensions, albeit only marginally. Younger students (aged 19-21) rated themselves relatively strongly both pre- and post- placement in most skill categories. See Table 4 for further details.

Within the placement program under investigation, engineering students undertake 20-week placements while IT students complete 12-week placements. The results show that 20-week WIL students rated themselves higher post-placement in teamwork and marginally higher in problem solving and innovation compared to their 12-week WIL counterparts.

TABLE 4: Comparative data by age of average scored before and after placement

Factor	Dimension	19-21 before	19-21 after	22-25 before	22-25 after	26+ before	26+ after
Problem Solving	Reasoning	8.23	8.72	7.81	8.55	7.83	8.79
	Analyzing and diagnosing	8.03	8.76	7.69	8.45	7.86	9.17
	Decision making	7.95	8.41	7.31	8.19	7.55	8.55
Critical Thinking	Conceptualization	8.10	8.64	7.45	8.45	7.79	8.93
	Evaluation	7.79	8.43	7.50	8.24	7.66	8.45
Communication	Verbal communication	8.10	8.56	7.86	8.43	7.66	8.55
	Giving and receiving feedback	7.85	8.47	7.64	8.48	7.59	8.31
	Meeting participation	7.59	8.40	7.67	8.57	7.52	8.24
	Written communication	8.10	8.45	7.79	8.33	7.48	8.55
Teamwork	Task collaboration	8.51	8.77	7.95	8.67	7.76	8.76
	Social intelligence	8.44	8.60	7.81	8.48	7.34	8.69
	Influencing others	7.44	8.00	7.14	8.00	7.00	8.28
	Conflict resolution	7.23	8.09	7.36	8.02	7.28	8.24
Innovation	Innovation	7.28	8.14	7.00	8.07	7.24	8.28
	Entrepreneurship/ Intrapreneurship	7.26	8.00	6.83	7.86	7.24	8.00
	Lateral thinking/ creativity	7.72	8.22	7.17	8.02	7.52	8.34

DISCUSSION

The study measured students' assessments of their skill levels before and after their placements. It reflected increases in innovation skills along with contributing factors, problem solving, critical thinking, communication and teamwork. Upon completion of their placements, the results reflected an increase in all skill categories compared to the pre-placement evaluation of skills. Additionally, students generally expressed strengths in reasoning, analyzing and diagnosing, conceptualization, task collaboration and social intelligence (as detailed in Table 2). Weaknesses included influencing others, conflict resolution and innovation including entrepreneurship/intrapreneurship and lateral thinking/creativity. Regarding innovation, while the WIL process brought about a significant improvement in this skill (among the highest increase at 12%, See Table 2), more concerted efforts are needed to integrate entrepreneurial curricula into earlier phases of engineering and IT degree programs.

The study also involved a comparative analysis of students by age, gender and degree type / placement duration. It found that students participating in longer durations of 20 weeks compared to 12 weeks had higher perceived levels of innovation skills post-placement (Table 5). This resonates with consistent feedback provided by employers indicating that longer placements allow students to immerse more deeply into a project and achieve more substantive innovation outcomes

TABLE 5: Comparative data by placement duration before and after placement

Factor	**Dimension**	20-week before	20-week after	12-week before	12-week after
Problem Solving	Reasoning	7.98	8.75	7.97	8.65
	Analyzing and diagnosing	7.86	8.79	7.87	8.65
	Decision making	7.64	8.44	7.55	8.32
Critical Thinking	Conceptualization	7.75	8.69	7.87	8.48
	Evaluation	7.61	8.45	7.77	8.32
Communication	Verbal communication	7.80	8.54	8.16	8.58
	Giving & receiving feedback	7.68	8.48	7.77	8.42
	Meeting participation	7.56	8.36	7.74	8.45
	Written communication	7.84	8.41	7.84	8.48
Teamwork	Task collaboration	8.06	8.85	8.23	8.55
	Social intelligence	7.96	8.76	7.77	8.13
	Influencing others	7.04	8.13	7.61	7.68
	Conflict resolution	7.21	8.10	7.55	8.03
Innovation	Innovation	7.13	8.18	7.32	8.06
	Entrepreneurship/ Intrapreneurship	7.15	8.04	7.00	7.87
	Lateral thinking/creativity	7.60	8.26	7.13	8.10

The study offers a range of useful approaches. Assessing skill levels in WIL students helps in uncovering areas of skill deficiency which can then be used to inform corrective action in subsequent WIL preparation programs and offer further support to students. In addition, it sheds light on the strong skills that students demonstrate through participation in the WIL program which can then be used for evidence-based promotion and expansion of the WIL program to future hosts. Tracking improvements in performance of WIL cohorts through various years can create a compelling case for continued industry participation in the WIL program. For students, the experience of engaging in self-reflection about their experiences in the innovation process through the questionnaire will enhance participants' insights into their own skill level, therefore boosting their awareness and development of their innovation and employability skills. The study showed how the information offered by the tool can also be used to provide feedback to students on their career literacy as shown in Table 2, thereby increasing their awareness and empowerment in their skill development.

CONCLUSION

The most challenging finding that emerged from this research was that engineering and IT curricula was inadequate in equipping students with innovation skills. While the WIL process did result in a significant improvement in innovation skills (see Table 2), much more is needed. Glaring from the results was that the weakest skills among students were in innovation, entrepreneurship/ intrapreneurship, lateral thinking/creativity and related skills to the innovation process such as the ability to influence others and resolve conflicts. It is clear that while existing curricula is effective in nurturing a range of other skills, the key skill of innovation is not being sufficiently addressed, despite rhetoric around the need for innovation for the future of work. Some important implications arise here which are outlined below.

Explicitly Embed Innovation within STEM Curriculum

Universities, educators, as well as engineering and IT accreditation bodies, should place a greater emphasis on ensuring that innovation education is more explicitly embedded within the curriculum. The engineering curricula from as early as year one is usually great at teaching problem solving through engineering design courses which provides technical solutions to problems. While this approach is essential, more is needed to extend the technical focus to explore the commercial viability in offering an overall business or market solution. Coverage of the curriculum should equip students with skills to assess whether the technology is financially viable, to identify various markets and applications and gauge the size of the opportunity, to understand how to protect the idea and to form partnerships to take the idea successfully to the market.

Design Training to Equip Students with Skills on Influencing Others and Managing Conflict

Students should be supported to hone their skills in influencing others to raise funding, partner and back their ideas. Education around how to develop narratives, storytelling, using emotional hooks and visuals would be useful. Having multi-disciplinary teams would also be helpful in generating the diversity of perspectives to explore ideas from various angles, generate creative excitement and conflict, and apply tools to manage that conflict towards a successful outcome.

Provide Experiential Learning Opportunities for Both Entrepreneurship and Intrapreneurship

To build the new businesses and industries of the future, STEM students should be supported in developing the skills to commercialize their new ideas by way of starting their own companies (entrepreneurship) and also identifying new product opportunities in existing businesses (intrapreneurship). Experiential learning for various stages of the curriculum is needed where students work with real life businesses in developing solutions. Partnership with businesses to contribute problems that need solving and be ongoing partners in mentoring and then providing feedback on the solutions have tremendous potential to provide mutual benefit to both students and industry partners.

Ensure that Educators and Projects are Stimulating by being Relevant to the Industry

Students relate well to education that is stimulating, relevant and authentic. It is not sufficient to plug-and-play standard business entrepreneurship courses wholesale into an engineering or IT program and expect students to relate. While some degree to transferability is possible, educators and/or industry mentors must have knowledge of the industry challenges and problems that need to be solved in order for the material to capture the imagination of students and integrate/synergize well with the broader curriculum.

The implications provided by this study will be valuable to a range of stakeholders such as the Australian Council of Deans of ICT (ACDICT), Australian Council of Engineering Deans (ACED), Australian Council of Deans of Science (ACDS) and relevant industry accreditation bodies such as Engineers Australia (EA) and the Australian Computer Society (ACS). In particular, it offers recommendations about the role of WIL in building vital, skilled engineering, IT and science workforces, and the need to explicitly embed innovation skills within STEM education programs.

For government agencies with innovation mandates for linking business with the research sector, the tool provided in this study can be applied to enhance the innovative capacity of graduates to meet the needs of industry. This is not a one-way street. Also important is the active involvement of the business community in shaping the next generation of innovators by way of providing WIL opportunities and mentoring. Additionally, the research is significant to federal and state government agencies which emphasize innovation such as the Federal Department of Industry, Innovation and Science. Future research can also administer the tool to employers to facilitate comparison of employer assessment with student self-evaluation post-placement, to evaluate performance of industry-university student innovation initiatives.

For businesses and a community looking for creative solutions on a timely basis to address problems confronting the areas of health, food, energy, environment, manufacturing and the economy, the interaction of talented students with industries and businesses will prove highly beneficial. Tracking the development of innovation skills as presented in this study can be applied to enhance collaboration and innovation between university and industry.

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APPENDIX A: Student Questionnaire

This survey should be completed prior commencement and upon completion of your placement. Please think your about ability to demonstrate particular skills. Please highlight your answer on a scale of 0 - 10 (0= strongly disagree and 10=strongly agree) concerning your ability to demonstrate specific skills.

Factor	Measurement item	Scale
Problem solving	*Reasoning:* Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.	0 1 2 3 4 5 6 7 8 9 10
	Analyzing and diagnosing: Analyze facts and circumstances and ask the right questions to diagnose problems.	0 1 2 3 4 5 6 7 8 9 10
	Decision making: Make appropriate and timely decisions, in light of available information, in sensitive and complex situations.	0 1 2 3 4 5 6 7 8 9 10
Critical thinking	*Conceptualisation:* Recognise patterns in detailed documents and scenarios to understand the 'bigger' picture.	0 1 2 3 4 5 6 7 8 9 10
	Evaluation: Recognise, evaluate and retain key points in a range of documents and scenarios.	0 1 2 3 4 5 6 7 8 9 10
Communication	*Verbal communication:* Communicate orally in a clear and sensitive manner which is appropriately varied according to different audiences and seniority levels.	0 1 2 3 4 5 6 7 8 9 10
	Giving and receiving feedback: Give and receive feedback appropriately and constructively.	0 1 2 3 4 5 6 7 8 9 10
	Meeting participation: Participate constructively in meetings.	0 1 2 3 4 5 6 7 8 9 10
	Written communication: Present knowledge, in a range of written formats, in a professional, structured and clear manner.	0 1 2 3 4 5 6 7 8 9 10
Teamwork	*Task collaboration:* Complete group tasks through collaborative communication, problem solving, discussion and planning.	0 1 2 3 4 5 6 7 8 9 10
	Social intelligence: Acknowledge the complex emotions and viewpoints of others and respond sensitively and appropriately.	0 1 2 3 4 5 6 7 8 9 10
	Influencing others: Defend and assert their rights, interests and needs and convince others of the validity of one's point of view.	0 1 2 3 4 5 6 7 8 9 10
	Conflict resolution: Address and resolve contentious issues with key stakeholders.	0 1 2 3 4 5 6 7 8 9 10
Innovation	Innovation: Contribute towards the development of new products, services or technologies (e.g. software, applications, devices).	0 1 2 3 4 5 6 7 8 9 10
	Entrepreneurship/ Intrapreneurship: Initiate change and add value by embracing new ideas and showing ingenuity and creativity in addressing challenges and problems.	0 1 2 3 4 5 6 7 8 9 10
	Lateral thinking/ creativity: Develop a range of solutions using lateral and creative thinking.	0 1 2 3 4 5 6 7 8 9 10

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About the Journal

The International Journal of Work-Integrated Learning (IJWIL) publishes double-blind peer-reviewed original research and topical issues dealing with Work-Integrated Learning (WIL). IJWIL first published in 2000 under the name of Asia-Pacific Journal of Cooperative Education (APJCE). Since then the readership and authorship has become more international and terminology usage in the literature has favored the broader term of WIL. In response to these changes, the journal name was changed to the International Journal of Work-Integrated Learning in 2018.

In this Journal, WIL is defined as "*an educational approach that uses relevant work-based experiences to allow students to integrate theory with the meaningful practice of work as an intentional component of the curriculum*". Examples of such practice includes work placements, work-terms, internships, practicum, cooperative education (Co-op), fieldwork, work-related projects/competitions, service learning, entrepreneurships, student-led enterprise, applied projects, simulations (including virtual WIL), etc. WIL shares similar aims and underpinning theories of learning as the fields of experiential learning, work-based learning, and vocational education and training, however, each of these fields are seen as separate fields.

The Journal's main aim is to enable specialists working in WIL to disseminate research findings and share knowledge to the benefit of institutions, students, co-op/WIL practitioners, and researchers. The Journal desires to encourage quality research and explorative critical discussion that leads to the advancement of effective practices, development of further understanding of WIL, and promote further research.

Types of Manuscripts Sought by the Journal

Types of manuscripts sought by IJWIL is primarily of two forms; 1) *research publications* describing research into aspects of work-integrated learning and, 2) *topical discussion* articles that review relevant literature and provide critical explorative discussion around a topical issue. The journal will, on occasions, consider best practice submissions.

Research publications should contain; an introduction that describes relevant literature and sets the context of the inquiry. A detailed description and justification for the methodology employed. A description of the research findings - tabulated as appropriate, a discussion of the importance of the findings including their significance to current established literature, implications for practitioners and researchers, whilst remaining mindful of the limitations of the data. And a conclusion preferably including suggestions for further research.

Topical discussion articles should contain a clear statement of the topic or issue under discussion, reference to relevant literature, critical and scholarly discussion on the importance of the issues, critical insights to how to advance the issue further, and implications for other researchers and practitioners.

Best practice and program description papers. On occasions, the Journal also seeks manuscripts describing a practice of WIL as an example of best practice, however, only if it presents a particularly unique or innovative practice or is situated in an unusual context. There must be a clear contribution of new knowledge to the established literature. Manuscripts describing what is essentially 'typical', 'common' or 'known' practices will be encouraged to rewrite the focus of the manuscript to a significant educational issue or will be encouraged to publish their work via another avenue that seeks such content.

By negotiation with the Editor-in-Chief, the Journal also accepts a small number of *Book Reviews* of relevant and recently published books.

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