

Evaluating the resilience of work-integrated learning: A pharmacy co-op program case study

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A descriptive analysis assessed how the University of Waterloo School of Pharmacy's co-op program adapted during significant changes in the healthcare environment. Work term data from 2017-2023 were analyzed, including new employer growth, breadth of sectors and geographical locations for co-op positions, and percentage of students who worked for their co-op employer post-graduation. During the timeframe, including the pandemic, the program recruited more jobs than students (2.3 jobs: student, range of 1.4 to 4.4 for an average class cohort size of 119 students per co-op term), averaging 17 new employers annually. Of jobs posted, 24.8% were outside community/hospital pharmacy settings. On average, 79.1% (74.2-84.7%) of students completed jobs outside the local urban area of Waterloo, Ontario, and 53% of alumni reported accepting a paid job with their co-op employer within five years post-graduation. By continuously growing sector engagement to align with changes in core and emerging healthcare settings, the co-op program demonstrated resilience by reliably providing students with relevant work settings.

Keywords: Pharmacy, co-operative education, work-integrated learning, employment, resilience, Canada

Many schools incorporate work-integrated learning (WIL) into their curriculum, with success being defined as students building new, employable knowledge and skills as well as participating in meaningful workplace experiences (Drewery et al., 2016; Drewery & Pretti, 2017; Drewery et al., 2015; Hurst et al., 2012). In most pharmacy-based WIL, this is achieved via four to eight week required placements in hospital and community pharmacies, most located geographically close to the university. Through immersion into pharmacy practice settings, students are given the opportunity to build on their classroom learnings through hands-on experience, preparing them to enter the workforce as capable pharmacists.

One challenge for pharmacy programs that want to expand and give students' opportunities in new and emerging areas, is that with local hospital and community pharmacies dependent on students for patient care delivery, it is very disruptive to healthcare when the academic institution decreases student assignments to these sites. Additionally, due to students wanting placements geographically close to the university and sites having restricted ability to take more students, most pharmacy programs have limited excess placements available. This leaves programs vulnerable to changing local conditions or external factors that impact these workplace settings. Healthcare disruptions, burnout and personnel shortages can lead to pharmacies not having capacity to host students for WIL opportunities. Any decreased WIL capacity has direct implications for students for whom completing these experiences is

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a degree requirement (Kay et al., 2020; Maietta & Gardner, 2022; Pretti et al., 2020; Zegwaard et al., 2020). For pharmacy programs, the potential repercussions of postponing WIL opportunities and by extension student graduation, may be significant: delays in the students' ability to earn income as a practicing pharmacist, the school needing to secure more WIL positions the following year, and a smaller than expected pharmacist workforce graduating, which has a negative impact on an already stretched health sector.

In 2020, Zegwaard et al. introduced the concept of institutional WIL resilience to describe a program's adaptability in the face of changing conditions (Zegwaard et al., 2020). The definition identifies programs with the demonstrated ability to assess changes in their environment that may impact the WIL experience, and pivot quickly to adapt to new conditions in a manner that supports students in their fulfilment of learning requirements. It is valuable to understand whether resilience can be built into WIL models to limit the impact of external changes and disruptions while maintaining educational quality for students in pharmacy schools and other programs.

The University of Waterloo School of Pharmacy, located in Ontario, Canada, is one of only two pharmacy schools in North America with a co-operative education (co-op) component (University of Waterloo School of Pharmacy, 2024), alternating periods of academic study with applied learning in the form of three paid four-month work terms in the field (CEWIL, 2018; McRae & Johnston, 2016). These work terms are designed so that students can reap the well-established benefits of this model including the fulfillment of learning competencies, application of theoretical knowledge in workplace settings, enhancement of job readiness skills and building career connections (Blair & Millea, 2004; Cullen, 2005; Dressler & Keeling, 2004; Haddara & Skanes, 2007). When this program started building their WIL framework in 2008, resilience and future-proofing were overarching goals to ensure that students would gain exposure to roles that are reflective of an evolving field, through a commitment to identification of shifts in the pharmacy space and future opportunities in new sectors. By encompassing an ever-expanding spectrum of sectors and geographical locations, and by prioritizing the fostering of ongoing relationships with current employers while simultaneously seeking new engagement with companies and organizations, the intent has been that the program would be diverse and robust enough to weather downturns in certain sectors or regions. In recent years, the field of pharmacy has advanced significantly, leading to greater diversity in employment prospects for pharmacists beyond hospital and community practice to include specialty pharmacies, clinics, government, long-term care, research, technology and the pharmaceutical industry (Park et al., 2022; Traulsen & Druedahl, 2018). To that end, approximately 15% of licensed pharmacists in Canada work in settings outside of direct patient care (Canadian Pharmacists Association, 2025).

This paper reports on an evaluation of whether the University of Waterloo's School of Pharmacy co-op program has demonstrated resilience during times of change and uncertainty, including the COVID-19 pandemic. This world phenomenon swiftly derailed plans, programs and processes, as businesses struggled to adjust to shutdowns and uncertainties. As with all healthcare fields, pharmacy changed drastically during the pandemic, with pharmacies challenged to stay open, provide increased care as family physician offices closed, work with personal protective equipment shortages, and manage pharmacy staff shortages, illness and stress. The evaluation of the resilience of the pharmacy co-op program was conducted to understand how well the program adapted to the ever-shifting opportunities in the health care system and the pandemic. It used a suite of indicators of employer relationship building, breadth of job opportunities offered and accepted across core and emerging sectors both within and outside of the local region, and value placed on co-op positions by employers. By sharing the analysis, it is hoped that the data on the program's resilience may provide valuable

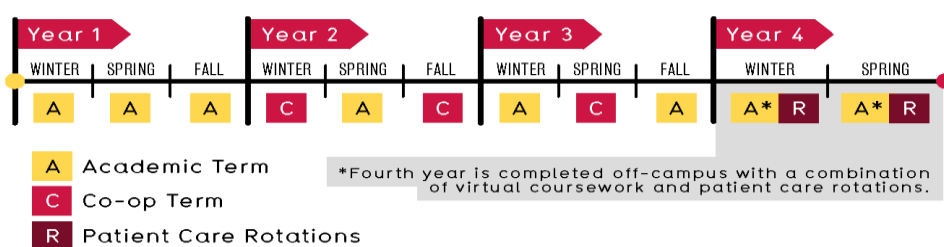
insight to other institutions and serve as a foundation for new initiatives, research and investment in co-op programs for pharmacy as well as other fields.

METHODS

Study Design

University of Waterloo offers the largest postsecondary co-op program in the world (University of Waterloo, 2020), with a highly structured and comprehensive data collection framework. The study design involved quantitative analysis of job and student data that were collected as part of University of Waterloo's pharmacy co-op program between the calendar years of 2017 and 2023. University of Waterloo's four-year Doctor of Pharmacy (PharmD) program (minimum two years of university level courses as prerequisites) has a student enrollment of 120 per year and requires students to complete three paid, full-time, four-month co-op work terms during the second and third years of the program. PharmD students also complete three eight-week rotations in their fourth year, prior to graduation as per Figure 1 (University of Waterloo School of Pharmacy, 2025). Co-op work terms must be with at least two different employers and practice settings, and fulfill predetermined competencies (University of Waterloo School of Pharmacy, 2025). Unlike some other forms of WIL where students are assigned to a placement setting by their university, the University of Waterloo School of Pharmacy's co-op program allows students to consider various work opportunities, select and apply to those of personal interest, and if selected, interview with the employer. Employers post the jobs for work that they need completed and are ready to supervise and pay for, and they subsequently interview and select the student who fits best.

FIGURE 1: University of Waterloo School of Pharmacy experiential program structure.



University of Waterloo Pharmacy Co-Op Application and Matching Process

Several months prior to each co-op term, interested employers are invited to submit prospective job description(s) which are screened by University of Waterloo to ensure they meet School of Pharmacy requirements. Positions are advertised on WaterlooWorks, an institutional software used by faculty, staff, students and employers to manage co-op terms, and facilitate the job/employee matching process (University of Waterloo School of Pharmacy, 2024). Students navigate this platform to view available job positions and select up to ten unique positions to which they apply. Along with pharmacist roles in community and hospital pharmacies (referred to as "core settings" in this paper), students are encouraged to experience roles with regulatory bodies and governments, health technology companies, insurance companies, advertising firms, pharmaceutical industry, humanitarian outreach organizations and enterprise development.

Employers review resumes, cover letters, academic grades, and other required documentation, then select candidates for interviews. For each position, employers rank the candidates post-interview process; once students have received ranking results, they rank job posts. WaterlooWorks conducts a match by finding the lowest sum possible for each position and student combination (first choices are thus prioritized). Students with matched positions must accept a job offer while those who do not find a match go back into the system for another round of applications, interviews and alignment/pairing.

While most students participate in the WaterlooWorks process to secure a co-op position, self-arranged jobs are an acceptable alternative. For pharmacy students, self-arranged positions must not be with employers who are actively participating in the University of Waterloo pharmacy co-op program (e.g., have not posted a position in WaterlooWorks in recent terms). Students may also return to their previous employers for a second co-op term.

Data Collection

As there are currently no validated measures for evaluating institutional WIL resilience, the definition has been interpreted (Zegwaard et al., 2020), utilizing metrics that are being proposed as good markers of the long-term health of a WIL program. Key indicators, their relevance to co-op program resilience, and the specific metrics used in this evaluation can be found in Table 1.

Institutional-level data regarding employers, jobs and matches are collected every co-op work term by the co-op team which includes one full-time staff member for employer management, as well as the academic lead for integrated learning, who is the program's associate director. This evaluation comprised data collected from the PharmD students between the 2017 and 2023 calendar years, where complete data were available. All data were extracted from two main sources: WaterlooWorks and CORE ELMS. CORE ELMS is an institutional software package with a separate online platform for both employers and students, used by University of Waterloo School of Pharmacy to manage student schedules, and act as a repository for co-op supervisor evaluations of the students' core pharmacy skills, as well as supervisor and student feedback about the co-op program (University of Waterloo School of Pharmacy, 2024). Data regarding post-graduation employment originated from a School of Pharmacy survey conducted in 2018 and 2021, disseminated to all alumni who graduated from 2011 onwards.

TABLE 1: University of Waterloo pharmacy co-op program metrics associated with sector engagement and resilience.

Key indicator	Relevance to co-op program resilience	Metrics
Engagement and continuous involvement of employers	Protection of a co-op program against changing conditions is optimized by strong employer engagement. Attracting new opportunities for students, and building and nurturing relationships with employers, ensures a sustainable and robust set of co-op jobs. Listing position(s) for students, year after year, is indicative of employers' long-term engagement in and satisfaction with the program, signifying that the employer is likely to continue contributing co-op jobs in upcoming years.	Number of companies/organizations posting positions for the first time per year Work term jobs offered per company/organization annually
Breadth of experiences available to students	A broad range of sector engagement supports program resilience by safeguarding against health system changes that limit job opportunities in certain sectors while providing students with access to a range of career opportunities that prepare them for future employment.	Healthcare setting/sector of jobs posted
Student/Job match rate	A track record of successful candidate matching reflects program resilience by demonstrating that the company/organization is committed to the co-op program, and views it as a viable source of competent students that are well-suited to the co-op positions for which they are hiring.	Work term job match rate
Sector and geographic location of jobs taken	Program engagement in multiple sectors and geographical regions protects the program's ability to continue operating without significant impact to its students should shutdowns, layoffs or other phenomenon affecting job availability occur in certain locations or sectors.	Sectors of jobs taken Region of job settings
Value placed on job by employer	Program resilience may be inferred by employers placing high value on the work that students complete and considering the program as a viable method of finding talented candidates for full-time future employment. This indicates that the employer will likely continue providing co-op positions to the program, since they view the co-op opportunity as evidence of the student's ability to be a long-term asset to their organization.	Student wages Post-graduation employment with co-op employer

Students complete their co-op terms in the Winter and Fall terms of their second year in the program, as well as the Spring term of their third year. Therefore, the pandemic, which was declared in March 2020, with the acute phase lasting until 2022, was likely to have most strongly impacted students graduating in 2021, 2022 and 2023.

Recruitment

This study is a secondary analysis of co-op data that underwent a de-identification process before being shared as aggregate data with the full research team. Data collected via the alumni survey were anonymous and provided by the University of Waterloo's School of Pharmacy Assessment office.

Analysis

For each of the metrics, descriptive analysis was performed to compute the percentages, frequencies, means and medians, and trends were examined over the study period. Significance testing was conducted (two-proportion Z-test), where relevant, to compare data from the University of Waterloo pharmacy co-op program to overall data from all of the university's co-op programs.

Ethics

Ethics approval was obtained for this study from the University of Waterloo Office of Research Ethics (ORE number 45507).

RESULTS

Data from University of Waterloo's pharmacy co-op program related to key indicators of sector engagement and resilience are presented, displayed by calendar year or graduating class year.

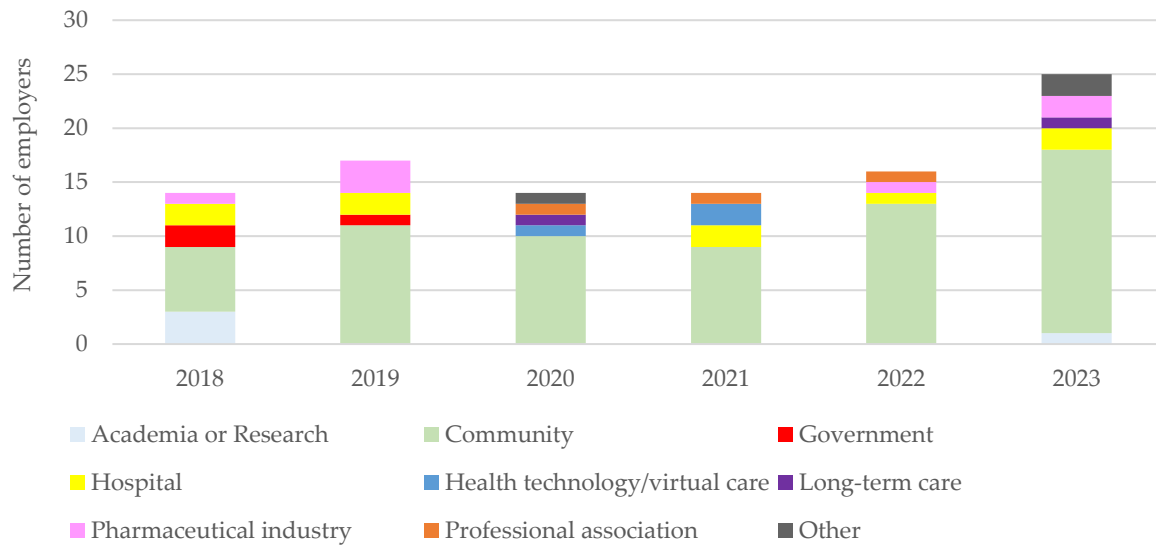
Engagement and Continuous Involvement of Employer

Each year, the co-op staff team reviews the pharmacy and healthcare landscape and targets an area for increased job opportunities. During the study timeframe, recruitment efforts resulted in an average of 16.7 new employers (range = 14-25) registering with the program every year and posting at least one student position, with an upwards trend observed since 2021 (Figure 2).

While the majority of new co-op employers were from community and hospital settings, the team also recruited employers in other settings and sectors including government and academia, particularly early in the study period. In 2020, the initial pandemic year, no new hospitals registered as employers with UW's pharmacy co-op program; instead, new employers in long-term care, professional associations, and health technology sectors enrolled to post co-op jobs for PharmD students. Post-2020, a growth in new hospital employers can again be observed, as well as for community pharmacies, the pharmaceutical industry and other non-core sectors.

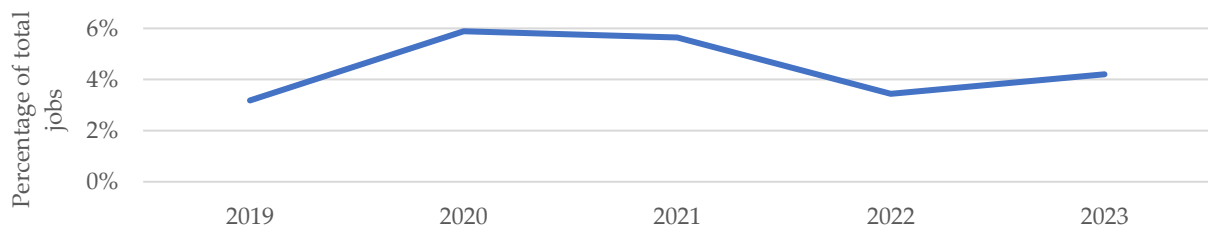
Every year, new employers (i.e., those who registered with the program that year) contributed an average of 4.5% (range = 3.2-5.9%) of all co-op jobs posted (Figure 3).

FIGURE 2: Number and sector of new employers registering with the University of Waterloo pharmacy co-op program per calendar year.



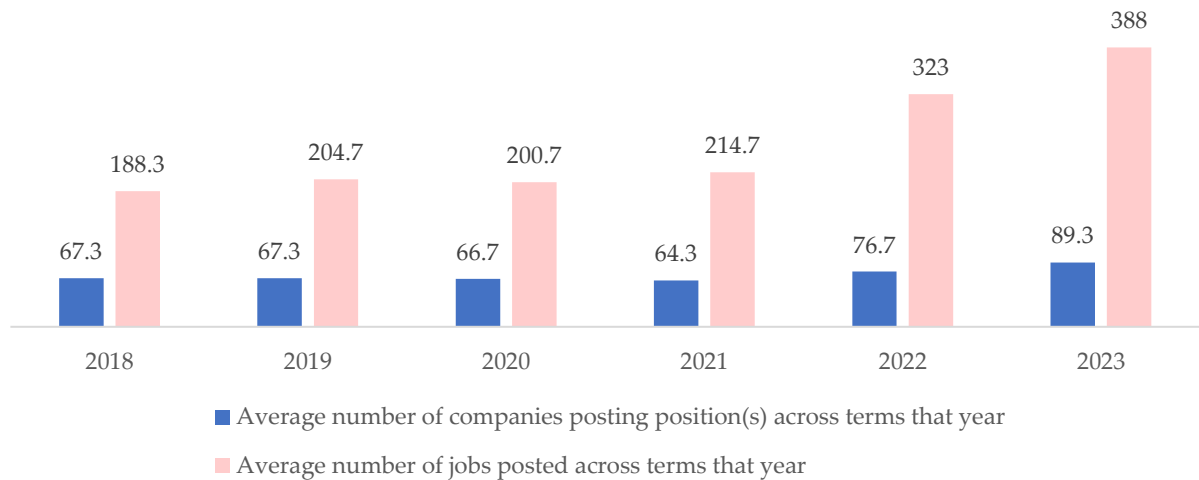
Note. 2017 is excluded since the data is artificially inflated by including those recruited in previous years. *Other* includes private payers or insurers, virtual clinical care companies, enterprise co-op (involving students starting their own company, typically in the technology field), cannabis producers, global healthcare communication companies, healthcare data companies, technology companies.

FIGURE 3: Percentage of total jobs posted from new employers per calendar year.



In each calendar year, an average of 71.9 workplaces (range = 67.3 to 89.3) posted at least one co-op work term job(s), with an upwards trend observed in 2022 and 2023 (Figure 4). After their initial year of listing co-op positions with University of Waterloo Pharmacy, 80% of workplaces posted at least one job annually. The total number of co-op jobs available to students consistently increased between 2017 and 2023, for an average of 253.2 (range = 130-388) across each of the three terms per year. A slight decline in the total number of companies posting co-op jobs can be observed during 2020 and 2021, rebounding and growing in the following years.

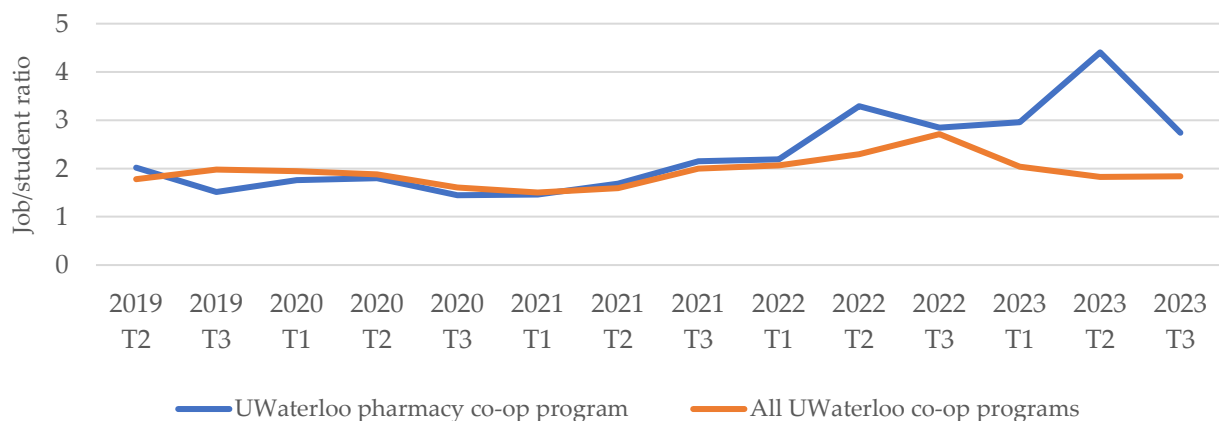
FIGURE 4: Average number of companies posting co-op jobs and average number of available jobs posted across co-op terms per calendar year.



Note. The average number of students per year was 119 (range = 111 to 123).

Across the pharmacy co-op terms analyzed, the average ratio of jobs posted to student was 2.3 (range = 1.4 to 4.4), compared to 1.9 across all University of Waterloo co-op programs for this time period (range = 1.5 to 2.7). See Figure 5. After the first term of 2022, there was an increase in jobs posted per student for the pharmacy programs, and the differences between the pharmacy program and all co-op programs at the University become further pronounced, though not statistically significant.

FIGURE 5: Available jobs: Student ratio available for pharmacy vs. all University of Waterloo co-op programs per calendar year and term.

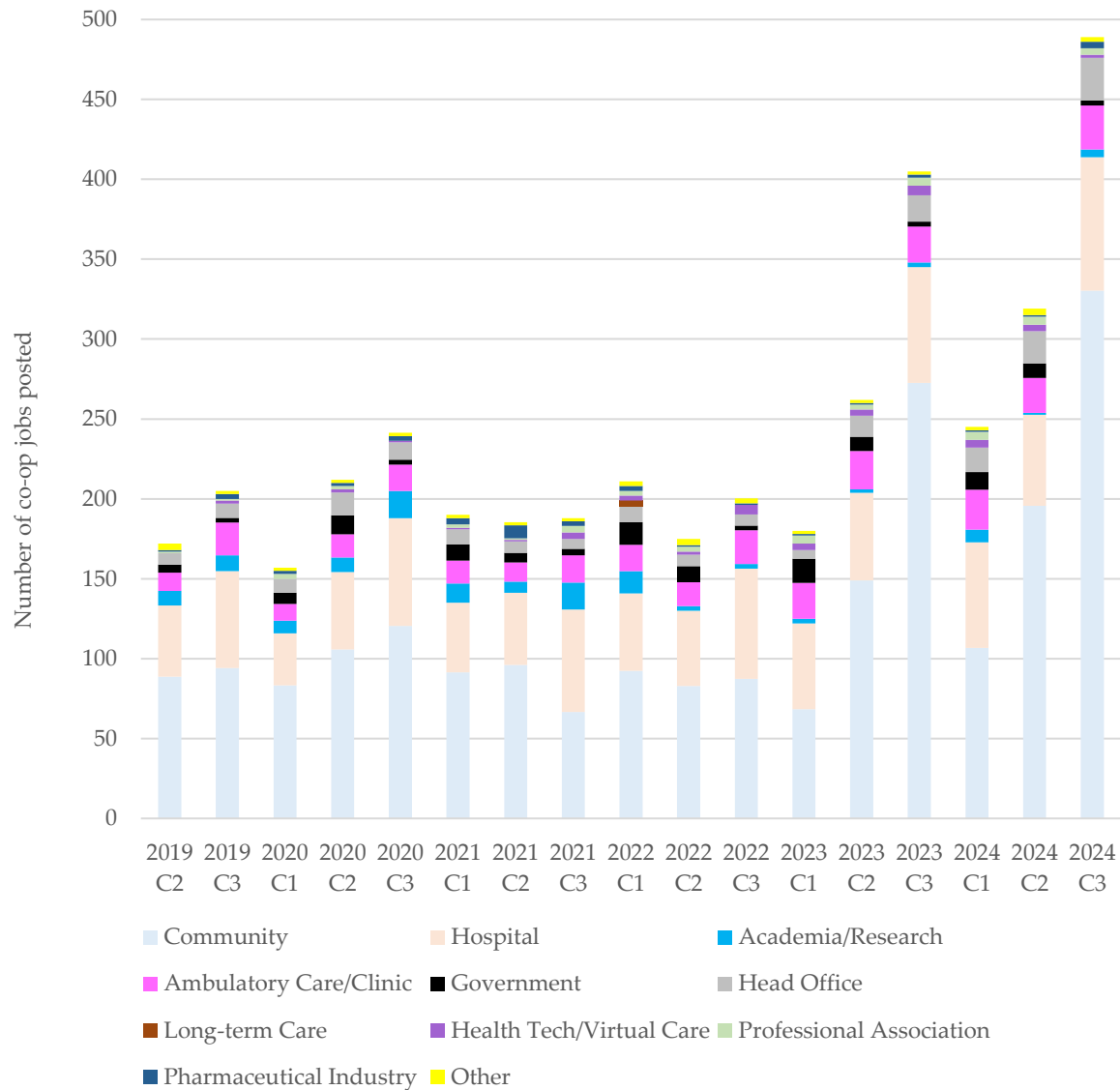


Note. The start of the pandemic (March 2020) coincides with students in the graduating class of 2021 beginning their third co-op term, while the graduating class of 2022 completed their second co-op term in the fall of 2020. T = Term; T1, T2, T3 indicate the winter term, spring term and fall term, respectively, in that calendar year. The average number of students per year was 119 (range = 111 to 123).

Breadth of Experiences Available to Students

Across the co-op terms within the studied timeframe, an average of 24.8% of jobs posted (range = 14.8-33.3%) were outside of community and hospital pharmacy settings. Positions spanned multiple sectors, including government, academia/research, pharmaceutical industry and health technology and virtual care (Figure 6).

FIGURE 6: Sector of co-op jobs posted, by graduating class year and co-op term.



Note. The start of the pandemic (March 2020) coincides with students in the graduating class of 2021 beginning their third co-op term, while the graduating class of 2022 completed their second term in the fall of 2020. C = co-op. *Other* includes private payers or insurers, virtual clinical care companies, enterprise co-op (involving students starting their own company, typically in the technology field), cannabis producers, global healthcare communication companies, healthcare data companies, technology companies.

Student/Job Match Rate

Student co-op employment rate was a mean of 80.0% (range: 71.8-88.4%) following the first round of job/student matching across all 21 co-op terms. This was significantly greater than the mean first round match rate for all University of Waterloo co-op programs in the same time period (44.7%, $p < 0.05$).

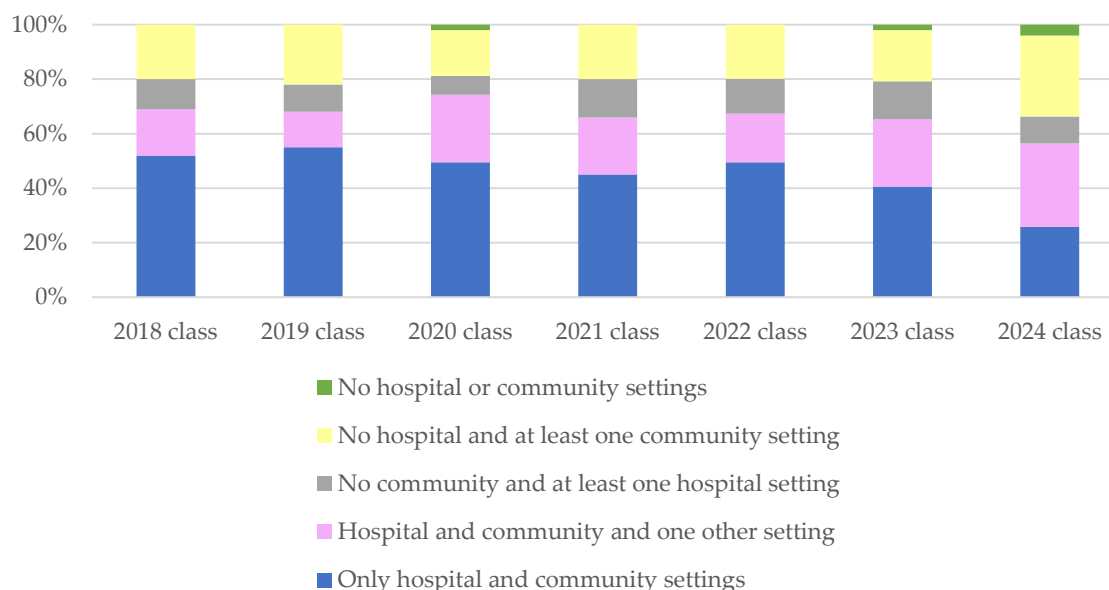
Following the second round of matching for the pharmacy program, employment rates were a mean of 90.1% (range: 72.6-96.7%) across all terms; the overall University of Waterloo co-op program match rate after second round was significantly lower at 59.7% ($p < 0.05$).

The overall employment rate of University of Waterloo pharmacy students was 100% for each co-op term. This rate was consistently higher than the overall employment rate for all co-op programs at University of Waterloo in the same time frame (average = 95.4%, range: 86.8% to 99.1%) indicating that there were students in each term that did not have a co-op job.

Sector and Geographical Location of Jobs Taken

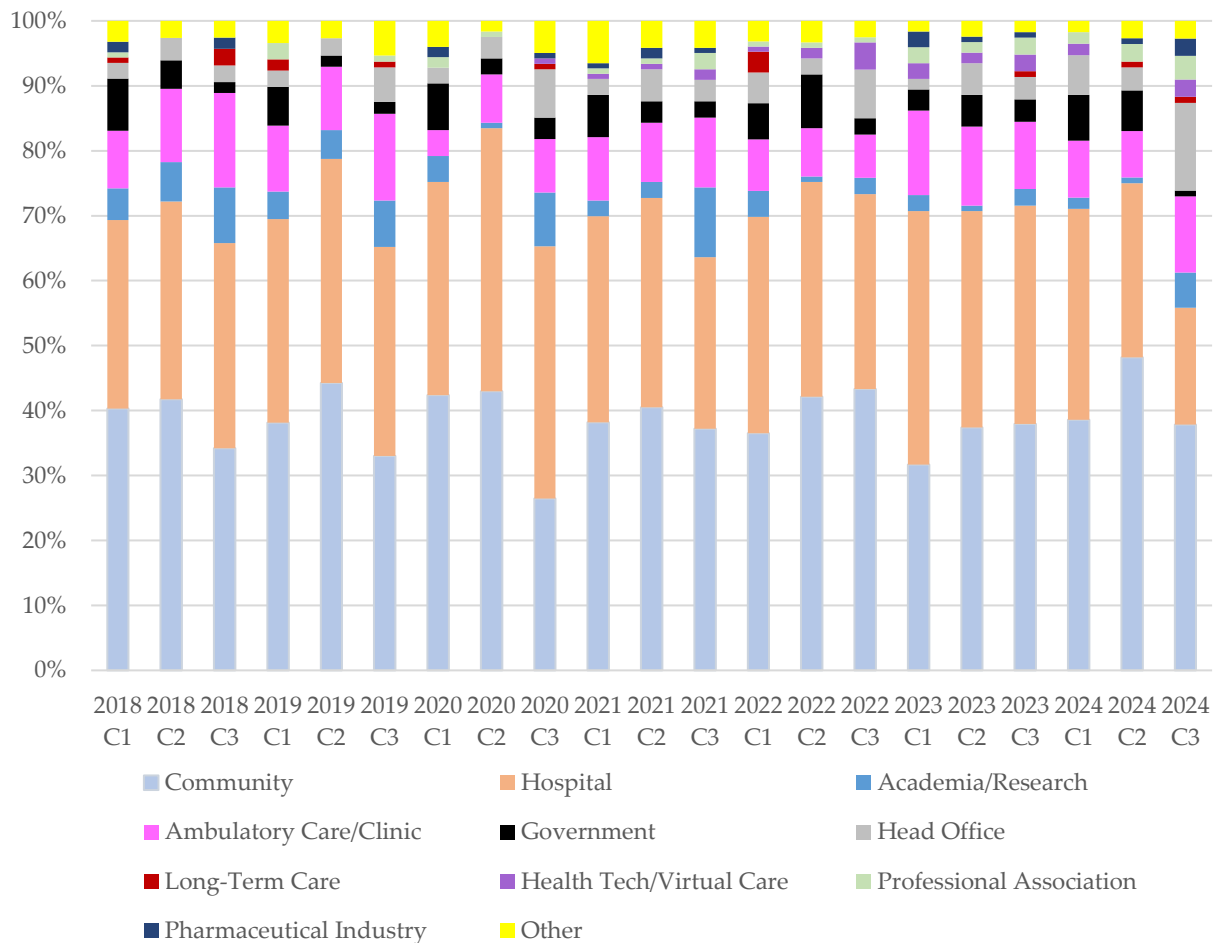
Over the course of their three co-op terms, most students completed jobs in both hospital and community settings (Figure 7). However, in every graduating class, at least 45% of students took one or more co-op positions outside of the core settings. An upwards trend has been evident in recent years with the graduating classes of 2023 and 2024 having 59% and 74% of their respective students completing at least one co-op job in a setting that was not in hospital or community practice.

FIGURE 7: Percentage of each graduating class taking co-op jobs in community, hospital and other practice settings, across their three co-op terms.



Across the co-op terms within the studied timeframe, an average of 29.3% of all sector jobs taken by students (range = 16.5-44.1%) were outside of community and hospital pharmacy settings (Figure 8). In five out of the seven graduating classes, a higher percentage of students completed positions in non-core settings in their third co-op term, compared to their first two terms.

FIGURE 8: Settings of co-op jobs completed by students, by graduating class year and co-op term.



Note. The start of the pandemic (March 2020) coincides with students in the graduating class of 2021 beginning their third co-op term, while the graduating class of 2022 completed their second term in the fall of 2020. C = co-op. *Other* includes private payers or insurers, virtual clinical care companies, enterprise co-op (involving students starting their own company, typically in the technology field), cannabis producers, global healthcare communication companies, healthcare data companies, technology companies

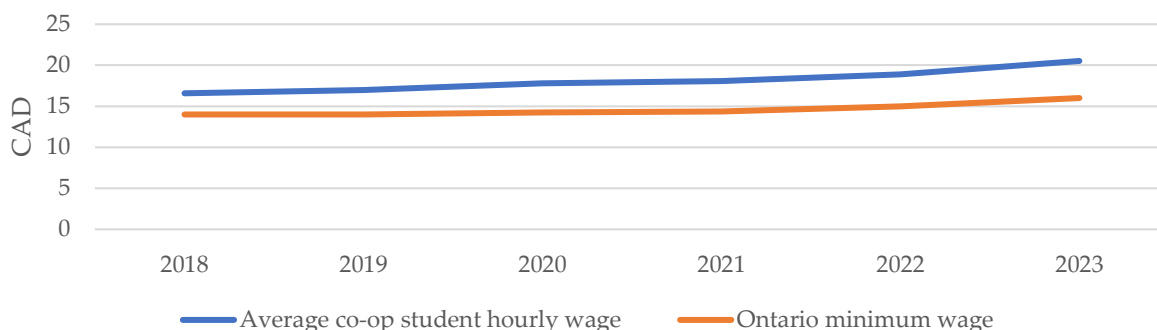
Across all co-op terms, an average of 79.1% of students (range = 74.2-84.7%) took co-op jobs outside of the University of Waterloo's local area of Kitchener and Waterloo, Ontario. Although the majority of jobs taken by students were in urban areas, an average of 5.4% of jobs (range = 1-8.9%) over the 21 co-op terms within the study period were also accepted in rural and remote areas, including Northern Ontario regions.

Between 2017 and 2023, 4.2% of all co-op jobs taken (range = 0.9-9.7%) were in Canadian provinces other than Ontario or jobs outside of Canada. Of the international jobs, most were related to medical aid which is one of only a few job types that students are allowed to accept for no pay.

Value Placed on Job by Employer

On average per year, the pharmacy co-op work term positions offered a higher hourly wage than the Ontario minimum wage (\$17.66 vs. \$14.32, respectively) and have increased over time (Figure 9).

FIGURE 9: Average student salary for pharmacy co-op jobs per calendar year.



Based on University of Waterloo Pharmacy Alumni Survey results for 2018 and 2022 (the only years during this evaluation period for which the survey was disseminated), more than half of the University of Waterloo pharmacy alumni surveyed reported that at least one of their paid jobs in the since graduating had been with a previous co-op work term employer (51% and 54%, respectively).

DISCUSSION

This analysis of the University of Waterloo School of Pharmacy co-op program, through the lens of sector engagement and resilience, found that the program has consistently engaged a wide range of local and more geographically varied employers in multiple sectors, with most employers continuing to post positions beyond the initial year. Even during 2020 and 2021, when the pandemic had the largest initial impact on workplaces, new employers registered with the program, and the number of co-op opportunities posted exceeded the number of students, as evidenced by metrics including the number and range of positions offered in a variety of sectors and regions, and the high match rates. The financial compensation offered for these co-op jobs as well as employers' willingness to offer future long-term employment to co-op students further signifies that the program has been able to provide students with co-op opportunities that prepare them for the pharmacy workforce, despite external factors.

Prior to the study, it was anticipated that the most significant impact from the pandemic on the co-op program would be evident in 2020, and particularly during the spring co-op term, as this coincided with community and hospital sites facing challenges including lack of personal protective equipment, physical distancing requirements, redeployment of staff and concern over COVID-19 outbreaks and spread. Given that co-op work terms occur in the students' second and third years of the program (i.e., while they are still completing coursework and before rotations), it could be assumed that co-op positions are more vulnerable to being revoked during a global health emergency than WIL experiences such as rotations that are scheduled close to graduation, when students may be considered more practice-ready. However, significant decline in positions available to students at this time was not observed, although some job duties were modified to include virtual care and remote work, as needed. From March to May 2020, 10 employers (16%) cancelled the co-op work terms for 18 University of Waterloo School of Pharmacy students they had previously accepted for the 2020 spring term (May to

August); these were for primarily head office and international positions. The co-op program administrators were able to quickly pivot by contacting the larger employer roster and scheduling a new cycle of job applications and interviews. This process was successful in securing jobs for all impacted students within two weeks. The agility in seeking student employment opportunities that has been an integral part of University of Waterloo School of Pharmacy co-op program processes and practices may have facilitated its adaptation to the changing conditions imposed by the pandemic, and allowed the program's number of available job opportunities to rebound very quickly in 2022 and 2023 once COVID-19's acute phase had subsided. The growth may also be attributed to the increased outreach efforts from the co-op team towards employers during the pandemic, including those from non-core industries including technology. Additionally, the widening scope of pharmacy practice in the province, resulting in increased opportunities for services such as prescription for minor ailments and vaccine administration precipitated new co-op jobs for students in community pharmacies, a core sector with which the pharmacy program was already engaged. The role shift for pharmacists to frontline providers of care has been noticed by other sectors, including pharmaceutical industry, resulting in additional co-op jobs for students.

Consistent employer engagement with the co-op program was observed, demonstrated by employers posting positions each term and hiring students through the match process. This indicates that employers believed the students applying for the available positions were a strong fit. Research conducted by program planners at pharmacy schools in Australia indicates that experiential opportunities can run the risk of providing little learning and development, with employers viewing students as cheap labour who can be relegated to performing unchallenging tasks (Ankrah & Al-Tabbaa, 2015). However, the University of Waterloo School of Pharmacy utilizes a paid co-op model by which the employer hires students to engage in work they need and value. In eschewing a unilateral relationship with employers in favour of a mutually beneficial one, the program has established itself as providing employers with capable future employees rather than simply students seeking job exposure, and was perhaps optimally positioned to navigate the challenging terrain of a global pandemic with as little disruption to student co-op experiences as possible (Kay et al., 2020; Maietta & Gardner, 2022). This reciprocal relationship enables the University of Waterloo School of Pharmacy co-op program to meet the definition of success for WIL experiences (Fleming et al., 2018; Stupans & Owen, 2009), as both employers and students benefit from mutually rewarding work experiences whereby employers are engaged not only in filling positions but in creating opportunities that shape the attributes, competencies and talents of graduates, often resulting in full-time employment for the student post-graduation.

Due to more co-op jobs available than University of Waterloo PharmD students as well as a very active 'student grapevine,' jobs considered more interesting and fulfilling become more competitive, thereby driving employers to create strong job postings and student experiences. The high first round interview match rate of the program over the co-op terms within the analysis timeframe (72.6-96.7%), particularly compared to that of all University of Waterloo co-op programs, also indicates that students view the available co-op positions as well-aligned with their job interests, and that employers see the students as strong suitably qualified candidates for their roles. In the fall 2024 term, there were 263 available co-op positions for students, and assuming 16 weeks of full-time hours at the average salary, employers were ready to invest a term total of \$3,487,590.

Given that 14% of Canadian residents live in rural, remote or Northern regions of the province of Ontario (Government of Ontario, 2025), it is encouraging that up to 9% of completed co-op jobs were in those regions each term, providing evidence of program administrators striving to maintain a

widespread geographical range of positions. Canadians living in rural, remote and Northern regions often face more health challenges than those in urban areas, including poorer health and shortages of physicians (Romanow, 2002), meaning other healthcare providers often assume more responsibilities in order to facilitate a greater equity in access to care. In the case of pharmacists, expansion in scope of practice in Ontario translates to pharmacists offering community-based primary care services including management of chronic diseases, vaccine administration, prescribing, and minor ailment assessment and management (Timony et al., 2022). This type of experience and exposure for students can provide them with valuable insight into a potential future career in these regions; previous studies have shown that pharmacists in rural regions of the United States and Australia must draw on many skills as they serve as the primary healthcare provider for local residents, answering concerns in areas such as public and mental health (Hays et al., 2020; Jewell et al., 2024; Scott et al., 2016).

An increase in co-op jobs available was observed in the graduating classes' third term, potentially attributed to students in their last term having the most experience and therapeutic knowledge, and therefore being viewed as having the most to offer employers, resulting in more opportunities from employers who may utilize this term as recruitment for future full-time positions. Co-op students in their final term may also be perceived as more willing to seek jobs outside of community and hospital settings, which may contribute to a wide range of employers posting positions, particularly in more recent years when pharmacist shortages have been observed. The findings of this examination indicate that many students did chose a non-core sector for at least one of their co-op terms, most commonly for their last term. This may be attributable to the program offering three co-op terms; students may therefore feel comfortable or open to selecting at least one position without a patient-care focus, such as in healthcare technology, in academic research or with a professional association, often after they have completed one or two terms in hospital and/or community settings. Overall, it is encouraging to observe that students are taking advantage of the opportunities to gain experience in a variety of sectors, to better prepare themselves for the breadth of paid professional roles which they may assume in their future. For example, technological innovation in pharmacy, including new medicines, devices and organisational systems means that more opportunities are becoming available to pharmacists where their knowledge and skills are increasingly appreciated and leveraged to improve the delivery of healthcare via digital tools (Barrett et al., 2012). Advancements in technology have led to systems that improve patient care and pharmacy workflow. Co-op opportunities that reflect the full range of potential careers a student may have access to upon graduation, including those in core settings and emerging sectors such as healthcare technology, are necessary in order to ensure that interested future pharmacists have the skills and training needed to integrate into and succeed in these workplaces.

Study limitations included a lack of job post data for the winter term of 2017, resulting in this term being excluded from the analysis for this particular metric. While the number of new employers recruited per year (Figure 2) includes organizations self-sourced by students, this contribution is assumed to be minimal given that the average of co-op jobs that were arranged by students each term was only 7%. There is no existing framework to measure the resilience of co-op programs, and therefore this analysis required the development of a suite of metrics that are believed to be indicative of a program's ability to adapt to changes and advances impacting the field of pharmacy, quickly learn about emerging sectors, recruit potential employers, and build lasting and mutually beneficial partnerships that provides students with exposure to a range of positions to enhance their career-readiness. The concept of resilience is integral to WIL, and this work is an important first step in defining how it could be optimally measured. Future research to evaluate and potentially modify resilience metrics would be valuable, and could support their application to pharmacy WIL programs in other countries, as well as WIL programs in other disciplines. Finally, it was not possible to compare

the findings of the analysis with that of other pharmacy schools, given that there is only one other North American pharmacy school with a co-op program, combined with a lack of literature on co-op programs within pharmacy schools internationally. This makes it even more important to share the findings with other schools, including those that are considering development of a co-op program for students.

CONCLUSIONS

Since beginning in 2008, the University of Waterloo School of Pharmacy has endeavoured to build a unique and resilient WIL program, and based on the metrics used in this examination. It has been successful in consistently offering its student cohorts' co-op job opportunities in the second and third year of the pharmacy program that allow them to apply their academic learning to the workplace and gain valuable experience both in core and new sectors. This has occurred despite external factors that have impacted the pharmacy field. The co-op program provides students with exposure to a host of roles in preparation for their future careers, pivoting to capture new innovations and evolutions in the field and the opportunities these advancements may yield, and connecting with employers that could offer students these new experiences. Future evaluations of this program will focus on the co-op experience from the student perspective, in order to better understand how their positions prepared them for their professional careers.

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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 related to Work-Integrated Learning (WIL). IJWIL first published in 2000 under the name of Asia-Pacific Journal of Cooperative Education (APJCE).

In this Journal, WIL is defined as:

An educational approach involving three parties – the student, educational institution, and an external stakeholder – consisting of authentic work-focused experiences as an intentional component of the curriculum. Students learn through active engagement in purposeful work tasks, which enable the integration of theory with meaningful practice that is relevant to the students' discipline of study and/or professional development (Zegwaard et al., 2023, p. 38).*

Examples of practice include off-campus workplace immersion activities such as work placements, internships, practicum, service learning, and cooperative education (co-op), and on-campus activities such as work-related projects/competitions, entrepreneurship, student-led enterprise, student consultancies, etc. WIL is related to, and overlaps with, the fields of experiential learning, work-based learning, and vocational education and training.

The Journal's aim is to enable specialists working in WIL to disseminate research findings and share knowledge to the benefit of institutions, students, WIL practitioners, curricular designers, and researchers. The Journal encourages quality research and explorative critical discussion that leads to the advancement of quality practices, development of further understanding of WIL, and promote further research.

The Journal is financially supported by the [WILNZ](#), [WACE](#), [WIL Australia](#), and the [University of Waikato](#).

Types of Manuscripts Sought by the Journal

Types of manuscripts sought by IJWIL are primarily in two forms: 1) *research publications* describing research into aspects of WIL and, 2) *topical discussion* articles that review relevant literature and provide critical explorative discussion around a topical issue. The journal will, on occasions, consider good 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 including recommendations.

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 into how to advance the issue further, and implications for other researchers and practitioners.

Good practice and program description papers. On occasions, IJWIL seeks manuscripts describing an example of good practice, however, only if it presents a particularly unique or innovative practice or it was 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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