Gender differences in work-integrated learning experiences of STEM students: From applications to evaluations

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Past studies have found that early career experiences drive attrition more than other factors. This paper investigates early engineering careers from a gender perspective to understand differences in opportunity, satisfaction, perceived competency, and choice. To do so, it analyzes job search, hiring, and performance appraisal data of 9,000 undergraduate students enrolled in work-integrated learning (WIL) programs. The analysis leads to four main findings. First, men and women appear equally likely to obtain interviews and secure WIL placements. Second, women in computing are more likely to apply to jobs involving user interfaces/experience. Third, women receive slightly higher performance appraisals. Finally, men appear to be more satisfied with their WIL experiences, especially with compensation and networking opportunities, while women appear to be happier with the availability of employer support. The results provide actionable insights for students interested in engineering, and academic institutions and employers wishing to diversify their talent pool.

Keywords: Co-operative education, gender differences, STEM, early engineering careers, statistical analysis, text mining

The gender gap in science, technology, engineering, and mathematics (STEM) is well-documented: Studies have shown that fewer women obtain STEM degrees and pursue STEM careers (Hango, 2013). Global institutions including the United Nations (UN) have identified under-representation of women in science as a problem and have started various initiatives to address it (United Nations General Assembly, 2015). Not only do fewer women enroll in STEM degrees, but also a higher proportion of women than men leave STEM degrees and careers (Hango, 2013). Some researchers found that work experiences drive attrition more than other factors (Glass, Sassler, Levitte, & Michelmore, 2013; Hunt, 2016). However, as noted by Kauhanen and Napari (2015), while most research on gender differences focuses on later career stages, early career experiences can greatly affect subsequent career choices. To fill this gap, this paper investigates gender differences in early engineering careers, specifically in the co-operative education (co-op) form of work-integrated learning (WIL).

WIL, specifically co-op, has become part of undergraduate engineering curricula worldwide. Co-operative and Work-Integrated Learning Canada (CEWIL) defines work-integrated learning (WIL) as "a model and process of curricular experiential education which formally and intentionally integrates students' academic studies within a workplace or practice setting" (CEWIL, 2018). Listed as one of the nine types of WIL, the defining characteristics of co-op include alternating periods of academic study and relevant paid work experience. Co-op and other forms of WIL provide real-world work experience to students, help attract new students, and offer a talent pipeline to employers (Eames & Coll, 2010;

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Thiel & Hartley, 1997). These work terms correspond to students' first experiences in the engineering workplace.

Research in co-operative education focuses on the impact of co-op on students' skills and career growth (Ferns & Moore, 2012; Gault, Redington, & Schlager, 2000), employers' expectations (Coll, Zegwaard, & Hodges, 2002; Hodges & Burchell, 2003), and the effectiveness and improvement of WIL programs (Hays & Clements, 2011; Ralph, Walker, & Wimmer, 2009). This paper studies co-op from a gender perspective. In particular, it examines all stages of a co-op process, including applications, interviews, ranking, placements, and evaluations, in order to understand gender differences in terms of opportunity, choice, perceived comptenecy, and satisfaction. The research questions examine gender difference in:

- Opportunity: Do men and women appear to receive equal opportunity in co-operative education in terms of the number of interviews and offers received?
- Choice: Do men and women apply to different kinds of jobs?
- Perceived competency: Do men and women receive equal workplace evaluations? Do employers appear to perceive them to be equally proficient in various aspects of their jobs?
- Satisfaction: Are men and women equally satisfied with their work experience?

By analyzing early career experiences using co-op data, the goal of this paper is to quantify gender differences in co-op and provide actionable insight into closing the gender gap in STEM.

This analysis was enabled by access to unique data extracts, covering a year of co-op data from nearly 9,000 undergraduate engineering students in a large university. These data extracts were not collected through surveys or interviews. Instead, they are records of students' and employers' activities in the co-op system. Data mining techniques such as text mining and statistical analysis were used to explore gender differences in the jobs students applied to and interviewed for, the jobs they obtained, their performance appraisals, and their appraisals of their employers. Permission for this secondary data analysis was granted by the university's office of research ethics (application number 42062).

The remainder of this paper is organized as follows: related work summarizes the prior work on gender differences in STEM; data and methods discusses the WIL datasets and provides details of the methods used to analyze the data; results summarizes the results obtained from each stage of the co-op process; and discussions offers possible explanations for key results. Finally, the paper concludes with directions for future work.

RELATED WORK

Past studies have found various reasons behind the gender gap in STEM. Gender differences have been attributed to differences in opportunity, choice, perceived competency, and satisfaction. This section summarizes past work on gender differences in STEM career experiences, with a focus on quantitative studies.

Difference in Opportunity

Some studies indicate that academic hiring practices favor women (Breda & Hillion, 2016; Williams & Ceci, 2015), whereas others found that women were preferred over identically qualified men, but not over more qualified men (Ceci & Williams, 2015). Among the associate professors who served as department or program chairs, a study found that women were promoted a year later, on average

(Berheide, Christenson, Linden, & Bray, 2013). Focus groups further revealed that a lack of feedback and mentoring decreased the likelihood of women applying for promotion to full professor. Some qualitative studies found that some women in engineering are relegated to managerial or secretarial roles more than men (Seron, Silbey, Cech, & Rubineau, 2016). Lee and Huang (2018) conducted experiments to see how entrepreneurial ventures (and the entrepreneurs themselves) are assessed by venture capitalists. Women without technical backgrounds were estimated as having less leadership ability than similar men and received less capital investment than technical women, technical men, and non-technical men. Many studies found (unconscious) bias in favor of men for STEM-related tasks (Knobloch-Westerwick, Glynn, & Huge, 2013; Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman, 2012; Reuben, Sapienza, & Zingales, 2014). Finally, historical analysis explained the factors that led to the masculine identity of the computing field (Ensmenger, 2012).

Difference in Choice

There are several studies related to gender differences in career choices (Sadler, Sonnert, Hazari, & Tai, 2012; Eccles & Wang, 2016), perhaps developing in secondary school (Sadler et al., 2012). Some found that women prefer working with other people, in socially oriented occupations, and wish to benefit society (Chopra, Gautreau, Khan, Mirsafian, & Golab, 2018; Wang, Degol, & Ye, 2015; Su, Rounds, & Armstrong, 2009). Others mentioned that women may overlook engineering careers because they are considered incongruous with communal goals of collaboration and helping others (Diekman, Brown, Johnston, & Clark, 2010; Diekman, Clark, Johnston, Brown, & Steinberg, 2011).

Difference in Perceived Competency

Studies on how STEM professionals are evaluated or perceived suggest gender differences in evaluations, regardless of the evaluator’s gender. A study that analyzed workplace evaluations and advice given to technology interns found that women with ability issues were viewed as having a lower field aptitude than men with ability issues, when judged by individuals holding sexist beliefs (Reilly, Rackley, & Awad, 2017). Men and women with interpersonal issues had similar aptitude ratings, although men were dissuaded from seeking help when facing interpersonal issues, while women were expected to find mentors and control their emotions. A study that conducted text analysis on recommendation letters discovered that female applicants were half as likely to receive excellent letters versus good letters compared to male applicants (Dutt, Pfaff, Bernstein, Dillard, & Block, 2016). Male and female evaluators were equally likely to display this bias. An analysis of the open-source software website GitHub showed that women’s contributions tend to be accepted more often than men’s, but for contributors whose gender is identifiable and who are outsiders to a project, men’s acceptance rates are higher (Terrell, Kofink, Middleton, Rainear, Murphy-Hill, Parnin, & Stallings, 2017). Works from OECD (2017) mentioned that women were evaluated to be better on collaborative efforts than men. In addition, if salary is a proxy for perceived competence, some works show a gender difference in salaries, with female professors receiving lower salaries (Berheide et al., 2013), even with equal likelihood of negotiation (Panther, Beddoes, & Llewellyn, 2018). Hu and Wolniak (2013) discovered that men who were academically engaged during college, and women who were socially engaged, had better early career earnings.

Difference in Satisfaction

Qualitative work found various challenges faced by women in the STEM workplace, including overt and implicit sexism, gendered expectations, and a lack of professionalism (Seron et al., 2016; Smith & Gayles, 2018; Gardner & Blackstone, 2013). Hunt (2016) discovered that dissatisfaction over pay and working conditions are the main reasons why women leave the STEM workplace. Qualitative and quantitative work found that women who receive more workplace support are more satisfied and stay in engineering longer, indicating that satisfaction can affect retention (Fouad, Singh, Cappaert, Chang, & Wan, 2016; Ayre, Mills, & Gill, 2013).

DATA AND METHODS

Data

This study analyzed one year of WIL data extracts, from September 2015 to August 2016, corresponding to 8,956 students enrolled in engineering or computing programs (abbreviated ENGCOMP), applying to 10,387 jobs. Initially, employers participating in the WIL process submit job descriptions to the university, and any student can apply to any job. Next, employers interview selected candidates and rank the ones they are willing to hire; rank 1 signifies an offer. Students also rank the employers who interviewed them. The university then follows a matching process to assign students to jobs based on the rankings. Ideally, as many students and employers as possible should get their top choice, but some may hire or be placed at their second or third choice depending on the level of competition, and some students or employers may not be matched at all. Finally, at the end of a work term, students and employers evaluate each other. This process is summarized in Figure 1 (grey boxes) and the dataset schema is summarized below.

- Student data: (anonymized) student id, gender, program, number of work terms completed at application time (from 0 to 5).
- Job data: job ID, job title, job description.
- Application data: student ID, job ID.
- Interview and ranking data: student ID, job ID, rank the employer gave to the student, a binary attribute denoting whether or not the student obtained the job.
- Employers' evaluations of students: student ID, job ID, an overall evaluation (on a 7-point scale: unsatisfactory, marginal, satisfactory, good, very good, excellent and outstanding performance), a detailed evaluation on 16 criteria listed in Table 7 (on a 7-point scale, grouped into developing (1-2), good (3-5) and superior (6-7), or "n/a" indicating not applicable). The evaluator's gender is unknown.
- Students' evaluations of employers**:** student ID, job ID, overall evaluation from 1-10 (10 being most satisfied).

The academic programs within ENGCOMP are Computer Science/Engineering (38% of ENGCOMP), Mechanical (21%), Industrial (9%), Electrical (8%), Chemical (8%), Civil (7%), Environment (5%), Nanotechnology (5%), and Biomedical (1%) Engineering. This study considered three groups of students: all students (abbreviated ENGCOMP), only Computer Science and Computer Engineering students (abbreviated COMP) and only Mechanical Engineering students (abbreviated MECH). COMP and MECH are singled out as these are the two largest programs in the dataset. Since this study analyzed students' work experiences, seniority was defined as in the WIL system of the institution. That is, student seniority was measured in terms of the number of work terms completed rather than the academic level: junior students are those who have completed 0 or 1 work terms and senior students are those who have completed at least 4 work terms. Junior students, senior students, and all students were analyzed separately. The sizes and the gender mix of the different populations under study are summarized in Table 1. Table 1 also shows the gender distribution of students at various stages of the co-op process, namely, students who obtained an interview, were among the top-3 ranked choices of their interviewers, received an offer, or were placed (and hence evaluated).

Since the job postings in the dataset do not include industry or discipline labels, labels were created as follows. If a job posting received at least 10 applications from (junior or senior) students enrolled in a particular program, this job was said to belong to the corresponding (junior or senior) industry. For example, a senior COMP job must have at least 10 senior COMP students applying to it. Even though this method is not perfect (e.g., a project management job that received 10 applications from COMP students would be considered a COMP job), other labelling methods that were tested were even less precise. For example, using the program of the student who obtained a job is sensitive to outliers: a MECH student may have obtained a software developer job that mostly COMP students applied to. Likewise, relying on the presence of particular keywords was problematic due to the lack of an exhaustive list of COMP or MECH specific skills. This analysis focuses on industries including COMP (containing 3232 job postings), junior COMP (2267), senior COMP (592), MECH (1657), junior MECH (912) and senior MECH (395). While the junior and senior jobs of an industry are strict subsets of that industry, there are a few jobs that appear in both.

Additionally, two semesters of data were analyzed, from January to August 2017, to explore students' satisfaction with their work terms. This data extract contains 4,888 students, including their gender, academic program and seniority, but not their applications, interviews or performance evaluations. In addition to giving an overall satisfaction score, students provided a score from 1 to 5 (with 5 being most satisfied) for the questions listed in Table 8. This dataset overlaps with the 2015/2016 dataset, but some students from the 2015/2016 dataset have graduated by 2017, and there were new students who enrolled in Fall 2016 and had their first work terms in 2017. Even then, the gender and seniority breakdown of the 2017 dataset is similar to that of the 2015/2016 dataset (Table 1). The 2015/2016 dataset was used to analyze the WIL process from end to end, and the 2017 dataset was used to provide additional insights on gender differences in satisfaction with WIL.

TABLE 1: Gender breakdown during the different stages of the co-op process by program

			Program/ Applications		Interviews		Top-3 Rank (Ranking)		Offer (Ranking)		Placement/ Evaluation	
Group	Seniority	Students	%M	%W	%M	%W	%M	%W	%M	%W	%M	%W
ENGCOMP	All	8956	77%	23%	78%	22%	77%	23%	77%	23%	77%	23%
	Junior	3828	74%	26%	74%	26%	73%	27%	74%	26%	74%	26%
	Senior	2144	81%	19%	81%	19%	81%	19%	80%	20%	81%	19%
COMP	All	3381	84%	16%	83%	17%	83%	17%	83%	17%	84%	16%
	Junior	1523	82%	18%	80%	20%	80%	20%	81%	19%	82%	18%
	Senior	693	87%	13%	87%	13%	85%	15%	84%	16%	87%	13%
MECH	All	1843	87%	13%	87%	13%	87%	13%	86%	14%	87%	13%
	Junior	780	83%	17%	82%	18%	81%	19%	81%	19%	83%	17%
	Senior	490	90%	10%	90%	10%	90%	10%	89%	11%	90%	10%

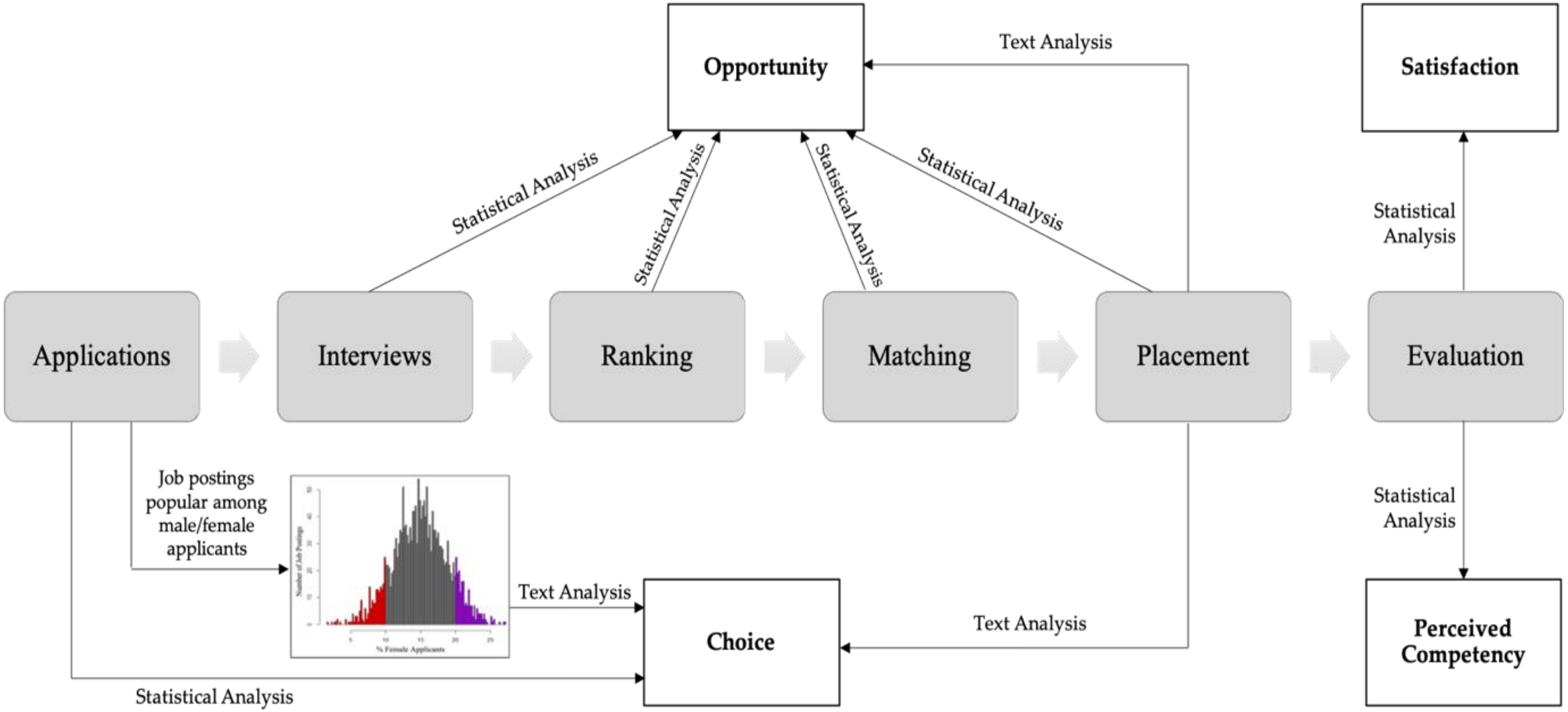

FIGURE 1: Methods used to analyze gender differences in WIL

Methods

Figure 1 provides an overview of the methods used to measure gender differences in co-op and their expected outcomes. The two sub-sections that follow describe statistical analysis and text analysis, respectively. Each sub-section discusses how the method was applied to each stage of the co-op process (in the order shown in Figure 1) and what information it may provide, i.e., a gender difference in choice, opportunity, perceived competency, or satisfaction (white boxes in Figure 1). Each method was repeated on all, junior and senior jobs/students in ENGCOMP, COMP and MECH to understand how these differences vary with industry and seniority.

Statistical analysis

A p-value of 0.05 was used for all tests. First, statistical analysis was applied to the applications stage of the co-op process. A t-test was used to compare the average number of applications submitted by men and women, which may reflect a gender difference in choice.

Next, statistical analysis was applied to the remaining stages of the co-op process, namely interviews, rankings, offers, and placements, to identify gender differences in opportunities. These differences were measured as follows:

- Interviews: 1) proportion test to compare the fraction of men and women who obtained at least one interview, 2) t-test to compare the average number of interviews obtained by men and women, and 3) t-test to compare the average conversion rate of men and women, which is the number of interviews obtained divided by the number of applications.
- Rankings: 1) proportion test to compare the fraction of men and women who were a top-3-ranked choice of at least one interviewer, 2) t-test to compare the average number of top-3 ranks obtained by men and women, and 3) t-test to compare the average interview to top-3 rank conversion rate, which is the number of top-3 ranks divided by the number of interviews.
- Job offers: A student received a job offer from an employer if the student was ranked first by this employer. The statistical tests include: 1) a proportion test to compare the fraction of men and women who received at least one job offer, 2) a t-test to compare the average number of offers obtained by men and women, and 3) a t-test to compare the average interview to offer conversion rate, which is the number of offers divided by the number of interviews.
- Job placements: proportion test to compare the fraction of men and women who secured employment at the end of the matching process.

Moving on to the evaluation stage of the co-op process (Figure 1), statistical analysis was applied to measure gender differences in the evaluations received by students. A difference may indicate that workplace supervisors perceive men and women to be competent in different ways. First, the average overall evaluations of men and women were compared using the Mann-Whitney test. Then, for each of the 16 evaluation criteria listed in Table 7, 1) the average scores of men and women were compared using the Mann-Whitney test, 2) a proportion test was used to compare the fraction of men and women receiving "developing", "good" and "superior" scores, and 3) a proportion test was used to compare the fraction of men and women receiving "N/A". The Mann-Whitney test was chosen because it is suitable for the Likert scale used in performance evaluations.

Finally, gender differences in the evaluations given by students were analyzed to examine satisfaction with co-op (marked in Figure 1). The 2015/2016 dataset was used to calculate average student evaluations of the employers. Male and female averages were compared using the Mann-Whitney test (again, because of the ordinal nature of the data). The same method was used on the 2017 dataset to identify significant differences in the seven specific satisfaction criteria.

Text analysis

The goal of text analysis was to understand gender differences in the types of jobs applied to (in the applications stage) and filled (in the placements stage) based on job descriptions. As students are free to apply to any job, text analysis of the job postings they apply to may indicate a gender difference in choice. Since placements are related to where students applied and what employment opportunities they received, text analysis of placements may indicate a gender difference in both choice and opportunity (shown in Figure 1). As mentioned earlier, each job record contains a title and a description that includes such things as desired skills, expected duties, and working environment. A parser that uses standard text mining techniques to process, tokenize, and stem the text (Croft, Metzler, & Strohman, 2010) was implemented in Python and applied to the job records. For example, the parser converted “development”, “developer”, and “developing” to “develop”, “quality assurance”, “QA”, and “Q-A”, to “qa”, and "manager", "manage", and "managing", to "manag" (Note that the stemming operation used in the parser affects word endings, as in “manag”, “appli”, and others found in Tables 3 to 6). For each job, the parser returns a set of such tokens, called job attributes, which were analyzed as follows.

First, consider applications. The following method was used to identify job postings that received a much higher proportion of applications from men (referred to as $jobs_M$) or women (referred to as $jobs_W$) compared to other jobs within the same discipline. For each discipline, the distribution of the proportion of male applicants was visually inspected to identify where the distribution function dropped off. For example, Figure 2 shows this distribution for senior COMP jobs, with the bulk of these jobs receiving between 79 and 94% of applications from men. The distribution drops on either side of this range, suggesting the thresholds for $jobs_M$ and $jobs_W$. Additionally, to avoid overfitting, it was ensured that $jobs_M$ and $jobs_W$ had more than 50 job postings. Subsequently, two sets of attributes were created: a) job attributes that frequently occurred in $jobs_M$ and $jobs_W$, and b) job attributes that occurred significantly more frequently in $jobs_M$ than in $jobs_W$. A two-tailed two-proportion z-test and a p-value of 0.05 were used for the latter. Finally, consider job placements. Again, two sets of attributes were reported: a) job attributes that frequently occurred in jobs filled by men and by women, and b) job attributes that occurred statistically significantly more frequently in jobs filled by men or by women.

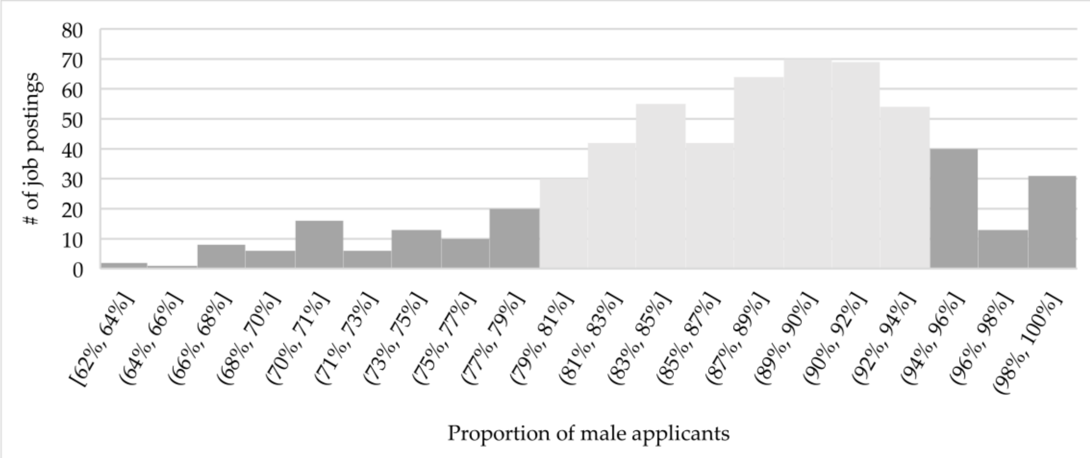

FIGURE 2: Distribution of the proportion of male applicants in senior Computer Engineering and Computer Science (COMP) jobs

Limitations

The nature of the data introduced the following limitations:

- As gender is socially construed, it is greatly impacted by society, culture, time, and personal experiences. The inferences drawn from this dataset may not apply to other countries or cultures.
- Co-op is a controlled career environment for students, and it may not be a representative of post-graduate employment.
- The data extracts did not include students' academic and extra-curricular attributes such as grade point average (GPA), making it impossible to control for these factors in the analysis. Additionally, without the knowledge of the supervisor's gender or the extent of mentorship, controlling for related factors that could have affected workplace evaluations was not possible.
- Missing data fields required the use of proxies. For example, in the data extract, a job posting did not contain an industry label, motivating the need to infer the industry from the academic programs of interested students.
- The job description provided by the employer was assumed to be representative of the job, even though the actual nature of the job may have been different.
- A general limitation of data analysis methods is that they focus on the question of "what" rather than "why". In other words, they can identify interesting patterns and correlations in the data, but not cause-and-effect relationships. This data-driven analysis thus provides a starting point for further study, which may require surveying or interviewing students and employers.

RESULTS

Starting with job application analysis and concluding with work term evaluations, this section proceeds in the order shown in Figure 1. Table 2 summarizes the statistical analysis of applications, interviews, rankings, offers and placements (recall the *Statistical Analysis* section above for definitions of metrics). Results are shown for all of ENGCOMP, just COMP, just MECH, and just junior or senior students. For each metric, if the difference between men and women within a particular group was statistically significant at a p-value of 0.05, the absolute difference is reported, with M or F indicating whether the male or female outcome was higher. Differences that were not statistically significant at a p-value of 0.05 are marked by a hyphen (-). Additionally, differences that were statistically significant at a p-value of at least 0.05 are marked with *, at least 0.01 with **, and at least 0.001 with ***.

Applications

As shown in Table 2, in ENGCOMP overall, there is no gender difference in the number of applications submitted. However, COMP women, especially junior women, submitted slightly more applications than men, and senior men across all of ENGCOMP submitted more applications. While this result may suggest a gender difference in choice (of submitting applications), there is no consistent pattern across the different groups of students that were examined.

Looking into applications further, text analysis of jobs$_M$ and jobs$_W$ was used to highlight 1) frequently occurring job attributes in each group, and 2) job attributes whose frequency is statistically significantly different for men and women.

Table 3 shows the top 10 most frequent job title attributes in jobs$_M$ and jobs$_W$ of COMP and MECH. For example, 52% of jobs$_M$ and 32% of jobs$_W$ in COMP mention the job attribute “develop” (or its variants such as “developer” or “development”, all reduced by the parser to “develop”) at least once. COMP jobs$_M$ and jobs$_W$ contain 79 and 390 job postings, and MECH jobs$_M$ and jobs$_W$ contain 178 and 461 job postings, respectively. The results for all of ENGCOMP are omitted as they contain a mix of attributes from COMP and MECH, the two largest industries in the dataset. In COMP, both jobs$_M$ and jobs$_W$ titles suggest software developer positions, with some jobs$_M$ titles indicating gaming and embedded systems, and some jobs$_W$ titles mentioning user interfaces and experience (UI/UX). Similar trends were seen in junior and senior COMP jobs (results omitted for brevity); notably some senior jobs$_M$ titles were hardware-oriented whereas some senior jobs$_W$ titles suggested data science positions. Some gender differences were also seen in MECH (Table 3b): some jobs$_M$ titles suggest mechanical and embedded systems positions, while some jobs$_W$ titles suggest more project management and analyst roles.

Table 4 shows the top 10 job attributes that are mentioned significantly more frequently in jobs$_M$ than in jobs$_W$ (on the left), and vice versa (on the right). The lists are sorted by the difference in frequencies, abbreviated Δ, as the percentage of job postings mentioning an attribute in jobs$_M$ (or jobs$_W$) minus the percentage of job postings mentioning this attribute in jobs$_W$ (or jobs$_M$). In COMP, jobs$_M$ are more likely to mention programming terms and hardware, whereas jobs$_W$ include more mentions of clients and reporting. In MECH, jobs$_W$ are more likely to mention project management skills. Similar results were obtained from the corresponding analysis of job title attributes. Next, significant differences are separately explored for junior and senior jobs$_M$ and jobs$_W$ (COMP and MECH). Several differences are seen, starting with senior COMP jobs$_M$ having more hardware and embedded systems jobs than junior COMP jobs$_M$. Furthermore, senior COMP jobs$_W$ appear to shift to data analysis roles. Furthermore, senior MECH jobs$_M$ appear to shift from manufacturing to design positions, while senior MECH jobs$_W$ appear to shift from supporting and recording roles to project management (full results omitted for brevity).

Tables 3 and 4, along with the discussion above, indicate a gender difference in choice: apart from some common positions, men and women, irrespective of seniority, apply to different kinds of jobs.

TABLE 2: Job application, interview, ranking, offer and placement statistics

Process	Metric	All			Junior			Senior		
		ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH
Applications	Avg # of applications submitted	-	F2.3**	-	-	F2.7**	-	M3.6***	-	-
Interviews	% students with >=1 interview	-	F4.6%**	-	-	F7.8%**	-	-	-	-
	Avg # of interviews obtained	-	F0.7***	-	-	F0.9***	-	-	F1.1*	-
	Conversion rate	-	F1.4%*	-	-	F1.5%**	-	-	F5.0%*	-
Rankings	% students with top-3 rank	F2.7%*	F4.2%*	-	-	-	-	-	F9.0%*	-
	Avg # of top-3 ranks received	F0.2**	F0.3*	-	-	-	-	F0.3*	-	-
	Conversion rate	F4.9%***	-	F6.6%*	-	-	F9.7%*	F4.4%*	-	-
Offers	% students with >=1 offer	-	-	-	-	-	-	-	F14.3%**	-
	Avg # of offers received	-	-	-	-	-	-	-	F0.6*	-
	Conversion rate	F1.6%*	-	-	-	-	-	F3.3%*	F6.0%*	-
Placements	% Employed Students	F1.1%*	-	-	-	-	-	-	-	-

Note. ***: p < .001; **: p < .01; *: p < .05; -: p >= .05

TABLE 3: Top 10 frequent job title attributes in $jobs_M$ and $jobs_W$

(a) COMP

$jobs_M$	%	$jobs_W$	%
develop	52	develop	32
softwar	51	analyst	18
game	6	softwar	16
embed	6	design	12
system	5	web	12
applic	5	qualiti	9
mobil	4	product	8
analyst	4	ui	7
web	4	qa	7
manag	4	ux	6

(b) MECH

$jobs_M$	%	$jobs_W$	%
softwar	22	assist	13
mechan	20	develop	10
develop	16	product	8
design	15	analyst	7
embed	12	project	5
system	7	design	5
product	6	softwar	5
assist	6	manufactur	4
control	5	manag	4
robot	5	qa	4

TABLE 4: Differences in frequency between job description attributes of COMP and MECH $jobs_M$ and $jobs_W$

(a) COMP

Token	M	W	Δ	Token	W	M	Δ
c++	37%	12%	25%***	document	40%	14%	26%***
linux	33%	14%	19%***	busi	47%	25%	22%***
hardwar	28%	10%	18%***	css	27%	5%	22%***
c	27%	9%	18%***	client	32%	13%	20%***
algorithm	23%	6%	17%***	report	31%	11%	20%***
debug	24%	9%	15%***	html	31%	11%	19%***
framework	33%	18%	14%**	process	42%	24%	18%**
java	39%	26%	13%*	focus	28%	10%	18%***
scale	22%	9%	13%***	support	47%	29%	18%**
github	15%	3%	13%***	meet	27%	9%	18%***

(b) MECH

Token	M	W	Δ	Token	W	M	Δ
hardwar	37%	8%	29%***	manag	50%	26%	24%***
c	29%	6%	23%***	assist	52%	31%	22%***
machin	30%	8%	23%***	report	40%	20%	20%***
system	70%	49%	21%***	support	53%	33%	20%***
softwar	59%	39%	20%***	construct	25%	6%	19%***
c++	26%	7%	19%***	document	38%	20%	18%***
assembl	29%	9%	19%***	servic	36%	18%	18%***
mandatori	31%	13%	19%***	help	36%	20%	16%***
embed	22%	4%	19%***	activ	38%	22%	15%***
appli	50%	31%	19%***	projectmanag	29%	14%	15%***

Note. ***: $p < .001$; **: $p < .01$; *: $p < .05$

Interviews, Ranking and Matching

This section inspects the next stages of the co-op process (recall Figure 1). Returning to Table 2, several significant differences are noted in COMP, but not in MECH. First, COMP women, especially junior women, are more likely to obtain interviews than men. Second, senior COMP women are more likely to be top-3 ranked than men. Third, senior COMP women are more likely to receive offers than men.

ENGCOMP and MECH demonstrate no gender differences in interview opportunities but do exhibit a difference in the number of ranks and offers received. The reasons behind the dissimilarities between COMP and MECH cannot be confirmed without further investigation. Overall, gender differences in opportunity, if present, exist in favor of women.

Placements

Returning to Table 2, the percentage of men and women who were employed at the end of the job search process are the same in all groups except all of ENGCOMP, where 1% more women were employed. Below, the attributes of jobs filled by men versus those filled by women are analyzed.

Table 5 shows the ten most frequent job title attributes in COMP and MECH jobs held by men and women; for example, the word "software" appears at least once in 50% of the job titles held by COMP men and 43% of the job titles held by COMP women. There does not appear to be a gender difference, and junior and senior analyses (not shown for brevity) confirm this.

The frequent job description attributes of jobs held by men and women align with the frequent job title attributes (Table 5), showing no gender difference. All groups of jobs include technical terms such as "develop", "design", "software", "system" and "test", as well as references to soft skills such as communication and team(work).

The only attribute that appears significantly more frequently in the job titles of COMP men than COMP women is "software" (by 7%). On the other hand, COMP women placements contain a variety of words that are mentioned more frequently than in COMP men placements (but only by less than 4%); these include quality assurance, research, consultant and management terms in various application domains including environment, health and trade. Thus, despite these small (but statistically significant) differences, it appears that men and women largely work in similar kinds of jobs. This is in line with the previous findings (Table 5).

Table 6 shows the significantly different job attributes of jobs held by men and women, sorted by Δ. The differences are statistically significant but small. The job attributes of COMP men include more programming terms; for COMP women, they include more project and data management terms. For MECH men, there are more references to manufacturing jobs while for MECH women, project management and programming is mentioned more. In all, the gender differences in job placements (Table 6) are similar to gender differences in job applications (Table 4), suggesting gender difference in placement *opportunities* to be a function of *choice*.

TABLE 5: Top 10 frequent attributes of job titles held by men and women in COMP and MECH

(a) COMP

Token	M	Token	W
softwar	50%	develop	47%
develop	48%	softwar	43%
applic	7%	applic	8%
web	6%	web	7%
analyst	5%	analyst	6%
mobil	3%	qa	4%
test	3%	qualiti	4%
stack	3%	programm	4%
qa	3%	system	4%
assist	3%	mobil	3%

(b) MECH

Token	M	Token	W
mechan	15%	develop	13%
develop	14%	assist	13%
assist	11%	mechan	11%
design	11%	softwar	9%
softwar	11%	design	8%
manufactur	8%	product	6%
product	6%	project	4%
research	5%	manufactur	4%
system	3%	research	3%
project	3%	system	3%

TABLE 6: Differences in frequency between job description attributes of the placements of COMP and MECH men and women

(a) COMP

Token	M	W	Δ	Token	W	M	Δ
featur	32%	26%	6%**	document	31%	23%	7%***
android	24%	18%	6%**	busi	44%	37%	7%**
ios	19%	14%	5%**	excel	39%	33%	6%**
improv	27%	23%	4%*	communic	52%	46%	6%*
api	17%	13%	4%*	execut	18%	13%	5%***
creativ	22%	18%	4%*	sql	27%	21%	5%**
space	9%	5%	4%**	net	15%	10%	5%***
algorithm	17%	13%	4%*	analysi	22%	17%	5%**
store	9%	6%	3%*	written	20%	16%	5%**
tech	9%	6%	3%*	problemsolv	26%	22%	5%*

(b) MECH

Token	M	W	Δ	Token	W	M	Δ
system	61%	48%	13%***	assess	15%	7%	8%***
product	67%	56%	11%**	written	22%	15%	7%**
automot	17%	8%	10%***	problemsolv	27%	21%	6%*
test	50%	41%	8%*	client	18%	13%	6%*
tool	30%	22%	8%*	creativ	15%	10%	5%*
assembl	25%	16%	8%**	consult	12%	7%	5%**
technic	41%	33%	8%*	check	10%	5%	5%**
manufactur	44%	37%	7%*	c#	11%	6%	5%**
procedur	16%	9%	7%**	profil	11%	6%	5%**
layout	13%	6%	7%**	databas	13%	9%	5%*

Note. ***: p < .001; **: p < .01; *: p < .05

Workplace Performance Evaluations

Table 7 shows gender differences in the overall performance rating and the 16 evaluation criteria for all, junior, and senior students in ENGCOMP, COMP, and MECH. The results of the Mann-Whitney test for the differences of means are reported in the same format as in Table 2: for statistically significant differences, an absolute difference in means is reported, with M or F to indicate whether the number was higher for men or for women; asterisks indicate the strength of the statistical significance and hyphens indicate no statistically significant difference. The results of the proportion tests for the fractions of students whose skills were rated as "Developing", "Good", "Superior" and "N/A" (recall section *Methods: Statistical Analysis*) are omitted as they produced similar trends as the Mann-Whitney results (Table 7).

Starting with the overall performance rating, according to Table 7, women receive higher overall ratings in all of ENGCOMP and in MECH, but there is no significant difference in COMP. Also, there is no significant difference between any group of senior women and senior men.

Next, the 16 evaluation criteria are examined for ENGCOMP. Table 7 shows that in all of ENGCOMP, women are rated more highly than men on most criteria. With women being more likely to be rated "superior", the proportion tests (not shown) agree with this finding. Table 7 also shows similar trends for both junior and senior ENGCOMP women. On the other hand, all and junior men are rated more highly on resourcefulness and entrepreneurial orientation, but this trend does not persist in senior ENGCOMP men. Additionally, no difference is seen in ability to learn and problem solving.

TABLE 7: Statistically significant differences between evaluation scores received by men and women

Criteria	All			Junior			Senior		
	ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH
Interest in Work	F0.08*	-	-	F0.09*	-	-	-	-	-
Ability to Learn	-	-	F0.17*	-	-	-	-	-	-
Quality of Work	F0.12***	F0.12*	F0.16*	F0.14**	-	-	F0.13*	-	-
Quantity of Work	F0.13***	-	F0.17*	F0.16***	-	-	-	-	-
Problem Solving	-	-	F0.19*	-	-	-	-	-	-
Teamwork	F0.16***	F0.17***	F0.15*	F0.14***	-	-	F0.20***	F0.29**	-
Dependability	F0.15***	F0.14**	F0.17**	F0.15***	-	-	F0.16**	F0.21*	-
Response to Supervision	F0.10***	F0.16***	F0.13*	F0.10*	F0.12*	-	F0.14*	F0.21*	-
Reflection	F0.10**	F0.12*	F0.17**	-	-	-	F0.17**	F0.26*	F0.27*
Resourcefulness	M0.03*	-	-	M0.04*	-	-	-	-	-
Ethical Behavior	F0.09**	F0.13*	-	-	-	-	F0.14**	-	-
Appreciation of Diversity	F0.11***	-	F0.16*	F0.10**	-	-	F0.15*	-	F0.30*
Entrepreneurial Orientation	M0.07**	M0.13**	-	M0.09**	M0.16**	-	-	M0.26*	-
Written Communication	F0.17***	F0.10*	F0.23***	F0.14***	-	-	F0.19***	-	F0.25*
Oral Communication	F0.09***	-	-	F0.07*	-	-	-	-	-
Interpersonal Communication	F0.17***	F0.12**	F0.25***	F0.15***	-	F0.19*	F0.23***	F0.28*	F0.35*
Overall Performance Rating	**F0.08****	**-**	**F0.19****	**F0.12****	**-**	**F0.27****	**-**	**-**	**-**

Note. ***: p < .001; **: p < .01; *: p < .05; -: p >= .05

Furthermore, the percentage of men who received "N/A" for teamwork, ethical behavior, appreciation of diversity, and interpersonal communication, is significantly higher than the percentage of women, indicating that these qualities were either required, observed, or evaluated for fewer men. Full results have been omitted for brevity.

Zooming in on COMP, Table 7 shows that all men, junior men and senior men are rated more highly than women on entrepreneurial orientation, with other criteria showing no difference (especially for junior women) or some differences in favor of women (especially senior women). On the other hand, there are no significant differences in entrepreneurial orientation in MECH. Furthermore, similar to COMP, MECH women are rated more highly than men on several criteria, especially senior MECH women. With men and women evaluated differently on some criteria, this analysis suggests a gender difference in perceived competency.

Satisfaction of Students

Table 8 shows significant differences in students' overall satisfaction with WIL (using the 2015/2016 and the 2017 datasets) as well as the seven detailed satisfaction scores (using the 2017 dataset); again, the same notational conventions are used as before. In the 2015/2016 dataset, men appear to be more satisfied in all of ENGCOMP and all of COMP. Breaking down by seniority, senior men in all of ENGCOMP and in MECH give higher satisfaction scores, but other groups do not show any significant differences.

TABLE 8: Gender differences in overall work term satisfaction and satisfaction with specific aspects of WIL: 2017 and 2015/2016 dataset

Criteria	All			Junior			Senior		
	ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH	ENGCOMP	COMP	MECH
Availability of employer support	-	F0.1**	-	-	F0.1*	-	-	-	-
Opportunities to learn/develop new skills	-	-	-	-	-	-	-	-	-
Opportunities to make meaningful contributions	M0.09**	-	-	M0.11**	-	-	-	-	-
Opportunities to expand professional network	M0.06*	M0.08*	M0.13*	-	-	M0.2*	-	M0.21*	-
Appropriate compensation and/or benefits	-	-	-	-	-	-	-	M0.23*	-
Work related to academic program	M0.1***	-	-	M0.12**	-	-	M0.11*	M0.14*	-
Work related to skills developed at University	-	-	-	-	-	-	-	-	-
Overall Satisfaction (2017)	**M0.08****	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Overall Satisfaction (2015/2016)	**M0.12*****	**M0.10***	**-**	**-**	**-**	**-**	**M0.18****	**-**	**M0.57****

Note. ***: p < .001; **: p < .01; *: p < .05; -: p >= .05

In the 2017 dataset, overall satisfaction is again higher for all ENGCOMP men, but this trend does not carry over to any subgroups. COMP women (but not senior women in isolation) give higher scores on availability of employer support, with other satisfaction criteria either showing no difference or a difference in favor of men. In particular, men appear more satisfied than women with opportunities to develop their professional network and do work more closely related to their academic program. Additionally, junior and overall ENGCOMP men report more opportunities to make meaningful contributions than women. Senior COMP men's average score for receiving appropriate compensation is 0.23 higher (on a scale of 5) than senior COMP women's, which is the highest statistically significant difference of means in this analysis. With men and women evaluating WIL differently on different criteria, this analysis suggests a gender difference in satisfaction.

DISCUSSION

In the context of opportunity, women did not appear to be disadvantaged in the engineering WIL job search process in terms of interview opportunities or job placements; in fact, some metrics such as the number of interviews were in women's favour (Table 2). However, there were some differences in job profiles that attracted more women than men (Tables 3 and 4), suggesting a gender difference in *choice*. Furthermore, in terms of perceived competency, the performance appraisal analysis revealed that women were rated equally or more highly than men, with the exception of specific criteria such as entrepreneurship (Table 7). Finally, men appeared to be more satisfied with their work term experiences than women (Table 8), suggesting a gender difference in satisfaction. These results should be interpreted with caution, keeping in mind that they are based on one year of WIL data from a North American institution and are subject to the limitations mentioned earlier.

Difference in Opportunity

Women in computing obtained more interviews than men and senior women in computing also received more offers (top-1 ranks by their prospective employers) (Table 2). This result is consistent with prior work that discovered no bias, or bias in favor of women, in terms of opportunities (Breda & Hillion, 2016; Ceci & Williams, 2015; Williams & Ceci, 2015). However, some studies found that there is a hiring bias against women in STEM (Ensmenger, 2012; Knobloch-Westerwick et al., 2013; Moss-Racusin et al., 2012; Reuben et al., 2014; Seron et al., 2016). Williams and Ceci (2015) suggest that a pro-female bias could be due to anti-discrimination policies and other efforts to combat sexism in male-dominated workplaces. Other studies argue that women who enroll and persist in STEM degrees are more competent than an average male STEM student (Williams & Ceci, 2015; Hango, 2013). Breda and Hillion (2016) propose the "boomerang" effect as a possible explanation for the pro-female bias. They suggest that women who apply to highly skilled jobs do not elicit the general stereotypes regarding their motivation and ability; this induces a rational belief reversal in interviewers and increases their chances of being hired. Furthermore, Breda and Hillion (2016) speculate that employers may have a conscious or unconscious preference for gender diversity, introducing a pro-female hiring bias in a male-dominated field. A combination of these reasons may explain the findings.

Difference in Choice

The job profiles that attracted significantly more men or significantly more women had some overlap as well as some differences (Tables 3 to 6). For example, all COMP students applied to and filled software, web developer and analyst positions, and all MECH students applied to and filled software and design roles. However, COMP jobs involving hardware, firmware and embedded systems were applied to and filled more by men, whereas user interface and data analysis roles appeared more frequently among COMP women. These results are consistent with prior work on gender differences in career goals and choices: men and women have been found to have different *goals* (Chopra et al., 2018) that influence their occupational orientations (Sadler et al., 2012). With altruistic inclinations, women have shown a preference for people-oriented jobs (Su et al., 2009). Additionally, Chopra et al. (2018) found that women have a wider variety of interests than men; this difference in interests could have led to men and women choosing to focus on different types of STEM jobs. Wang & Degol (2017) found a gender difference in ability in that women were more likely than men to be highly skilled in both verbal and mathematical domains, potentially affording them a greater variety of career options. This may be another explanation for the results: perhaps women apply to computing jobs that mention both programming and user experience elements because they perceive themselves as having high technical and communication skills (besides being interested in these types of jobs). Furthermore, the findings could be a function of women's, either implicit or society-driven, low mathematical self-concept; their *competence beliefs* may have led them to choose less technical jobs (Sullivan & Bers, 2016; Eccles & Wang, 2016; Wang & Degol, 2017). A combination of these reasons may explain why men and women made different choices when applying to WIL jobs.

Difference in Perceived Competency

In terms of workplace evaluations, Table 7 suggests that women tend to be evaluated more highly than men. One possible explanation is that women who decide to pursue male-dominated degrees are likely to be highly qualified, e.g., one study found that more men than women with low high school mathematics scores pursue STEM degrees (Hango, 2013). Another possible explanation is that the "boomerang" effect (explained above) creates a pro-female bias in supervisors (Breda & Hillion, 2016), making them evaluate female STEM workers differently than men. In terms of evaluations on specific criteria, gender stereotypes could have influenced workplace evaluations. According to Heilman (2012), women are rated higher than men on communal qualities (e.g., those related to social relationships), while men are rated higher on agentic qualities (e.g., those related to goal achievement).

Specifically, women tend to be evaluated more highly on written, oral, and interpersonal communication (Table 7). In addition to the reasons stated above, Wang & Degol (2017) found a gender difference in ability. They found that girls are more likely to possess both high mathematical and verbal abilities, and boys are more likely to demonstrate higher mathematical abilities relative to their verbal abilities. In addition, the higher evaluation scores women receive on teamwork should be noted (Table 7). A recent report on collaborative problem solving from the Programme for International Student Assessment (PISA) similarly found that girls outperform boys in collaborative problem solving in several countries (OECD, 2017). This difference suggests further investigation, especially with the growing awareness of the importance of collaborative efforts, even in traditionally competitive fields such as STEM (Borrego, Karlin, McNair, & Beddoes, 2013).

On the other hand, men in computing were perceived as having an entrepreneurial orientation more often than women (Table 7). Related work on risk-taking presented conflicting reports on how risk averse men and women are (Nelson, 2015). There is also recent work reporting that universities produce fewer female entrepreneurs (Andrade, Chopra, Nurlybayev, & Golab, 2018). Given the importance of entrepreneurship in today's economy, it is interesting to note that any group, men or women, receive higher evaluations in this area.

Difference in Satisfaction

Table 8 suggests some gender differences in students' evaluations of their WIL experiences. Men appeared to be more satisfied, especially with opportunities to make meaningful contributions at work, expanding their professional network, and working on topics related to what they learned in the classroom. Additionally, senior men in computing commented more positively than women on receiving appropriate compensation. These results point to gender differences in (perceived) workplace experiences. They offer support to prior, largely qualitative, work on gender differences in workplace experiences. In particular, prior work found evidence of men receiving more opportunities (including to network and contribute meaningfully to their work) and fair compensation (Berheide et al., 2013; Panther et al., 2018; Seron et al., 2016; Smith & Gayles, 2018; Gardner & Blackstone, 2013). They identified underrepresentation of women and overt discrimination against them to be the main causes of women's dissatisfaction with STEM. Research suggested that STEM workplaces tend to offer incentives that are valued by men more than women (Konrad, Ritchie, Lieb, & Corrigall, 2000), contributing to a gender difference in satisfaction. Based on past work, men and women may evaluate STEM jobs on different scales and criteria (Konrad et al., 2000; Su et al., 2009), resulting in the observed differences in satisfaction.

Finally, in the analysis of students' evaluations of their employers, the only difference in favour of women was in the availability of employer support, observed mainly in junior women in computing (Table 8). Assuming that "employer support" is related to "mentorship", this result does not fall in line with prior work reporting that women receive less mentoring than men (Berheide et al., 2013; Moss-Racusin et al., 2012). These differences are important to examine further as they may impact young engineers' career trajectories: there is evidence that dissatisfaction over pay and working conditions can explain the higher rate of attrition for women in STEM as compared to men (Hunt, 2016).

CONCLUSIONS

This work leads to the following actionable insights for students, academic institutions, and WIL employers. In terms of opportunities, it was found that men and women appear equally likely to obtain interviews and secure jobs in the WIL process. This suggests that in a WIL environment with short work terms and a structured job search and feedback process maintained by the university, there is no evidence that women in engineering are disadvantaged. Since past research suggests that women's perception of STEM as "inhospitable male bastions" discourages them from pursuing STEM degrees and careers (Williams & Ceci, 2015; Alon & DiPrete, 2015; Steele, James, & Barnett, 2002), women interested in studying engineering may find these results encouraging.

In terms of choices or preferences, this study found that women in computing are more likely than men to apply to jobs involving user interfaces and user experience. Consequently, highlighting the different types of jobs may attract more women to study computing and engineering: in addition to software developer and system analyst roles, there are WIL opportunities in user interfaces/user experience, data analysis/data science, and project management. This point should be of interest to academic institutions and employers wishing to increase STEM enrolment and diversify the talent pool. Similarly, adding user experience and data analysis elements to curricula may combat the observed gender difference in satisfaction regarding how work was related to the student's academic program. Additionally, adding these elements might be a way to align STEM's male-centric pedagogy with women's goals and interests, thus attracting and retaining more women in STEM (Blickenstaff, 2005).

In terms of perceived competencies, this study found that women tend to receive higher performance appraisals from their WIL employers. These results may be used to combat stereotypes regarding gender difference in STEM ability (Sullivan & Bers, 2016; Jones, Howe, & Rua, 2000). Furthermore, it was found that men and women are rated differently on some skills by their WIL employers. As a result, universities and employers may want to provide resources to help students acquire these skills, including communication and entrepreneurship.

Finally, in terms of satisfaction, a focused analysis on a second batch of students suggested that men appeared to be more satisfied with their WIL experiences than women. In order to attract and retain STEM talent, employers and institutions should ensure that both men and women are satisfied with the availability of support and networking opportunities, as well as with compensation and opportunities to make meaningful contributions at WIL work terms.

This data-driven analysis provides a starting point for further study, with feedback from students and WIL employers, of the reasons behind the observed gender differences in choices, preferences, opportunities, job duties, perceived competencies, and satisfaction. In particular, there may be other factors driving students' satisfaction with WIL besides the seven criteria identified by the university (Table 8). As mentioned in the literature review, prior work suggests that women in STEM report negative experiences when working in teams more than men. Investigating whether women who received higher teamwork scores were more satisfied with their WIL experience could reveal additional insight. This would require additional knowledge of the nature of the teamwork, e.g., the presence of female peers and mentors on the team. Furthermore, this paper separately studied employers' evaluations of students and students' satisfaction with their WIL employment. It would be interesting to examine the role of gender in work terms where the student was rated highly but did not reciprocate or vice-versa. Finally, collecting additional data from alumni could reveal whether positive or negative early experiences through WIL impact students' career paths, especially, gender specific attrition.

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International Journal of Work-Integrated Learning
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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 2018 the journal name was changed to the International Journal of Work-Integrated Learning.

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. Defining elements of this educational approach requires that students engage in authentic and meaningful work-related task, and must involve three stakeholders; the student, the university, and the workplace"*. 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, entrepreneurships, student-led enterprise, etc. WIL is related to, but not the same as, the fields of experiential learning, work-based learning, and vocational education and training.

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.

The Journal is ongoing financially supported by the Work-Integrated Learning New Zealand (WILNZ), www.nzace.ac.nz and the University of Waikato, New Zealand, and received periodic sponsorship from the Australian Collaborative Education Network (ACEN) and the World Association of Cooperative Education (WACE).

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 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.

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