

## **Board 69: Co-ops are Great! but What Are the Final Numbers Telling Us?**

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## **Co-ops are Great! but What are the Final Numbers Telling Us?**

### **Abstract**

This paper discusses the results of an engineering cooperative program for over a three year period. At York College of Pennsylvania (YSP), students are required to pursue three co-op opportunities over the course of their four year academic schedule. Many faculty and industry personnel are familiar with the benefits that engineering cooperatives (co-ops) provide to both students and employers. Based on data from graduating civil engineering student survey results, co-ops are shown to increase a student's probability of receiving a full time employment offer from their co-op employer. This paper will also discuss if the school data follows national hiring trends. The results of the study also discuss the percentage of students who pursued multiple co-op opportunities with the same company versus students who pursued co-op opportunities with different companies. In addition, the results will also show how many students accepted full time employment with companies they completed a co-op experience with versus students who accepted an offer from a company they did not complete a co-op with.

### **Background**

Cooperative work experience, also commonly referred to as co-op, is not a novel program for academic and industry partners. Co-ops have been integral parts of engineering programs for the past 100 years. The first formally documented cooperative program started at the University of Cincinnati in 1906 [1]. As the word implies, co-ops are a partnership between academia and industry. Academia relies on industry for graduate employment and feedback for accreditation and industry requires students for future employees [2]. Today, a co-op is not just considered summer employment. Many programs allow students to participate in a co-op during a spring and/or fall semester in addition to summer break. At York College of Pennsylvania (YCP), the engineering co-op experience has developed into a program where a student is immersed full-time with a company or organization for three to five months at a time per co-op opportunity. The students are required to complete three co-op employment opportunities prior to graduation [3].

### **Student Benefits**

The benefits of co-op participation have been well researched and discussed in the past, not just in scholarly academia publications but also in popular industry publications. Co-op education provides students with work experience between academic semesters at schools and follows a variety of participation schedules. While it may be argued that students gain knowledge in the fundamentals of engineering by completing the program objectives of their various academic programs they also gain additional engineering knowledge while learning to apply these fundamentals in an actual work setting. In addition, the co-op experience is just that and allows

students to not only gain skill in applying such knowledge but they also gain knowledge in the application of “soft”, or non-cognitive, skills in communication, professionalism, and ethics. One could classify all these benefits as experiential learning opportunities. This real world engineering work opportunity also allows students to integrate their newly acquired work experience knowledge and skill with academic classes [1] [3].

Research has shown that the most significant perceived benefit to students participating in a co-op is gaining work experience. Other perceived benefits include developing a competitive edge in the job market, networking, and career exploration. Not surprisingly, due to the constraints of student budgets and tuition costs, earning money during the co-op was also a significant perceived benefit. Studies also found the primary student reason for participating in a co-op was to improve future employment opportunities. In addition to these perceived benefits, students who did participate in co-op opportunities earned a higher grade point average and had a higher graduation rate when compared to students who did not participate in a co-op experience [1] [4].

### **Industry Benefits**

Recruitment appears to be the overall reason that industry partners participate in co-op programs. A significant part of this recruitment process includes evaluating the students in both terms of the quality of a potential new full-time employee but also to understand if the student is interested or gaining interest in the type of engineering discipline(s) that a particular company performs in the industry [4]. Since recruitment is a significant expense, employers are very concerned with yields from the expense and effort devoted to recruitment. Studies from 1984 and 2015, both show that employers were satisfied with recruitment goals resulting from co-op programs [5] [1].

Other significant factors that employers want to reduce are employee training costs and turnover rates. Employer surveys revealed that co-op hires had less training costs than non co-op employees. Employers also rated employee retention as higher with co-op hires when compared to non-cop hires [5].

## The York College of Pennsylvania Cooperative Program

The YCP program requires all engineering students to participate in three cooperative work experiences within the engineering industry. These three co-ops will provide each student with nearly a year of work experience before graduation. The co-ops occur during the course of a four-year academic course schedule. However, unlike the majority of universities and colleges across the nation who typically have eight semesters over a typical fall/spring annual semester sequence, the students at YCP complete two semesters annually on a rotating summer, spring, fall co-op schedule. As a result of this sequence, the students who stay on track with the academic and co-op course schedule will graduate in August compared to the typical May graduation at the majority of higher educational institutions. The typical academic/co-op schedule that students follow is shown in the following table [6].

**Table 1: 4-year academic and co-op schedule**

<b>Year</b>	<b>Fall</b>	<b>Spring</b>	<b>Summer</b>
1st Year	Full Academic Term	Full Academic Term	Break
2nd Year	Full Academic Term	Full Academic Term	<b>CO-OP I*</b>
3rd Year	Full Academic Term	<b>CO-OP II</b>	Full Academic Term
4th Year	<b>CO-OP III</b>	Full Academic Term	Full Academic Term

\*Summer Co-op (2020) was cancelled for the Class of 2022 students

### Co-op Requirements

Prior to registering for a co-op, students are required to complete a one-credit-hour course on engineer career training during the spring semester of their sophomore year. The learning objectives of the course cover topics on communication, professionalism, and ethics. Students also create resumes and cover letters, participate in mock interviews, and network with industry leaders from the various disciplines in civil engineering. While on co-op, students are assigned a faculty advisor who visits the student and the student's co-op supervisor sometime during the middle of the co-op duration. The faculty advisor meets with the student and supervisor to discuss the student's progress and performance during the co-op. After the completion of the co-op, an online evaluation survey is emailed to the co-op supervisor to document the student's performance and provide comments about the civil engineering co-op program. Returning students also create a poster showcasing their co-op experience. The posters serve as a reflection on the co-op experience as well as advertisements to future students looking for co-op opportunities [6].

### **Civil Engineering Co-op Program**

The civil engineering program at YCP is fairly new. The inaugural civil engineering student cohort were members of the class of 2020 and participated in their first co-op opportunities in the summer of 2018, after the completion of the sophomore year. In 2020, the inaugural civil engineering class had 14 graduates. The Class of 2021 followed with 17 graduates and the Class of 2022 graduated 23 students, with the department totaling nearly 100 students as of spring 2023. The Class of 2023 is projected to have 30 graduates.

### **Employment Results**

Completed co-op opportunities for each student are tracked and documented. Just prior to graduation, students also participate in a survey which documents where they will be working full-time after graduation. These results were recently reviewed to determine what percentage of the graduates are employed with companies at which they completed at least one co-op. Preliminary results from the YCP civil engineering program show that students were more likely to accept full-time employment with one of their co-op companies in 2020 and 2021. The results, shown in Table 2, show that roughly 65% to 69% of graduates from the Classes of 2020 and 2021 are now employed full-time with one of their co-op employers versus 31% to 35% of graduates employed at a company where the student did not complete a co-op with.

**Table 2: Graduate employment rates with co-op companies**

<b>Class</b>	<b>Number of students</b>	<b>Students who accepted offer from co-op employer</b>	<b>Acceptance rate</b>
2020	13	9	69 %
2021	17	11	65 %
2022	23	9	39 %
<b>Totals</b>	<b>53</b>	<b>29</b>	<b>55 %</b>

Preliminary data showed a clear and positive trend for 2020 and 2021. As the number of graduates slightly increased so did the number of graduates who accepted a full time offer from a company that they completed a co-op with. However, the data from the Class of 2022 cohort showed a significant decrease.

To try and understand what factors may have contributed to the reversal in the acceptance rate, the student survey results for the Class of 2022 were reviewed and compared to the previous classes. The number of offers the students from the Class of 2022 was analyzed to determine if the students were receiving less offers from co-op employers. The results in Table 3 showed that the students did receive a lesser percentage of offers from co-op employers. The Class of 2022

graduates not only received fewer offers from their co-op companies but the students also had a lower acceptance rate of offers given as compared to the previous two years.

**Table 3: Number of full-time offers from co-op employers**

<b>Class</b>	<b>Students</b>	<b>Received offer from their co-op employer</b>	<b>Acceptance rate</b>
2020	13	10	77 %
2021	17	14	82 %
2022	23	14	61 %
<b>Totals</b>	<b>53</b>	<b>38</b>	<b>72 %</b>

However, the survey results and faculty observations for the Class of 2022 show that the majority of students received multiple offers not just from companies that they completed a co-op with but also from companies that were participants in YCP’s co-op program. As a result of these observations, another analysis was done to determine what was the employment rate with companies that participated in the college’s co-op program even though a student may have not completed a co-op with that specific company. Table 4 shows that roughly 70% of the students from all three graduating years accepted offers from a company that participated in YCP’s civil engineering co-op program, regardless if they actually completed a co-op with that specific company.

**Table 4: Graduates employed by participating co-op companies**

<b>Class</b>	<b>Students</b>	<b>Offers from any co-op employer</b>	<b>Acceptance rate</b>
2020	13	9	69 %
2021	17	12	71 %
2022	23	16	70 %
<b>Totals</b>	<b>53</b>	<b>37</b>	<b>70 %</b>

On the other hand, the results listed in Table 5 shows that students who completed two or more co-ops with the same company were more likely to be offered and accept a position with that company compared to those students who only completed one co-op with a company. Although this is an obvious trend it does show that students who are interested in a company they completed a co-op with are likely to pursue additional co-op and full-time employment opportunities with that same company.

**Table 5: Number of co-ops with same company and graduation hire rate**

<b>Number of co-ops</b>	<b>Number of students</b>	<b>Graduates hired</b>	<b>Hire rate</b>
1 co-op with same company	53	29	55 %
2+ co-ops with same company	28	20	71 %

### **Need for Further Research**

Although the data is limited to the small sampling size of three graduating classes of a new engineering program, preliminary results show that students were more likely to accept a full time offer from their co-op employer. This result tends to follow trends documented by the National Association of Colleges and Employers (NACE) Internship & Co-op Survey Report, which shows that employers have had success in converting internship and co-op students into full time employees. However, the NACE data also analyzes a conversion rate, which is a product of the percentage of employer offers and student acceptance rates. For example, if a company makes full-time employment offers to 80% of the co-op students and 80% of those students accept the offer, then the conversion rate would be 64%. Such a statistic would be useful in marketing the benefits of developing partnerships with YCP's civil engineering program and future employers [7].

To understand and market the benefits of a co-op program, similar co-op data will need to be collected from future student cohort classes. In addition, the student survey needs to be expanded to include documenting how many offers students received from employers that they participated in a co-op with in addition to what offer they accepted.

Other factors that could have impacted the Class of 2022 results also need to be researched. The Class of 2022 was significantly affected by Covid-19 protocols. In the spring of 2020, classes were removed to a remote setting and a majority of co-ops planned for the summer of 2020 were cancelled. Furthermore, all co-op and career networking events were cancelled and were slow to return. The university was back to its pre-covid operations in the spring of 2022. As a result, the Class of 2022 experienced a significant increase in recruiting efforts from both companies that offered co-ops and those who did not. There was also a significant increase in the number of offers per student. The aggressive hiring process did create a more competitive hiring environment for employers as they tried to also catch up with the backlog of pandemic delayed projects. However, this was an observation and the actual amount of offers received per student were not quantified.

## Bibliography

- [1] J. M. N. R. J. D. M. O. B. Strubel, "Modeling student perceived costs and benefits to cooperative education programs (Co-ops) and pathways to participation," in *IEEE Frontiers in Education Conference*, 2015.
- [2] L. E. Daphene Koch, "Building the Future of Construction Industry through Academic Partners," in *53rd ASC Annual International Conference Proceedings*, 2017.
- [3] S. Hamilton, "Co-Op Program Provides Full-Time Work Experience," *Civil Engineering*, pp. 18-19, March 2019.
- [4] D. Wanless, "Perspectives from internships and co-ops with industry," in *120th ASEE Annual Conference & Exposition*, Atlanta, 2013.
- [5] R. C. P. Richard P. Nielsen, "Employer Benefits and Cost Effectiveness of Cooperative Education Programs: A Review," National Commission for Cooperative Education, Boston, 1984.
- [6] Blind "Civil Engineering Program," accessed December 2021.
- [7] N. Staff, "Converting Interns, Co-ops Into Full Time Hires On The Rise," *National Association of Colleges and Employers*, p. 3, 12 April 2019.