# AC 2011-2704: COMPUTING STUDENTS RELATIVE USE OF COOPERATIVE EDUCATION SERVICES WITHIN AN URBAN UNIVERSITY

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# Computing Students Relative Use of Cooperative Education Services within an Urban University


## Abstract

Computing students used the cooperative education services of an urban university at a relatively lower rate than business students. However, this lower participation did not appear to negatively affect the overall employment outcomes of computing students in industries that participated in the cooperative education program. Some of the students who did not use cooperative education services might have done so through rational decision making that yielded an option of a faster trajectory to higher hourly pay rates and quality major related professional experience, which some employers might have found to be an asset for full-time employment.


## Introduction

Cooperative education (coop ed) programs were initiated to provide engineering students with a more holistic educational experience inclusive of theory and workplace practice. They are now open to students in all disciplines and majors in some universities. Relatively higher starting salaries for coop ed students upon full-time employment have been viewed as one of the key benefits of participating in coop ed programs[1,4,15]. Because coop ed students often obtained higher than minimum starting salaries on their full-time jobs they tend to be more loyal employees when compared to peers with lower starting salaries[4]. However, the actual length of time the salary advantage lasts is arguable. Some researchers contend that the salary advantage seems to vanish within five years[5,15]. What seems to be less arguable are that women and those who would otherwise have little or no related work experience prior to full-time employment tend to benefit more from coop ed experiences[5,15]. Moreover, students benefit from coop ed programs in other ways. Some of these ways include clearer career goals, marketable workplace skills, better access to employers, assessment feedback of workplace tasks, money to help pay for education related expenses, reduced incurred debt on educational loans, and interdisciplinary learning experience[5,6,10]. Another seemingly important benefit of coop ed to students is its effect on classroom learning. However, the research on the educational benefit is not sufficiently conclusive[1,10,14,16]. Some researchers have found hardly any evidence supporting meaningful assessment of student learning based on having a coop ed experience[5,9,16]. Besides, faculty have not fully accepted coop ed as being an academically sound program[5]. In contrast, many employers engage in coop ed programs for financial savings, better recruitment, higher productivity, relationship building, and improved retention purposes[2,4,5,10]. Employers also use coop ed programs to prescreen for potential enthusiastic new employees at reduced cost. While coop ed benefits to employers have been found to be consistent, its benefits to students are somewhat inconsistent, but this may be the result of several factors including the local economy and the relative location of the institution[5].

Over the last 40 years, many researchers have reported on the value of coop ed to computing students[3,6,12,13,17]. Many of these studies reported positive student reactions to the coop ed experience, especially in providing them with exposure to work on real problems that utilize academic knowledge and skills as well as broadening their knowledge and understanding of industry culture and practices[3,6,12,13]. Some coop ed programs are selective and favor academically competent and professionally informed students[17].

We have hardly seen any study that used non-engineering or non-computing students as a basis for studying the participation of engineering and computing students in coop ed programs. For this work, computing comprises computer science, information systems, and technology systems majors. Because of the origins, purpose, and benefits of coop ed programs, it would be both informative and instructive to know the extent to which engineering and computing students are using the services of coop ed programs. Therefore, this paper contributes to the literature by studying the extent to which computing students use the services of an urban university's coop ed program relative to business students who constituted the largest sub-population of the university during the study period. The paper will highlight the relative percentage of undergraduate computing students that use coop ed services as well as discuss the implications of that usage. Moreover, it will examine the percentage of coop ed undergraduate computing students relative to coop ed undergraduate business students hired full-time in the same coop ed internship industries as well as the relative percentage of coop and non-coop ed computing students who obtained full-time employment in these same industries. The results showed that computing students used coop ed services less than business students. Computing students had at most three coop ed experiences, but the percentage of students with two coop ed experiences was about the same as that for business students and ultimately both types of students mainly found full-time employment in the financial industry.

**Data Preparation and Processing**

The data sets used for the study were obtained from the office of Cooperative Education and Career Services in a Microsoft Excel file. The file was comprised of a coop ed and a full-time employment data set. The data sets were separated by discipline: two for the business discipline and two for computing. The data for undergraduate students participating in coop during 1994-95 through 2004-05 were filtered out of the coop ed data sets and the students who obtained full-time employment during 1998 through 2006 in each discipline were also isolated (see Table 1). The two data sets per discipline were inserted into a Microsoft Access database so that the fulltime and coop ed data for each discipline could be matched on students first and last names. This process yielded 45 computing students and 657 business students. In order to establish a common basis of comparison between the coop ed students from the two disciplines, the coop ed companies in each discipline's data were coded on the basis of whether the company's industry was in both data sets. Finally, these industries were identified in the full-time employment data for each student in the computing and business data sets yielding the information shown in Table 4.

**Results**

The results showed that computing students used the resources of the university's coop ed program less than business students over the 12-year study period spanning academic years 1994-95 to 2005-06. Of the 1090 computing students who used the office of Cooperative Education and Career Services to obtain coop ed internships and full-time employment, only 21.6% had at least one coop ed experience compared to 52.7% of the 3025 business students who similarly used the offices' services (see Table 1). In addition, 1828 computing and business students used the coop ed services to obtain internships. Of this number, only 13% were computing students (see Table 2). For the computing and business students who obtained coop ed internship experiences and full-time employment, no computing student had more than three

**Table 1**

**Distribution of Cooperative Education Undergraduate Students by Discipline**

| Type of Student | Computing | Business |
|---|---|---|
| Number of Coop Ed Students | 235 | 1593 |
| Number of Non-Coop Students Obtaining Full-time Jobs | 855 | 1432 |
| **Total** | **1090** | **3025** |
| **Coop Ed Percentage** | **21.6%** | **52.7%** |

**Table 2**

**Relative Percent of Overall Cooperative Education Undergraduate Computing Students**

| Total Coop Ed Computing Students | Total Coop Ed Computing and Business Students | Overall Percent of Computing Coop Ed Students |
|---|---|---|
| 235 | 1828 | 12.9% |

coop ed experiences while some business students had up to six. Computing students had relatively more one coop ed internship experiences – 71% and essentially the same amount (27%) of two coop ed internships as the business students (see Table 3). Nineteen percent of the total number of coop ed computing students received full-time employment through Career Services. This percentage is less than that for business students by 22%. Of this percent, 35.6% got full-time employment in the same industries that provided computing coop ed internships, 6.3% less than that for business students. When computing students who obtained full-time employment in their coop ed industries between 1998 and 2006 are compared with coop ed business students that met the same criteria, it was found that computing and business students mainly gained full-time employment in the financial industry. Eighty-one percent of coop (37.5%) and non-coop ed (43.5%) computing students received employment in the financial industry compared to 66.4% (43.8% of coop ed and 22.6% of non-coop ed) in the information technology industry (see Table 4). Education was the third most frequent coop ed industry in which computing students found employment with most of the employed being non-coop ed students.

## Observations and Discussion

The study revealed that computing students made relatively less use of the urban university's coop ed program services. Of those who obtained coop ed internships as well as full-time employment through the office of Cooperative Education and Career Services, 98% had one or two coop ed experiences with most having one coop experience. Moreover, across the many companies within the financial and education industries that participated in the university's coop ed program, not having a coop ed experience did not seem to negatively affect the hiring of a computing student for full-time employment. In both the financial and education industries,

computing students with no coop ed experience were hired in greater numbers than those with coop ed experience. This situation did not necessarily hold true for business students. Of the 275

**Table 3**

**Distribution of Undergraduate Computing and Business Students Obtaining Cooperative Education Internships and Full-time Employment between 1994-95 and 2005-06**

| Computing Students | | | | | Business Students | | | |
|---|---|---|---|---|---|---|---|---|
| **Number of coops** | **Number of Students** | **Percent of Students** | **Number of Coops** | **Percent of Coops** | **Number of Students** | **Percent of Students** | **Number of Coops** | **Percent of Coops** |
| 1 coop | 32 | 71.1% | 32 | 54.2% | 391 | 59.5% | 391 | 37.7% |
| 2 coops | 12 | 26.7% | 24 | 40.7% | 178 | 27.1% | 356 | 34.3% |
| 3 coops | 1 | 2.2% | 3 | 5.1% | 69 | 10.5% | 207 | 20.0% |
| 4 coops | 0 | 0.0% | 0 | 0.0% | 14 | 2.1% | 56 | 5.4% |
| 5 coops | 0 | 0.0% | 0 | 0.0% | 3 | 0.5% | 15 | 1.4% |
| 6 coops | 0 | 0.0% | 0 | 0.0% | 2 | 0.3% | 12 | 1.2% |
| **Totals** | **45** | **100%** | **59** | **100%** | **657** | **100.0%** | **1037** | **100%** |

**Table 4**

**Distribution of Computing and Business Undergraduate Students Obtaining Full-Time Employment in Cooperative Education Industries between 1998 and 2006**

| | Computing | | | | Business | |
|---|---|---|---|---|---|---|
| **Coop Ed Industry** | **Number of Coop Ed Students** | **Percent of Coop Ed Students** | **Number of Non-Coop Ed Students** | **Percent of Non-Coop Ed Students** | **Number of Coop Ed Students** | **Percent of Coop Ed Students** |
| Chemical | 0 | 0.0% | 1 | 1.6% | 0 | 0.0% |
| Education | 1 | 6.3% | 10 | 16.1% | 0 | 0.0% |
| Energy | 0 | 0.0% | 1 | 1.6% | 5 | 1.8% |
| Finance | 6 | 37.5% | 27 | 43.5% | 203 | 73.8% |
| Government | 0 | 0.0% | 3 | 4.8% | 10 | 3.6% |
| Information Technology | 7 | 43.8% | 14 | 22.6% | 9 | 3.3% |
| Media | 0 | 0.0% | 4 | 6.5% | 8 | 2.9% |
| Insurance | 1 | 6.3% | 1 | 1.6% | 26 | 9.5% |
| Personal Care & Hygiene | 1 | 6.3% | 1 | 1.6% | 1 | 0.4% |
| Other* | 0 | 0.0% | 0 | 0.0% | 13 | 4.7% |
| **Total** | **16** | **100%** | **62** | **100%** | **275** | **100%** |

*Other represents the following industries: food & beverage, law, real estate & construction, tobacco, and transportation.

coop ed business students who obtained full-time employment within the computing coop ed industries, 74% got full-time employment in the financial industry. Because the local economy has a large number of finance related companies, it is assumed that a large percentage of the non-coop business students would also be employed in this industry. However, why did non-coop computing students get hired at a larger percentage rate than the coop students given that many

companies got involved in coop ed for the purpose of prescreening potential candidates for permanent hire? Were employers able to achieve some of their other goals for participating in a coop ed program such as early high productivity and financial savings by hiring non-coop ed students?

Joseph and Payne[9] found that a comparison between coop and non-coop ed computing students is complex, since the non-coop population "may include a large percentage of students who engage in various types of major related and unrelated work experiences." Gardner and Motschenbacher[4] further stated that computer science students with coop ed experience tended to become employed in relatively smaller sized companies and usually at positions higher than entry level if they had summer work experience. They said that discipline and company size affects level of entry into an organization. They are also reported to have suggested that students might obtain the advantages of coop ed through "other experiential learning" practices[5]. For the computing student, being able to integrate theory with practice through creative, critical, and practical thinking and know-how is very important. Notwithstanding the salary benefit of coop ed upon entry level full-time employment, students like companies have immediate financial concerns, such as paying educational expenses, that influence their decision to participate in workplace experiences while enrolled in college. As rational decision makers, some students might decide to engage in discipline related work experiences while working part-time in spring and winter semesters and full-time in the summer at the highest possible hourly rate given their practical skills under the constraint of maintaining full-time or near full-time college enrollment. This type of thinking on the part of students could benefit employers; especially those who purposefully design employment programs inclusive of coop and non-coop ed participants and that focus on new employees having discipline related work experiences. These employers would save on training expenses without losing access to potentially highly motivated and productive new employees. This scenario seems to reflect the behavior of coop ed participating financial and education industry companies in hiring computing students for full-time employment – they respectively hired 6% and 10% more non-coop ed computing students than coop ed ones. Moreover, the non-coop computing students might have been professionally more experienced than their coop ed counterparts and were therefore hired as more knowledgeable and skilled lower risk new employees.

According to Huggins[6] local market forces strongly influence student and employer participation in coop ed programs. Local markets can be complicated with the mix of non-profit organizations as well as for-profit large, medium, and small entrepreneurial companies that might be experiencing somewhat different economic realities. Larger firms might limit the number of coop ed internship offers or offer a relatively lower hourly pay rate while smaller entrepreneurial companies might be less interested in interns and more interested in student workers as part-time consultants, that receive higher hourly pay rates than what are received by coop ed interns. In the 2004-2005 academic year of this study the average hourly rate for undergraduate coop ed computing students was $15.00-$16.00 with a range from $10.00 to $33.00. Over the period of the study, there was an increasing demand for computing professionals. This demand was not just limited to information technology related firms, but it included the general mix of firms and industries. It was made even more acute with the rise of the dot com and the Y2K retrofitting of computer systems. The turn of the century and the fall of the dot coms as well as the presumed adverse effect of outsourcing on computing jobs led to a general lack of potential students'

interest in computing education that subsequently resulted in the fall in college enrollment. The slump in and sluggish recovery of college student enrollment in the first decade of the 21st century did nothing to slow down the demand for computing professionals in some local economies. This suggests that in a vibrant local economy of competing firms and industries seeking computing professionals, even computing students with minimal professional experience gained within the first year of college might be able to demand higher than usual hourly pay rates. This means that smaller entrepreneurial and non-profit companies might not be able to compete with larger firms for scarce and expensive highly skilled computing professional services and would therefore settle for lower priced computing student professionals. The student professional with limited experience would then negotiate a higher than intern hourly rate with the smaller entrepreneurial or non-profit company who could not afford the more expensive computing professional service. From this start, the non-coop computing student would likely build his/her professional experiences at a faster rate than peers with coop ed internship experiences. This argument offers an explanation for why companies in the financial industry prefer to hire non-coop ed computing students for full-time employment. The argument offered is also bolstered by the fact that while most coop ed computing students who obtained full-time employment in the computing coop ed industries did their internships in information technology firms, they were about twice as likely to gain their full-time employment in the financial industry upon graduation. Therefore, these computing students were behaving entrepreneurially. In fact, it was observed that some computing students work professionally in small entrepreneurial and non-profit companies. These students relatively higher hourly pay rates help to subsidize their tuition payments. Thus, the students simultaneously build academic knowledge and professional skills while enrolled in college. Upon graduation, they enter the workforce as experienced professionals.

## Conclusion

Although a relatively small percentage of computing students used the services of the coop ed program, they did not appear to be negatively affected by it in securing full-time employment upon graduation. One reason for this might be that employers are not altruistic about their coop ed involvement and some of the computing students make rational decisions about the relative pay-off of coop ed versus non-coop ed major related work experience, choosing the option with the fastest trajectory to higher hourly pay rates and quality professional experience. When the decision of the computing student favors non-coop major related workplace experience, employers might benefit with greater financial savings in new employee pre-professional and professional training without sacrificing the amount of time to higher productivity.

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