Cooperative Education: An Exploratory Study of its Impact on Computing Students and Participating Employers

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Abstract – The University of Technology, (UTech) Jamaica recently implemented an exploratory cooperative education program in its computing curricula where students work part-time for five days per week and attend classes’ fulltime in the evenings. This paper uses a case study methodology based on semi-structured interviews with both students and employees to determine the impact of this cooperative education model. This paper explores factors found in the literature that internship has an impact on, including GPA, time management, team work, problem solving and communication skills. From the company’s perspective factors examined were, students overall attitude, skills level and the impact of the program. The preliminary results are encouraging with students indicating considerable improvement in time management. Initial findings also suggest that the participants’ grades were not negatively impacted by their involvement in the program. The responses from the employers have all been positive. The findings will help to determine what model the School implements and may provide a framework for other universities to adopt.

Index Terms - Computer Science, Information Technology Cooperative Education, Internship, Jamaica

INTRODUCTION

The School of Computing and Information Technology (SCIT) at the University of Technology, Jamaica (UTech) in revamping its curriculum for 2008 incorporated a cooperative education component in response to the University’s prompting and trends in all disciplines. According to [1] students, employers, and academics are all calling for more programs to incorporate cooperative education components to make education relevant to jobs and organization. Disciplines such as engineering have long incorporated cooperative education as part of the professional training and certification.

One of the recurring curriculum issues is whether or not to include a work experience component for all students. UTech has work experience components in several of its programs. Its Engineering and Pharmacy degree programs both have internship components which contribute to the professional qualification of the students in these programs. In the past, graduates of SCIT Computing diploma program were required to gain a minimum of two years of work experience in the relevant field prior to starting the post diploma degree. This requirement was later relaxed to one year in any field. The post-diploma degree was later replaced by a 4-year degree program. This degree had no work experience or internship component. However, during its initial years the program administrators tried to incorporate a summer work study program. This initiative failed because there were not enough (work-study) jobs for all the students. As a result of this, the 4-year program was administered without a structured work experience program. Due to financial pressures several students hold part-time and full time jobs while pursuing the full-time program. These jobs were not necessarily related to the student’s area of study. With the recent revision of the SCIT’s degree program (dubbed Curriculum 2008) the issue of coop education was again revisited.

The paper is structured as follows: First there is an outline of the aim of the study, followed by a description of the structure of the pilot program. This is followed by a brief literature review, and then the methodological approach used to gather the data. We then discuss the findings and the limitations of the study.

AIM OF THE STUDY

SCIT needed to decide on a co-op education approach to integrate in its revised curriculum. The aim of the present study is to provide some insights on the effectiveness of the pilot program. The following research questions were addressed:

- What was the impact of the cooperative education program on student’s academic performance?
- How did students access their learning experience in the workplace for their career development?
- What if any debasement experience did students encounter?
- What were the main weaknesses of the pilot program as perceived by the students and what were the suggestions for improvements?
- What were the employer’s expectations of the students and to what extent were they met?
STRUCTURE

The proposed structure of the new coop education initiative required that students successfully complete all subjects in the first two years of study. Students would have gained a broad theoretical base in computing and communications, completing courses such as Programming, Introduction to Networks, Data Structures, Software Engineering, Database Systems, Web Technologies and Communications.

Two predominant coop education models were identified in the literature [2]. In one model the student alternate a semester of academic coursework with an equal amount of time in paid employment repeating this cycle several times until graduation. The second approach, the parallel method splits the day between school and work. SCIT adopted a variation of the parallel model; students were engaged in paid industry employment in the mornings from 8:00 am to 1:00 pm for two consecutive semesters. They attend classes in the evenings from 3:00 pm until 8 or 9:00 pm for four or five days per week. This structure ensured that students would not take longer than the required four years to complete the degree.

LITERATURE REVIEW

According to [3] one of the problems of conducting cooperative education research involves defining what is meant by internship. In [4] it was suggested that the term internship can be used as a catchall word to describe all work programs that are designed to supplement a student’s academic coursework. The terms used include internship, co-op, externships, apprenticeship, and career academically. Some researchers make a distinction between cooperative education and internship; coop students tend to work full time while interns work part time. For the purpose of this paper the terms cooperative education and internship will be used interchangeably and the operational definition used by [5] “a unique form of education and experiential learning which integrates classroom study with paid, planned and supervised work experience in the private and public sector” will be adopted. This definition is consistent with the aims of the University’s cooperative education program.

The Joint Task Force on Computing [6] has indicated that any reputable computing degree program should include inter alia the acquisition of skills beyond technical skills. These skills should include interpersonal, communication, team and management skills as appropriate to the discipline. In order to have value, learning experiences must build such skills and not just convey that they are important. The above mentioned skills are also outcomes of co-op education, and as highlighted by the literature [5], the experience provides students with: 1) enhanced student self-confidence, self concept and improved social skills, 2) enhancement of practical knowledge and skills, 3) enhanced employment opportunities, 4) attainment of necessary skills to supplement theoretical training and 5) enhancement of the induction process when the student joins the workforce.

FINDINGS

From the employers perspective [5] and [7] suggested that the reasons why companies participate in coop education includes the following: to develop an improved company image and achieve greater awareness of the company among the community; as a relatively inexpensive and simple means of recruiting new employees who may be attracted back to the company after graduation if desired; to increase employee productivity by employing students who are fresh and eager to learn and achieve, and to supply the company with a steady stream of “new blood” and fresh ideas.

METHODOLOGY

The studies found in the literature [5] generally adopted a qualitative methodology. In [8] it was argued that this method was more subtle in uncovering details of students work experiences and providing insights into the dynamics and processes involved in work related learning. The small number of students (seven) involved in this exploratory pilot study also dictated that a case study methodology approach be chosen. The objective was to place 15 students however, only seven students were placed. Prior to placement, staff members (academic and administrative) prepared the students for the interviews with the companies emphasizing resume preparation and interviewing techniques. Data was collected based on a series of semi-structured face-to-face interviews that aimed to explore both students and employers perceptions of the program. Both students and employers perspective were sought in order to add balance and corroboration to the findings. The employers were interviewed individually while the students were interviewed both individually and in groups using an open discussion format.

Using GPA as the only criterion the top 20 students at the end of the second year (of the four year program) were invited to participate. After internal interviews 15 students expressed interest and seven were placed in four companies. The gender composition was four males and three females.

GPA

Based on the structure of the program there were concerns among the SCIT administration that this approach may have a negative impact on students performance. The literature indicates that even part-time work in combination with class assignments might result in a feeling of pressure and a sense of being pulled in two directions [9], [10].

Most students noted that their coursework was excellent and that there was no negative impact as a result of the program. Further probing revealed that there were occurrences of late project submissions, however only one person had this problem. The students’ perspective on their performance on the final exam was mixed. One student said that final exams were not done very well, but that this was usually the norm. Another student indicated that this was the best semester yet.
The grades of the seven students involved in the pilot were compared with the grades of the other 13 students who were initially invited to be part of the program to determine the possible impact of the co-op program. GPA at the end of second year was compared with GPA at the end of the first semester in the third year. Of the 20 students 17 grades were available, three had restricted access. Six (6) of the seven (7) coop students grades were accessible and 11 of the other 13 students. Four of the six coop students had improved performances of .5%, 6%, 9% and 16%. Two students had declines of 7% and 11%. Of the eleven regular students four had improvements (ranging from 4% - 12%) and seven declined (ranging from 9% - 19%). The findings suggest that the coop students had a better performance than those who did not participate in the program. Although both groups had declines in GPA, a greater percentage of non-participants had declines and the percentage decline in GPA was greater.

Skill Acquisition:

Several studies have associated co-op education with skills development [8], [11]. In [8] it was asserted that internship had the greatest impact on academic and enterprise skills. The students’ reactions were generally consistent with the literature, and they were generally positive about the additional skills acquired to date.

One student noted that her theoretical knowledge was not yet applied but this is currently work-in-progress as there are other projects for her to work on. Another student noted however, that the program provides a good base for skills acquisition. His skills in webpage, and HTML had seen drastic improvements. Another student remarked that the market-oriented, programming knowledge learnt at UTech was applied to some projects on the job. It also increased her research interest. One student informed that her C-Programming and Business Communication knowledge came in handy on the job.

As it relates to communication skills, students reported significant improvements and indicated that theoretical work done in Introduction to Communications and Advanced Communications courses were useful. Another student commented on her improved ability to deal with persons at different levels and with customers, skills that she would not otherwise have obtained in a classroom setting.

Another area of improvement was time management skills. Students reported that working and attending classes, forced them to manage their time better. They were generally better able to prioritize task. One student who lived out of town was forced to leave home early and return home late to avoid peak traffic. This student found the long hours commuting and adjusting difficult and initially slept in some of her classes. Other students indicated that the major impact was on their social life and leisure time.

The culture of the companies involved in the program ranged from formal international fortune 500 companies to informal software engineering companies. Consequently the interpersonal skills that students were exposed to varied. Students reported that some organizations seem very formal, while others are quite casual. The level of respect and professionalism in both formal and informal settings was high. There was however one exception where it was reported that staff generally feigned respect to their bosses in their presence and displayed disrespect in their absence. The student indicated that these occurrences did not have an impact on the level of respect that he accorded to all staff in the organization. Students reported an increase in the level of self confidence and being more proactive despite two incidence of debasement experience reported below.

Debasement Experiences

A common theme found in the literature is that of debasement experiences. According to [5] these are dramatic experiences which cause the individual to adjust his behavior or attitude and self image. The experiences are striking enough to alter the individual’s dispensation and as a result the individual becomes more humble. This humble posture and attitude permit an easier application of organizational influences. These experiences can take two forms. One is to set the employee assignment which are too easy or trivial that they carry a message that the new person is not worthy of being given anything important, the other is to set the newcomer impossible tasks. Two students reported that some staff members as well as managers underestimated their abilities and had to apologize when they realized the level of maturity and experience as it relates to the job. These students reported that not much respect was accorded to interns.

Curriculum

Students were asked to use a five point scale (1 being lowest and 5 being highest) to rate the relevance of their theoretical training from UTech to on the job training. The responses were generally positive. All the students gave a rating of 3 or more. One student commented that what was taught in Webpage Design and HTML was the basis for his vastly improved technical skills gained on the job. Another student commented that programming knowledge learnt at SCIT was applied to some projects on the job. A few students commented that C Programming was relevant.

When asked to use a five point scale (1 being lowest and 5 being highest) to rate how well the curriculum prepared them for work. Their scores averaged four out of five. These scores were given even though some students criticized the curriculum commenting that there were too many unnecessary courses and that some courses like Networking needed a greater practical component. Another commented that the SCIT degree program is generalized and that she will consider specialized training after completion of her first degree.
Rating of Experience

Using a similar rating scale mentioned above, the vast majority of the students reported positive co-op education experience. One person who rated their experience a 2.5 of 5 complained about where she was placed, in the service department where the tasks were not relevant to her area of interest and that the guidance and supervision was very limited as persons were constantly busy. This response is consistent with the literature which indicated that how students are treated by peers and supervisors is the most important factor in determining the students overall level of satisfaction [12], [5]. All other students rated the pilot a 4 or 5 indicating that the experience was hands-on and real-world, while another was quite satisfied even though his skills were underutilized.

Except for the student who rated her experience at 2.5 all other students had a good rapport with their supervisors and peers and there were clear lines of communications. One student explained that a major part of the staff is located in Canada, which makes communication a bit conflicting, but final feedback or clarity was sought from his immediate supervisor. Another student indicated that while he was on several projects that were supervised by different persons he only reported to his department supervisor.

All the co-op students were satisfied with their remuneration, with ratings of good to acceptable. In [8] it was suggested that making remuneration more attractive would increase the appeal and by extension improve overall satisfaction. While this may have contributed to the overall student satisfaction in this study students were more focused on the quality of the experience gained and the relevance of the work processes to their career. There was unanimity in recommending the program to other students.

Employer Feedback

Initial feedback from employers was overwhelmingly positive. One company commented that the interns had excellent attitudes, great technical competence, good deportment and excellent work ethics. The manager inquired if it would be possible for one student to continue in the coop program in the final year and act as a mentor for new coop students joining the program. The company wanted to further access the student’s leadership skills with a view of hiring the student on completion in a management position. The company also decided to increase the remuneration for both students.

Another supervisor commented that the student was an excellent worker, organized, took on responsibilities and managed on her own. The student under-studied a senior staff who was on maternity leave and carried out most of these responsibilities. One coop student was required to present on a Content Management Project to a senior management meeting. The General Manager commented that while the student was nervous at first, she was very prepared, knowledgeable and responded maturely. Two companies recommended that the current students act as mentors for new students in the coop program.

Weaknesses of the Program

The students generally thought that the selection process should not be dependent on GPA as was done in the pilot. One student expressed that there was too much office related or non-technical work involved in her assignment and that the job content should be examined for appropriateness before assignment are made. It should be mentioned that job profiles were requested from each company, they were examined for content, relevance and applicability to the curriculum and in most cases the technical requirements were beyond the student capability and had to be revised.

One student felt that the employees in the company were not familiar with the coop education program. He stated:

“Many persons were unfamiliar with our purpose at the organization.”

Strengths/Benefits of the Program

Students expressed more strengths than weaknesses. Among the strengths were:

- Increased technical skills
- Exposure to the world of work thereby improving professionalism.
- Application of theoretical knowledge to real world situations.
- Improvement in time management skills
- Increase in self-worth, maturity, sense of responsibility and feelings of accomplishments.

One student said:

“Though at times there has been many challenges, being able to rise and conquer those challenges is an irreplaceable achievement”

With respect to the companies the major benefits were that the coop program (1) provided additional manpower for companies to assign to tackle specific task/jobs, (2) identified potential permanent employee, and (3) improve corporate image.

For the SCIT the program provided the school with feedback on the relevance and needs of its program courses. The coop education program was also an opportunity for greater collaboration between SCIT and industry.

SUGGESTIONS FOR IMPROVEMENTS

The students made several recommendations for improvements which are outlined below.

At the end of each semester students are given a week off from classes to prepare for exams. The companies involved were not informed of this at the beginning of the
Overall the current cooperative education appears to have been successful. These results are preliminary and further study will be done at the end of the one year pilot period to provide further insights.

There are some limitations to this study. This study is exploratory in nature and consisted of a very small sample. In addition data was collected after only one semester in the program. Based on the sample size, and the possibility that students’ responses may change at the end of the program, only tentative conclusion can be drawn. What is however encouraging is the fact that the initial findings are consistent with the literature and both students and employers are satisfied with the program to date. The findings suggest that co-operative education integrates classroom theory and lab practices with real world working conditions. It provides the university with an important feedback mechanism of channeling education needs into the design of course curricula and provides a means to develop a healthy and symbiotic relationship with industry.

Acknowledgment

The authors wish to acknowledge the contributions of the seven coop students, the managers, supervisors and the companies (Illuminat Jamaica Ltd., Innovative Cooperative Solution, IBM WorldTrade Corporation, and RealDecoy/ZedJamaica Ltd.), who were all enthusiastically involved in this project. We are also appreciative of the members of staff of the SCIT who embraced the coop thrust and gave their valuable information and time.

Conclusion

This paper reported the key findings on a pilot co-operative education program by SCIT. The findings of this paper will help to determine the structure of the co-operative education program that the School will implement. The data were gathered from seven students and four companies involved in the pilot program. Key findings of this study include:

- Despite concerns that the structure of the program may place undue hardship on the students and affect their performance, students response and GPA data suggest that the concerns were maybe unfounded. There was one incidence of a student sleeping in class as a result of the hectic schedule.
- The findings suggest that key skills such as time management, communications, technical and social skills have improved.
- The overall assessment of the program was very positive both from the students and companies. There was some concern expressed about the appropriate selection of companies and the tasks that were performed by students.
- Students generally found that the content of the curriculum was very useful in performing tasks on the job. The theoretical knowledge and hands on experience from SCIT was transferable and enhanced on the job.

References


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