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Is Co-operative Education in Engineering Education is a Great Thought: An Evidence from an Undergraduate Study Program

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Abstract- The growth of the social economy is directly connected to higher engineering education, and the upgrade of factories for every nation and the education industry plays a very important role in it. This determines that the standard of engineering science and technology staff preparation can be assured only through the deep cooperative curriculum of universities and enterprises. Education specialists are expected to determine the academic results of students and produce qualified and highly employable learners. Therefore, this paper accesses the effectiveness of the cooperative education process and its benefits. A detailed literature review has been carried out followed by a quantitative evaluation of the factors in this paper. The data has been collected online via questionnaire from alumni of engineering programs. It is concluded that most of the alumni are pleased with the current cooperative education assignment procedure and time. Few suggested that it can also be improved and automated. The cooperative education opportunities bank can be enhanced and diversified fields should be covered. Communication skills, Interpersonal skills, Ability & desire for continuous learning and Decision making are the key benefits of cooperative education. It is also observed that cooperative education lacks to enhance research skills and leadership skills.

Keywords: Co-operative Education, Higher Education, Engineering Education, Cognitive Learning

I. INTRODUCTION

Higher engineering education is closely related to the development of social economy and the upgrading of industries for any country and education industry plays a very vital role in it. Higher engineering education is a kind of education which combines the theory of natural science and engineering technology with the practice of modern production technology, which is an important part of Higher Education. It is mainly to train engineering science and technology talents which have the ability to engineering planning, design and development, the ability to engineering organization and management, benefit concept of engineering quality, and innovation [1][2][3].

Education connected to the environment of work. Students become able to gain a greater understanding of how to communicate with others in the workplace by cooperative education. They gain an appreciation of employing organizations' history, technologies, and procedures. Developing Theory-Reality Connections; Organizing job activities for the campus curriculum department creates a stronger link between theory and practice, so students see the greater significance in their research. Students are being increasingly explicit on their research priorities and they have been able to recognize the similarities between academic philosophy and experience in the workplace. Work-Integrated Learning (WIL) modes such as Cooperative Education (COOP) in higher education are becoming increasingly popular [4]. The purpose of this arrangement is to combine "practical" information with scholarly knowledge. Data indicates that COOP active students reap a multitude of benefits over their non-cooperative peers [5]. Input from partners in the measurement of COOP learning results plays a very significant position in long-term learning assurance. It is important to establish specific expectations; 2) resources, techniques and tools are needed to promote the transmission of knowledge; and 3) for student learning, the formative appraisal is required. An academic approach that emphasizes research, the use of academic activities, and a workplace atmosphere that expands learning and complements that of the academic environment is necessary to emphasize learning outcomes. Connecting academic aspects of cooperative education with learning Philosophy technologies function together to advance learning results [6].

It's been over 100 years since the University of Cincinnati in the United States initiated a cooperative education program [9]. Around 50 years later, at the University of Waterloo, the first Canadian cooperative education program launched. The American initiative was partially influenced by the sandwich systems that might have developed since 1840 in the United Kingdom. The rise of cooperative education systems in North America was propelled largely by the industry's demands for better-prepared engineers. In the early twentieth century, economic expansion in the United States and around the mid-century in Canada demanded rapid growth in manufacturing and technical education [10].

In terms of academic and labour market results, numerous reports have recorded the importance of cooperative education. Initially, cooperative education systems were created to fill the difference in engineering education between philosophy and reality, address emerging trends in industrial requirements and render university education available to the increasing number of students [10]. Graduates who took part in the cooperative education course have slightly more accountable employment than graduates who were not involved in the course in the comparative category. The Alumni with prior involvement of cooperative education, the experience in cooperative education has a rather good impact on their employment [11]. The early career complexities of a group of members of a college of engineering. Their analysis shows that the gain of a higher starting pay would not convert into an increased job. They also propose that students with other experiential learning opportunities will benefit from the same advantage [12]. In the sense of the aims of student success, the systematic learning experience that may be utilized to accomplish the goals, and the degree of the accomplishment of the students, student benefits have to be measured. As stated in the literature, they outline the student benefits. Increased disciplined thinking; improved learning: taking responsibility for learning, learning how to learn; improved problem solving: analytical thinking; improved classroom performance, increased GPA; increased dedication to educational objectives; increased capacity to finance their education[13].

In several aspects, appraisal at COOP may be beneficial. The advantages of evaluation should be taken into consideration by COOP professionals: students will understand and draw on what they are studying when assessment systems detect and track their growth skills. The COOP program: gathering reviews will boost the program, and advertising appraisal material that tracks student learning gives the program clout. Institution: COOP appraisal evidence provides exemplary external recommendations that can be valuable for accreditation and curriculum evaluations [6].

COOP is a key course at all higher degree awarding institutes to assess multiple curricula and extra curriculum activities of students. It is one of the right course assesses the higher level of Blooms Taxonomy. The recent Saudi Arabian Qualification Framework (SAQF) also emphasizes on additional competencies and skills acquirement of university-level courses which will help the students to succeed in their early job career [14]. To achieve this, the COOP course is being introduced and offered as a choice for students to get a sight of field experience. The findings of this analysis will act as a resource in the review of results for other organizations that are involved in improving the COOP experience of their students. The happiness of students with their experience in cooperative education may also be viewed as a value that students receive as a consequence of their involvement in the curriculum. An undergraduate study of students who have just concluded a course in cooperative education. The findings of this study suggest that students felt that their interactions with cooperative education were optimistic and helpful [11].

Participating in cooperative education or work-integrated learning, experience has many benefits for undergraduate students. COOP provides students with the opportunity to integrate classroom learning into the workplace. Cooperative education, also known as fieldwork, practice or training, is often called pedagogy of the professional profession. Interest in cooperative education has increased, The reason for this is that companies require skilled workers with practical experience in addition to a university degree [7]. COOP students developed a variety of skills including (1) additional skills and knowledge, (2) interpersonal skills, and (3) time management [8].

The improvement of the quality of higher engineering education cannot be separated from the in-depth cooperation between universities and enterprises. Colleges are the main body of the implementation of engineering education.

II. Research Methodology

An extensive literature review has been carried out for this study and the various journal articles, conference papers, books and reports were reviewed to observe the significance of this topic and the benefits of COOP. The articles were downloaded from several sources including science direct, Scopus database, the web of science and google scholar. The factors were identified from the literature and shaped in a questionnaire for engineering program alumni student's feedback on various elements of co-operative education and its benefits. The survey population was focused on engineering graduate students only as the main goal of this paper is to observe the benefits of COOP for engineering degree programs offering COOP course. The questionnaire was sent online to alumni students and the data was analyzed using Statistical Package for Social Sciences (SPSS). The Average Index weights were calculated and the final ranking of the key features was made.

III. Data Collection and Analysis

The questionnaire was sent to almost two hundred alumni students of an engineering program of Prince Sultan University, Riyadh, Saudi Arabia and one hundred forty responses were received successfully which is a satisfactory number for analysis. The demographic section of the survey asked questions concerning discipline, year of graduation, current position and time for their COOP place assignment. The second half of the survey addressed several key factors aligned with COOP benefits. Responses for each question were based on a Likert scale of 1-4 where 1 = "Never" 2 = "Sometimes" 3 = "Often" 4 = "Always".

IV. Results and Discussion

As mentioned in the last section, the first phase of the questionnaire was basic and demographic information of the Alumni. The response rate of the received questionnaires is shown in Figure 1.

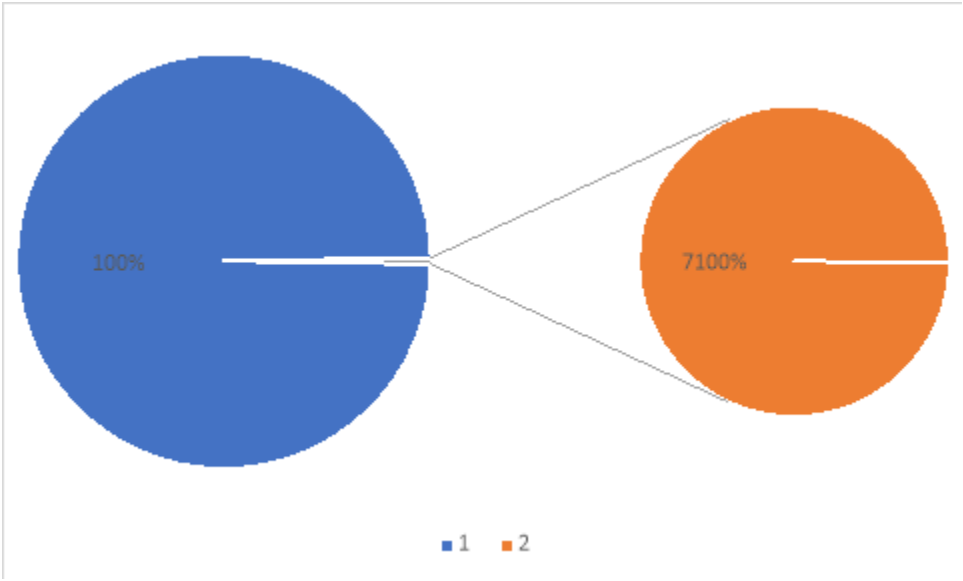

Figure 1: Questionnaire Response Rate

It can be observed that almost 70% of the questionnaires were received successfully. It is a satisfactory rate for data analysis. In the next phase, the respondents were requested to share their feedback on the ease of the COOP process and Figure 2 shows the responses.

It can be observed that almost 75% of the alumni are satisfied with the existing practices of the COOP process whereas 25% of the alumni feel that the process can be improved. They suggest to automate the COOP assignment process and higher COOP opportunities can be offered to students. In the next phase, the

respondents were requested to share the experience on the timeframe of the COOP assignment and Figure 3 shows the alumni feedback.

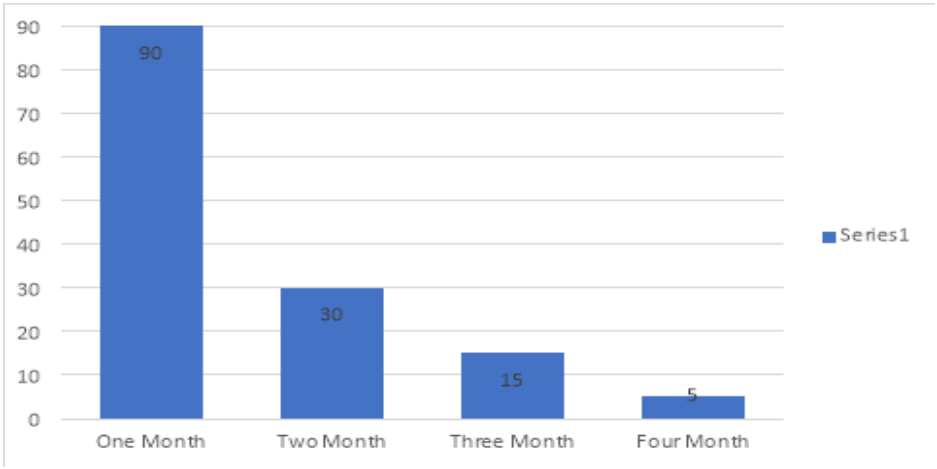

Figure 2: COOP Assignment Time Frame

It can be observed that almost 64% of the engineering students received their COOP offer within one month and 21% received their COOP offer within two months. In general, almost 85% successfully assigned their COOP placement with maximum two months' timeframe which is quite satisfactory but it can be improved as still there are 15% of the alumni, who believes that the timeframe can be improved and upgraded.

In the last phase of the questionnaire, the alumni were requested to share their experience on the overall benefits of the COOP especially in undergraduate engineering degree programs. Figure 4 shows the results of the COOP benefits features.

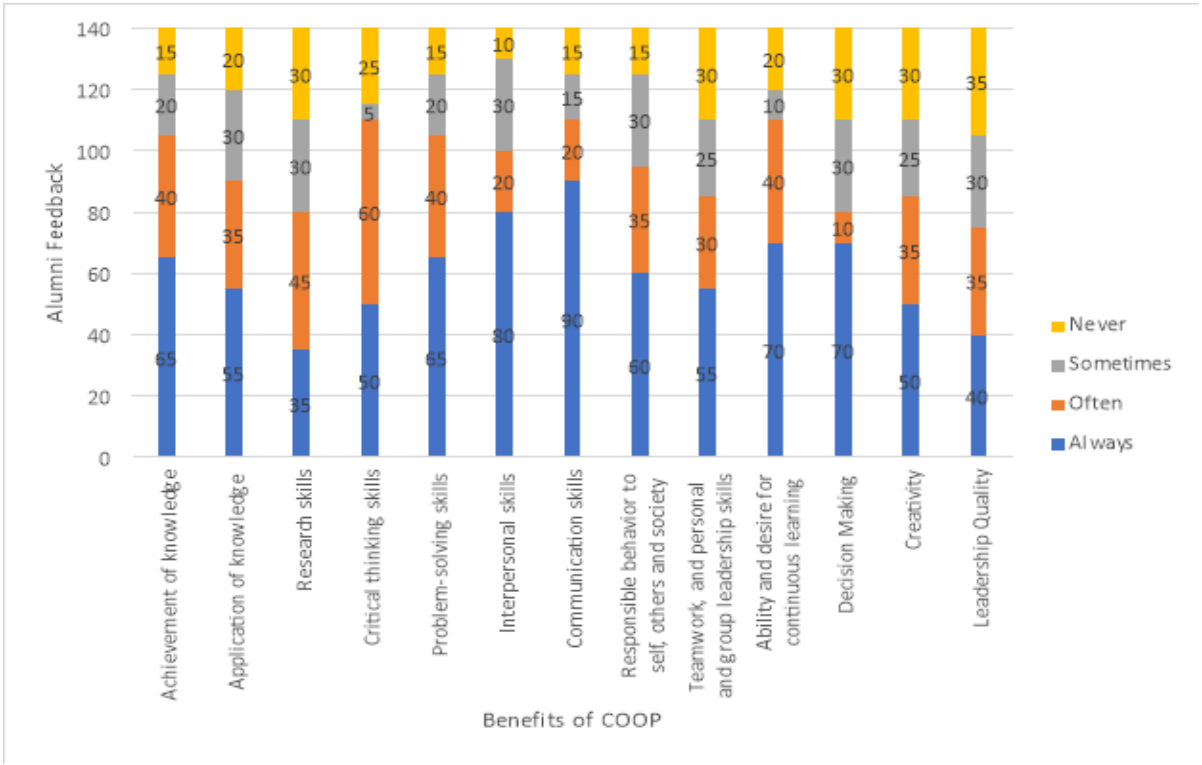

Figure 3: Benefits of Co-operative Education in Engineering Programs

It can be observed that the COOP has provided better benefits for the engineering students and it enhances various cognitive and interpersonal skills of the students. Communication skills, Interpersonal skills, Ability & desire of continuous learning and Decision making are the key benefits of cooperative education followed by others as shown above. Whereas, it is also observed that cooperative education lacks to enhance research skills and leadership skills.

V. CONCLUSION

Engineering science and technology is an important driving force of social and economic development. Engineering research and technology creation are inseparable from engineering science and engineering talent. Also, the creation of engineering science and technology for training engineering science and technology talents is inseparable from higher engineering education. Most of the alumni are pleased with the current COOP project procedures, while few of the alumni also believe that the method can be expanded and improved. An automated process for the method of COOP assignment and appraisal may make a significant contribution. Students may also be given higher COOP opportunities. In total, nearly 85 percent successfully allocated their COOP placement for a median timeline of two months, which is very satisfactory, but it can be increased since there is already 15 percent of alumni who feel that the span can be changed and upgraded. Communication skills, Interpersonal skills, Ability & desire of continuous learning and Decision making are the key benefits of cooperative education followed by others as shown above. Whereas, it is also observed that cooperative education lacks to enhance research skills and leadership skills. Higher engineering education is regarded as the cornerstone of promoting economic and technological development of a country in future. The quality of higher engineering education will have a profound impact on the comprehensive national strength of a country.

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