

Evaluation of “*Industrial Application*” Training Program In Engineering Education

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Abstract

Economic globalization, rapid advances in conceptual science and technology, global trend to output-based programs, the amendments to the classical engineering education program makes it a necessity. The students who completed their education program despite having theoretically adequate, work experience is very limited. In order to give our graduates a little work experience, a course called “Industrial Application” was added to curriculum of the Industrial Engineering Department of the OndokuzMayıs University. This course is actually a training program for selected senior students, who work 3 days/week in actually selected workplaces within the scope of this course. In this study, we have evaluated academically the contribution and implementation of this program for both students and companies. The results indicated that the program is very useful and acceptable for students and companies. “Yes” rate of most of the questions is above 75%. This study also showed us that the current engineering practices should be integrated into our curriculum. One another findings of this study is that the decision making capacity of our students is not enough.

Key words: education, engineering education, work experience

1. Introduction

Economic globalization and rapid advances in science and technology has changed the learning of engineering students. One of the major changes has been the incorporation of more team-based, project driven activities. However, recent reports on engineering education make clear that additional enhancements are needed to prepare engineering graduates to meet the challenges of the today’s business world[1-3]. One of the keys to preparing students to meet these challenges is to help them build knowledge and skills that they can readily adapt to address the novel, complex problems that they will encounter. Fortunately, the literature on learning provides rich information on the characteristics of learning experiences that build such adaptable knowledge and skills. The current practice and critical issues for engineering education has been discussed and addressed very well [4,5]. Work experience issue is not addressed in any literature. There is no literature how engineering students gain work experience during their study period. The students who completed their education program with adequate knowledge and skill have very limited work experience.

However, today’s business world want to hire a person who has also certain work experience along adequate knowledge and skill. The engineering graduate who has some work experience is always preferable by the companies. The summer internships have been intended to provide some work experience, but it is not sufficient.

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In order to give our graduates a little work experience, a course called "Industrial Application" was added to curriculum of the Industrial Engineering Department of the Ondokuz Mayıs University. This course is actually a training program for selected senior students, who work 3 days/week in actually selected firms within the scope of this course as intern engineer. They have to prepare two reports. The first one is graduation project. This project could be related to their work place or something else. The second report is completely about their duty in workplace. They have to tackle a problem and developed solution for it along the daily duties. They have to come to school for two days. During that time they have to attend two classes and discuss their workplace problem with assigned faculty member. The faculty member helps them to overcome their problem. At the end of semester, each students present their work to committee member which consist of all faculty and represents of industries. So that before graduating they gain some work experience in the business environment.

Under this program, 12 students in the spring semester of 2012-2013 attendant in 10 company, 12 students in the spring semester of 2013-2014 attendant in 12 companies, and they have graduated with success. 17 students in the spring semester of 2014-2015 period have started to this program in 11 companies.

Within the concept of this study, the implementation and contribution of this program is evaluated from the students and companies' point of view. The outline of study and results are given in following sections.

2. Materials and Method

In order to evaluate this program, a survey has been carried out. The different questionnaires for students and companies have been prepared. The questionnaires for students consist of 18 question (Table 1), and questionnaires for the companies consists of 16 questions (Table 2).

Table 1. Questionnaires for Participating Student

Q#	Question	Choice
1	How helpful was the work experience gained through Industrial Application program in finding jobs?	(Y, N, P)
2	What extent did your sector in industrial applications played a role in your choice of job after graduation?	(Y, N, P)
3	Theoretical knowledge you gained in the school was useful to you in the industrial application program?	(Y, N, P)
4	Was the industrial application program helpful to you in the development of oral and written communication skills in a professional work environment?	(Y, N, P)
5	Has the industrial application program increased your self confidence?	(Y, N, P)
6	Are you saying I have obtained significant gains in teamwork point as a result of the industrial application program?	(Y, N, P)
7	Did the industrial application program help you to determine the purpose and vision of point before graduation?	(Y, N, P)
8	Do you think time allocated for the industrial applications is sufficient?	(Y, N, P)

9	Do you have a more advantageous position than your colleagues at the current job due to the industrial application program?	(Y, N, P)
10	What are the benefits you gain through industrial application program?	Open Ended
11	Do you think that industrial application program help you to gain a skill to design and conduct experiments, analyze and interpret data in industrial engineering field?	(Y, N, P)
12	Do you think that industrial applications program has helped you to realize the global , environmental impact and social levels of industrial engineering solutions	(Y, N, P)
13	Was the industrial application program helpful to you to understand trends related to the profession and, to identify the missing point of you?	(Y, N, P)
14	Was the industrial application program useful to gain experience in the organization having the hierarchical structure?	(Y, N, P)
15	Do you think that the industrial applications program has helped you to determine, describe and solve the engineering problems.	(Y, N, P)
16	Did the industrial applications program give you the ability to use modern engineering tools necessary for engineering applications?	(Y, N, P)
17	Did the industrial applications program enable you to see the areas where you are weak and complete your shortcomings in this regard?	(Y, N, P)
18	Specify the three lectures that was helpful to you in the industrial application program.	Open Ended

*Y:yes, N:no, P:partially agree

Table 2. Questionnaires for Participating Companies

Q#	Question	Choice
1	Students (taking into account their class) sufficient in terms of knowledge ?	(Y, N, P)
2	The harmony of students to business environment is sufficient?	(Y, N, P)
3	Is adaptation ability of the student to the rules and practices in work environment in sufficient level?	(Y, N, P)
4	Student tendencies to team work is sufficient?	(Y, N, P)
5	Responsibility taking capabilities of students is sufficient?	(Y, N, P)
6	Decision-making abilities of students for any event in the company is sufficient?	(Y, N, P)
7	Research and learning capabilities of students is enough?	(Y, N, P)
8	Did you want to employ graduated students who were in your company for the industrial application program?	(Y, N, P)
9	Is three days per week sufficient time for the company and students for the industrial application program?	(Y, N, P)
10	How many days should be required for the useful industry application program?	Open-ended
11	Are the students aware of the current engineering applications?	(Y, N, P)
12	Did you have the opportunity to focus on some of your business problems, that you postponed, due to the industrial application program?	(Y, N, P)
13	The Industrial application program can be accepted as work experience?	(Y, N, P)
14	Do you say that your belief in necessity of industrial engineer employment has increased due to the industrial application program?	(Y, N, P)
15	What is most important benefit of students from the industrial application program?	Open-ended
16	Is there anything else you want to say for industrial application program?	Open-

ended

The questionnaires for students sent out to 24 graduated students via *googleforms* and asked to fill out online. 22 of students have replied. The questionnaires for participating companies sent out to 12 companies. 8 of them have replied.

3. Results

The results of study evaluated separately for students and companies. 22 of 24 graduated students replied to questionnaires, which is equal to 91%. One more important point is that 20 of the participating students are working as industrial engineer. Only 8 of 12 companies replied to questionnaires, which is equal to 66.7%.

3.1. The evaluation of students answers

The two of eighteen question are open ended, the others have three answers as yes, no, and partially. The answers of graduated students have been analyzed. The results are summarized as follows:

According to answers to Q1, 90% of graduates benefited from the experience gained from industrial applications to find job. According to answers to Q2, 45.5% of graduates said the industrial application program played role in the selection of sector to work after graduation, 40.9% of graduates said the industrial application program played partial role in the selection of sector to work after graduation.

86.4% of graduated students indicated that theoretical knowledge gained in classrooms was useful in the industrial application program. 95.5% of our graduates found the industrial application program extremely helpful to develop oral and written communication skills in a professional work environment. Industrial applications 72.7% of them indicated their self-confidence increased, 27.3% of them had partial increase in self confidence.

The rate of those who had serious gains in teamwork is 77.3%. 90.9% of the graduates said that the industrial applications program was extremely useful in determining their goals and vision before graduating.

72.7% of our graduates indicated that 3 day/week was enough for this program, while 27.3% said time were not enough.

95.5% has gained the ability to design and conduct experiments and analyze data for engineering problems. 90.9% of students found the program was extremely useful to understand, observe and to identify the missing points in industrial engineering trends.

81.8% of student found the program extremely helpful to gain experience in an organization with a hierarchical structure.

90.9% of our graduates found the program extremely useful to gain the ability to express, identify

and solve engineering problems.

The program helped 95.5% of student to see the areas where they are weak and provided extremely useful practice to overcome the deficiencies in this regard.

The answers to Q18 which is open ended are given in Table 3. The lectures are ranked on the basis of replies. 14 of lectures have been mentioned. The first four of these lectures are Quality Control and Management, Statistics, Production planning and work systems.

Table 3. The lectures benefited most during the industrial application program

R	Lecture	# of Answer
1	Quality Control and Management	12
2	Statistic	8
3	Production Planning	6
4	Work Systems	6
5	Operations Research	5
6	Facilities Design and Planning	3
7	Production Management	3
8	Production methods	3
9	Ergonomics	3
10	Engineering Economics	2
11	Logistics Management	2
12	Reliability and Maintenance	2
13	Marketing	1
14	AutoCAD	1

The answers to Q10 which is open ended are different for each students. Every students indicated their benefit from this benefit. The common reply for this question is that they have gain some experience related to afterschool environment.

3.2. The evaluation of companies answers

The first question is about knowledge adequacy of students. 50% of answer was “yes” and 50% of answer was “partially enough”. This is the one of areas we should asked more question. %87.5 of companies indicated that students worked in harmony and very good in team work. 75% of them have adapted easily business rules and successful in taking responsibilities.

25% of students are capable of decision making for any event, 50% of them are partially capable of decision making for any event.

87.5% stated that students were successful in terms of research and learning capabilities. %75 of companies said that they want to hire these students after graduation.

50% of companies stated that 3 days per week for the program is enough, 25% of said partially enough.

87.5% of companies are reported that students are partially aware of the current engineering practices.

50% of companies indicated that they were focused on some business problems due to this program and 25% of them partially focused on.

87.5% of firms are reported that the industrial application program can be accepted as work experience.

62.5% of firms indicated that the industrial application program has resulted in awareness of the necessity of having industrial engineer in their firms.

4. Discussion

According to the results of participating graduated students, it is found that the 90.5% of participant students are benefited from this program. The results are given in bar graph (Figure 1). As seen from the Fig. 1, positive answers to most of the question are above 75%. This indicates that the program is very beneficial for the students.

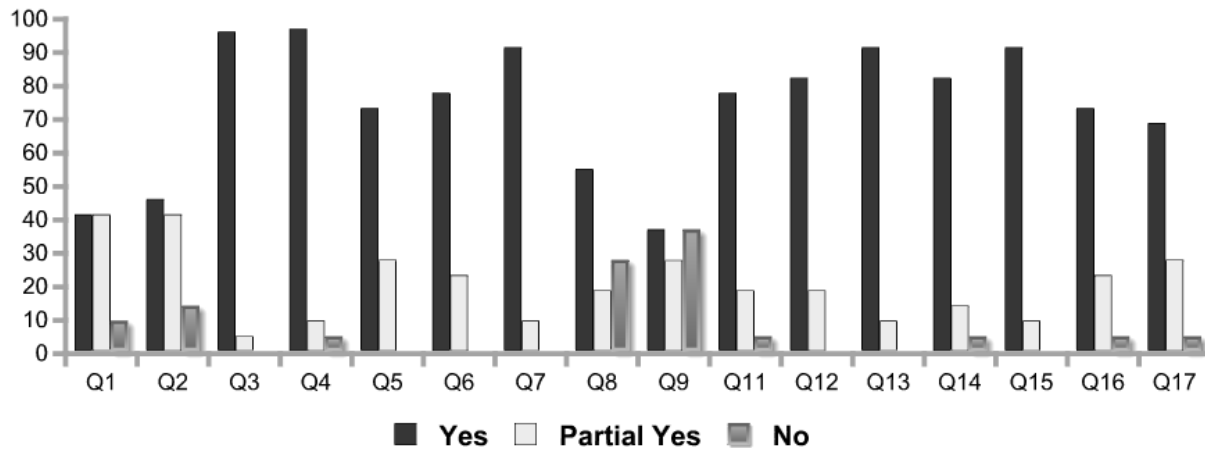


Figure 1. Participating Students Answers

The results of the participating companies indicated that we have two focus on two areas in our curriculum (answers to Q6, Q11 and Q12) as seen in Figure 2. The one area is we should find the way to integrate the current engineering applications into our curriculum. The second area is the decision making capabilities of our students. We should also work on this area to improve decision making capabilities on any event.

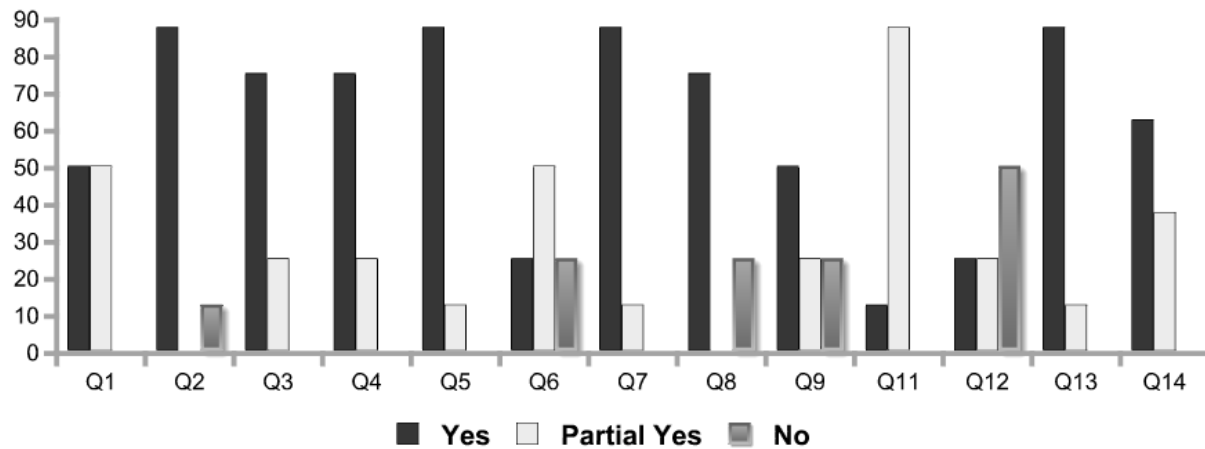


Figure 2. Participating Firms Answers

Conclusions

This study indicated that the *industrial application program* is very beneficial for students. They gain self-confidence, work experiment and see their weak points before going into business work. The program is also useful for the firms that they have an opportunity to train their potential engineers at no costs. Another advantages of this program is that our department gets into contact with the number of important companies in Samsun, and explore potential university-industry cooperation.

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