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The Effectiveness of Industrial Training on UKM Engineering Students

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Abstract

Every student in the Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia (UKM) is required to undergo an industrial training. This survey was conducted after the students have completed their five months industrial training in 2009. The survey aims to get students' perceptions on the industrial training course and the benefits of self changes. This survey involved 285 respondents from four departments in the faculty. The criterion is based on the 5-score Likert scale. There are three parameters used to study the self changes i.e. the 'knowledge', 'skills' and 'attitude'. Overall, the students from the faculty achieved an average performance before the industrial training of 41% of the 'knowledge', 49% of the 'skills' and 65% for 'attitude'. After completing the industrial training, these three parameters were increased to 89% of the 'knowledge', 88% of the 'skills' and 95% for 'attitude'. On the benefits of industrial training, 91% of respondents agreed it was useful in providing added value to the career opportunities, while 88% agreed it was beneficial in improving their qualifications after graduation and 92% agreed it was useful in providing guidance for future careers.

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1. Introduction

The Industrial Training (IT) course is conducted over five months in the third semester after students have completed at least six (6) semesters of full-time engineering programs. For architecture programs, students must complete at least four (4) full-time semesters. This training is compulsory for all students from all five departments in the Faculty of Engineering and the Built Environment, UKM. The survey was conducted after the students completed their industrial training. They were required to undergo industrial training starting from 12th April 2009 (or 13th April 2009) until 27th August 2009 (or 28th August 2009).

They were placed in various government and private agencies. Among them were the Municipal Councils, the Public Works Department, Telekom Malaysia, Tenaga Nasional Berhad, Mardi, Petronas and Motorola which

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involved in 13 different areas from communications to agriculture. As reported by Garrick et al (2004), on-job-training will expose students to a conducive working environment, change of experience and knowledge to teaching in a more innovative and creative approach. Apart from the good relationship between the university and industries, students gain benefits by exposure to the latest knowledge in an increasingly competitive world of technology.

The Industrial Training objectives are to expose students to the engineering and architectural practices in specific areas of specialization and to the nature of industry selected and to expose students to the responsibility of an engineer and the engineering profession. In addition it seeks to develop communication skills in engineering which include daily interaction with the working environment and technical writing.

2. Methods

As suggested by Carr et al. (1996), Likert scales can be used to measure the level of social development and individual assessments of students' industrial training environment. After completion of their industrial training, students are required to fill out survey forms provided. Assessment is carried out based on the Likert scale scores, namely 1, 2, 3, 4 and 5 which represent 'very unsatisfactory', 'not satisfactory', 'neutral', 'satisfactory' and 'very satisfactory' respectively. For the purpose of facilitating the presentation, the value of the scale 1 and 2 are grouped together and categorized as 'not satisfactory', while the value of the scale 4 and 5 are grouped together are categorized as 'satisfactory'. The value of the scale 3 is categorized as a 'neutral'. In this paper, only results for the category of 'satisfactory' are displayed.

For the assessment of respondent's perception before and after the Industrial Training, they are evaluated from three aspects, namely 'knowledge', 'skills' and 'attitude' covering 21 different criterias. As suggested by Galagedera (1991), industrial training program should have an assessment of student achievement in terms of working environment suitability, increase of knowledge and ability to adapt the concepts and theories they have learned either before or after industrial training.

Questions asked in this survey includes the respondents profile, company profile, students' perceptions before undergoing industrial training, students' perceptions after undergoing industrial training, students' perceptions of the benefits of industrial training, industrial training placement method by student information system for industrial training (SMPLAI) and the training period.

3. Results And Analysis

3.1 Profile of Respondents

Of the 285 respondents, 33% were students from the Department of Mechanical and Materials Engineering (JKMB), 27% from the Department of Chemical and Process Engineering (JKKP), 21% from the Department of Electrical, Electronics and Systems Engineering (JKEES) and 19% from the Department of Civil and Structural Engineering (JKAS).

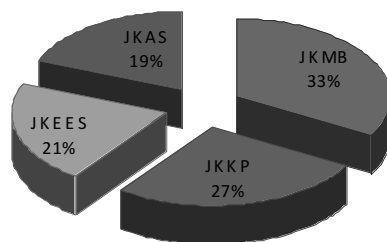


Figure 1 Percentage of students by the department

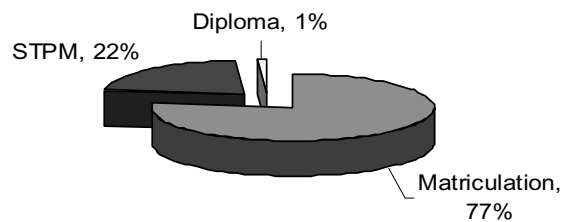


Figure 2. Percentage by latest qualification

Of the 285 respondents, 178 students (63%) are males while 107 of them are female students (37%). The breakdown by race is as follows: 57% Malay, 40% Chinese, 2% Indian and other races made up of indigenous ethnic students (Sabah/Sarawak) as much as 1%. Of the 285 respondents, 220 students (58%) came from Matriculation colleges, 63 students (22%) from Malaysian higher school certification (or STPM) and 2 students (1%) were diploma holders.

3.2 Company Information

The students were placed in various government and private agencies throughout the state. However, most of the training places were concentrated in the Klang Valley. Table 1 shows the breakdown of the state for industrial training.

Based on the Small and Medium Industries Development Corporation (SMIDEC) definition, companies with less than 100 employees are classified as small-sized companies, whilst 100-250 employees as a medium size category and more than 250 employees as large size category. 30% of students did their industrial training in small companies, 22% in medium-sized companies, and 48% in large companies as shown in Figure 3.

Table 2 shows the percentage of students based on their industrial training place of specialization. Meanwhile, Table 3 shows the percentage of industries involved by the company. 25% of the students performed their industrial training in manufacturing sector, 10% of students in the communications and IT sectors, 9% of students in property development and construction industry and 9% of students in the consultation. 8% of the students performed the industrial training in the built environment and other sectors.

Table 1. List if the state for Industrial Training

Location	Number	Percentage (%)
Federal Territory of Kuala Lumpur	23	8
Federal Territory of Putrajaya	4	2
Johor	17	6
Selangor	127	45
Melaka	12	4
Perak	14	5
Pulau Pinang	22	8
Kedah	14	5
N. Sembilan	16	6
Pahang	6	2
Kelantan	9	3
Terengganu	12	4
Perlis	3	1
Sarawak	6	2
Total	285	100

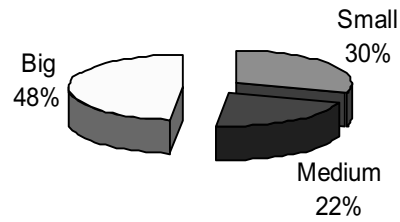


Figure 3 Percentages of companies by size

Table 2. Percentage of students based on company specialization

Company Specialization	Percentage (%)
Mechanical	15
Manufacturing	19
Civil and Structural	13
Civil and Environmental	7
Biochemical	3
Chemical	10
Microelectronics	4
Electricity	13
Communication	5
Computer	4
Architecture	3
Other	5
Total	100

Table 3. Percentage of industry involved by the company

Type of Industry	Percentage (%)
Health and Social	3
Manufacturing Sector	25
Education	3
Property Development and Construction	9
Communications and IT	10
Defence and Security	1
Transport	4
Agriculture and Food	6
Materials Engineering	7
Energy and Natural Resources	7
Built Environment Sector	8
Consultation	9
Other	8
Total	100

3.3 Student Performance Before Undergoing Industrial Training

The perceptions of students were evaluated in three aspects of 'knowledge', 'skills' and 'attitude'. Table 4 describes detailed criteria which represented by the aspect of 'knowledge', 'skills' and 'attitude'. Overall, 41% of respondents agreed that they had good 'knowledge' in the engineering field, 49% of respondents felt that they had the 'skills' needed as an engineer and 65% thought they had the satisfactory 'attitude' (Figure 4). This show that even before the Industrial Training, students were confident that they had a good attitude, but there were significant weaknesses in terms of knowledge and skills.

3.4 Student Performance after Undergoing Industrial Training

Students' perceptions were also assessed in the three aspects mentioned above. It was found that aspects of 'knowledge' had 89% while the aspect of 'skills' was recorded by 88%. 95% of respondents also agreed that the aspect of 'attitude' was at a good level (Figure 5). This shows that the Industrial Training is a good move in helping the respondent to improve all three aspects being assessed and further establish the characteristics of a good engineer in students.

From the observation, aspects of 'knowledge' showed a significant increase to a better level compared to the other aspects. The training also helps the students adjusted to the working environment in terms of knowledge, skills and attitudes. This is important in helping the faculty to produce responsible engineers. According to Harris et. al. (2005), the engineer holds great responsibility for the safety, health and welfare of the public.

Table 4. Judging criteria based on the three aspects

Aspects	Criteria
Knowledge	Knowledge in the field of endeavour The ability to apply knowledge The ability to gain new knowledge Ability to solve technical problems Conscious of the need for continuous learning
Skills	Oral presentation skills Written communication Ability to communicate ideas Discuss skills Ability to listen and respond Ability to make decisions Leadership
Attitude	Good self esteem Self-confidence Good self-management Good time management Curiosity Ability to work independently Can adapt well Ability to work in group Able to work under stress

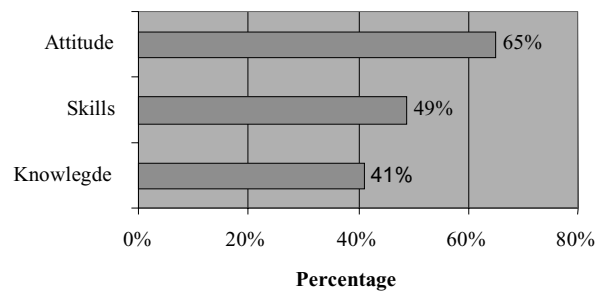


Figure 4 Percentage of student having satisfactory knowledge skills and attitudes before undergoing Industrial Training

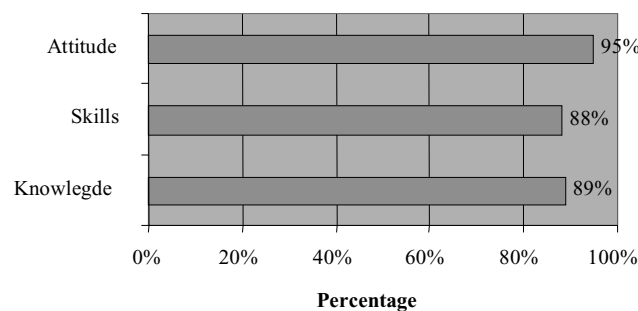


Figure 5 Percentage of student having satisfactory knowledge, skills and attitude after undergoing Industrial Training

3.5 Comparison Between the Perception of Students Before and After Undergoing Industrial Training

There were significant increments in students' perceptions after the Industrial Training. This was demonstrated by an overall improvement in the scores of 4 and 5 and a decrease in score of 1, 2 and 3. It was found that 'satisfactory' score for 'knowledge' recorded an increase of 48%. While the 'satisfactory' score for 'skills' increased by 39% from 49% to 88%. For the aspects of 'attitude', there was an increment from 65% to 95% for a total increase of 30% (Figure 6).

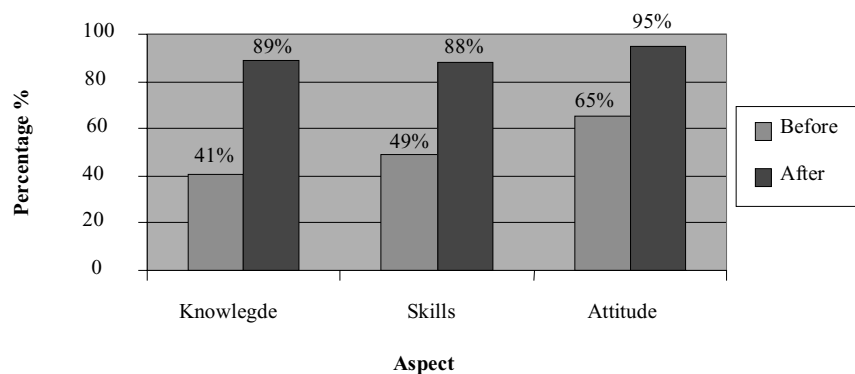


Figure 6 Comparison of percentage of students having satisfactory knowledge skills and attitudes before and after undergoing Industrial Training

This shows that by undergo the Industrial Training, the students can improve their shortcomings, especially in terms of their knowledge in the field of endeavour, and thus can use that knowledge to solve problems in real work situations. Carr et al. (1996) expected that through good interaction between employees in the bigger environment, the students can improve their communication skills and knowledge management.

3.5.1 Comparison Based on the Criteria for All Aspects

Figure 7, Figure 8 and Figure 9 respectively describe the perceptions of students before and after the Industrial Training based on the criteria for the aspects of 'knowledge', 'skills' and 'attitude'. Overall, there are improvements for each criterion evaluated.

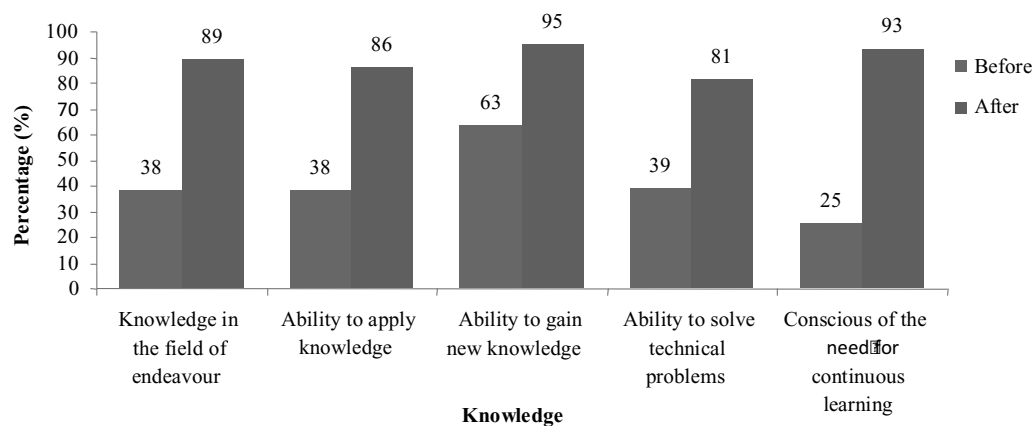


Figure 7 Comparison of student perceptions before and after undergoing Industrial Training based on criteria for knowledge aspect

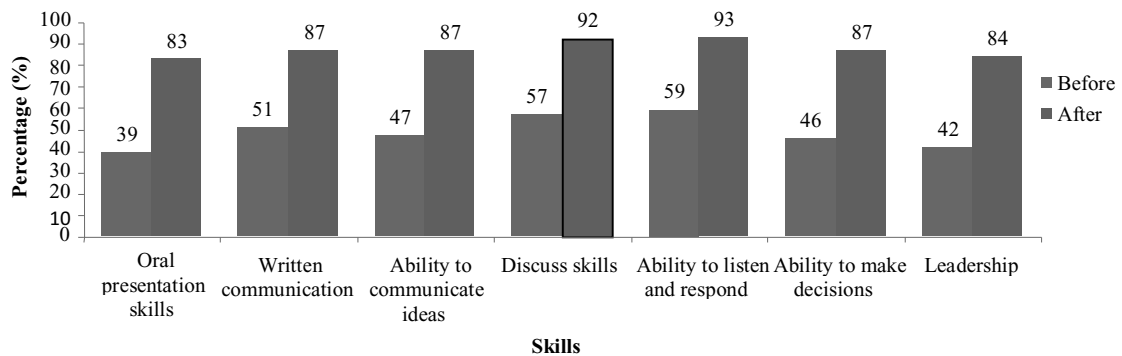


Figure 8 Comparisons of Student Perceptions Before and After the Industrial Training based on Criteria for Skills

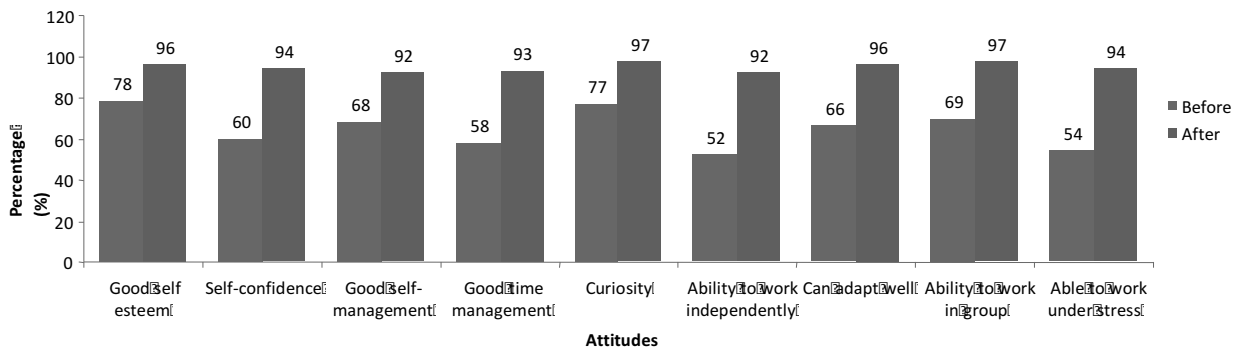


Figure 9 Comparisons of Student Perceptions Before and After the Industrial Training based on Criteria for Attitude

3.6 Benefits of Industrial Training

Figure 10 shows that 91% of respondents 'agreed' that the industrial training able to increase their career opportunities while 88% also believed this training provides the qualifications for several careers after graduation. 92% of respondents were of the opinion that the industrial training provides guidance for their future careers. This proves that they believed the industrial training gives a significant benefit to themselves in terms of increasing the prospects, the qualifications and guidelines for their future career.

According to Fallows and Steven (2000), the employers require workers to contribute to the company shortly after beginning work, and they need to achieve a certain level specified by employer in a short time. Surely this practice is a good move because they have already known what is expected by the prospective employers.

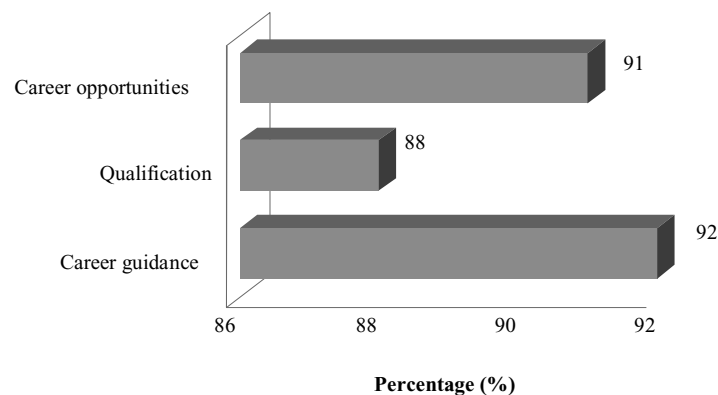


Figure 10 Perceptions of students on Industrial Training benefit

3.7 Method of Industrial Training Placement (SMPLAI)

As in previous years, the industrial training placements in 2009 also used the SMPLAI online method to facilitate application management. Of the 285 respondents, about 51% of students received the training offer through this method, while 49% of students by other methods (Figure 11). Most of students who received the training offer through other methods had applied the placement by their own initiatives. These were done by sending the application using letters and emails after finding the information from the website or direct call to the company.

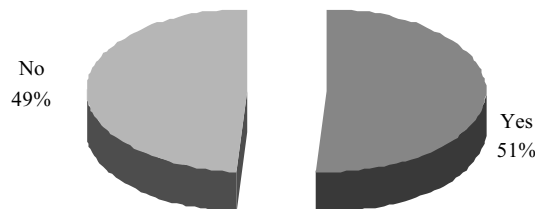


Figure 11 Percentage of Training Placement through SMPLAI

Figure 12 shows the percentage of students who are satisfied with SMPLAI system based on several aspects. Some students thought that the data is not sufficient when only 34% of the students responded satisfactorily to the insufficient data statement. 42% of students gave satisfactory response on the application procedure, 48% were satisfied with the application period, 56% of students felt that the SMPLAI system is user-friendly while only 36% of students thought that the system was informative.

This suggests that there should be a lot of improvement in various aspects such as application procedures and the complete data of company to make the system run more smoothly. The period of application can also be improved by extending it to allow students to make the right choice of training place that suitable with their study field.

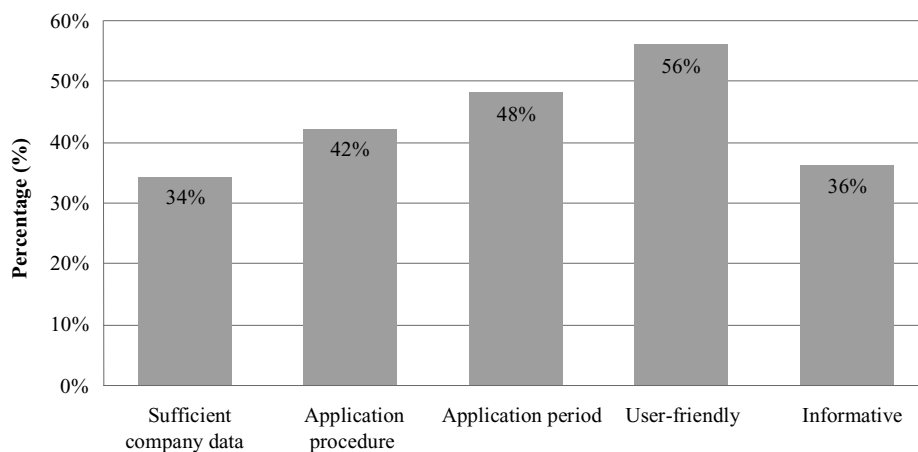


Figure 12 Perceptions of Students on SMPLAI

3.8 Period of Industrial Training

Period of the industrial training placement was a new question included in students' perception survey, since the industrial training period has been changed from two months last year to five months in 2009. This survey was necessary in order to gauge whether students agree or disagree with the existing training period. Out of 285 students, 68% agreed with the industrial training placement for five months (20 weeks), while another 32% disagree (Figure 13).

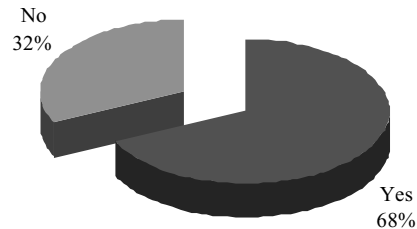


Figure 13 Breakdown of percentage based on five months Industrial Training period

Of the total number of students who did not agree with a five-month training period, they were given a choice of industrial training period that they feel appropriate. The majority (43%) of them chose three months period, while the rest chose 2 months, 6 months, 12 months, or others.

4. Conclusion

There was an increase in the knowledge, skills and attitudes aspect of the students themselves. They were able to use their learned knowledge in the actual work situation. Some weaknesses, particularly in terms of communication skills have been improved for which students will be more confident to communicate and thus adapt to their working environment. In conclusion, industrial training provides various benefits for students, especially in terms of knowledge, skills and attitudes. In addition, they were also confident about the Industrial Training benefits to themselves. However, there are few areas need to be improved, particularly in the placement of students using the SMPLAI system so that all related management can run smoothly. Five months period for industrial training also felt very appropriate to the student.

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