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Research paper

The Subjects Required by Industries for Engineering Technology Students in Universiti Tun Hussein Onn Malaysia

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Abstract

This paper investigates the effectiveness of the Structured Internship Program (SIP) for engineering technology students in the Faculty of Engineering Technology (FTK), Universiti Tun Hussein Onn Malaysia (UTHM). Apart from 6 months training which is carried out during second (2) semester of year 4 (i.e. final semester), the SIP is an additional training component that takes place during the third (3rd) semester of year two (2) and year three (3) for two (2) months respectively. The SIP is developed mainly to enhance the engineering skills, particularly for the practical skills of FTK students. The practical experience has become one of the criteria for the majority of employers in selecting the potential students to work with them. This practical experience also allows the students to build the confidence in preparing the job interview. However, the effectiveness of the SIP is still required further investigation as the extra training may affect the performance of FTK students. An online survey has been carried out for 35 students after completing their training. The results show that majority of students satisfied with their training and considered to prolong their training period. They claim that the academic development, work skills development and work assignment are important aspects to be considered and monitored in order to improve their knowledge and skills after completing their industrial training. The survey clearly shows that a few suggestions have been made to improve the SIP and Industrial Training programme.

Keywords: *Electrical Engineering Technology; Electrical Engineering; Faculty of Engineering Technology; Different Engineering and Engineering Technology*

1. Introduction

The Department of Statistics, Malaysia, reported in Macro Economic Indicators had shown that the unemployment rate in first quarter of 2008 is 3.6% (398,000) which is 0.4% increased from 2007 (3.2% unemployment rate) [1]. The unemployment rate increased including a graduate of the tertiary level. To overcome this problem, several studies have been conducted to find the factors of this increment and to find the solution to this problem. One of the factors is the graduates are not ready to enter the workforce [2]. The graduates lack employability skills required by employers. Therefore, engineering graduates obviously need to have certain skills to help them applying and practicing the knowledge effectively in the workplace [3].

The representatives in a workshop organized by the Economic Planning Unit in July 2004, had agreed that the graduates are well equipped with the technical skills such as in ICT, management, engineering, and marketing, however, they still lack in certain aspects such as ability to communicate, skills to solve problems and poor interpersonal skill [4]. The current educational system and practices in Malaysia unable to deliver the graduates fully equipped with employability or generic skills required by employers nowadays or in the near future [5]. In fact, [6] remind us that the Malaysian education system should undergo a paradigm shift in the teaching and learning process. The institutions of higher learning around the world also are very much concerned about their graduate employment. They play significant roles in developing and enhancing the employability skills to their students by providing certain courses, seminars, workshops, industrial training, practical training and etc.

Developing the curriculum at the university level is essential to ensure that the students are equipped with the proper knowledge before graduation. In particular, the Department of Engineering Technology, Universiti Tun Hussein Onn Malaysia, had developed the curriculum for engineering students. The guidelines on how to develop the curriculum for engineering technology students are based on the Malaysia Qualification Agency [7], Engineering Technology Accreditation Council Malaysia [8] and Accreditation Board for Engineering and Technology [9]. These accrediting bodies are responsible for ensuring that engineering technology program is recognized, relevant and forefront. [10-11-12 and 13] have highlighted how importance to relate current syllabus according to the industrial needs.

In general, the subjects required by engineering students are the National Requirement, HEPs (Higher Education Providers), Personal Development, Common Core and Discipline core. First, the national requirement subjects are subjects that provide a holistic across the disciplines for Malaysian. The National Requirement Subjects during the studies in the university are compulsory to register in Malaysia. The subjects are Islamic studies, Moral studies, Islamic and Asian Civilization, Ethnic Relations, Malaysian Studies and Culture and so on.

The high education providers requirement only covers co-curricular I and co-curricular II. Co-curricular activities facilitate the development of various domains of mind and personality such as intellectual development, emotional development, social devel-

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opment, moral development and aesthetic development. Creativity, Enthusiasm, and Energetic, Positive thinking are some of the facets of personality development and the outcomes of extracurricular activities. It also helps to develop co-ordination, adjustment, speech fluency, extempore expressions, etc. among student both at the school as well as college levels

The class of personal development covers the subjects that can improve awareness and identity, develop talents and potential, build human capital facilitate employability, enhance the quality of life and contribute to the realization of dreams and aspirations after the students graduate. The subjects included are academic English, effective communication, foreign language, technical writing and also creativity and innovation.

The common core is a set of standards for what student should learn in each level. It is a movement by states to start using the same set of academic standards in public. The subjects that under common core help students graduate with the skills which they need to be succeeded in the workforce. Besides, it also makes sure students are getting a strong education, no matter where they live. There are some examples of the subject namely mathematics for engineering technology, physical science for technologists and occupational safety and health.

Meanwhile, the class of discipline core subjects focuses on the science curriculum, instruction, and assessment on the important aspects of science. It has a broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline. The discipline core relates to the interests and life experiences of students or is connected to societal or personal concerns that require scientific or technological knowledge. Besides, it also provides a key tool for understanding or investigating more complex ideas and solving problems. It is considerable and has some important factors that students who graduate need to apply for any job successfully in industries.

Interestingly, initial survey results show that some companies feel that national requirement such as moral studies is needed to build a high personality of a person. The class of personal development covers the subjects that can improve awareness and identity, develop talents and potential, build human capital facilitate employability, enhance the quality of life and contribute to the realization of dreams and aspirations after the students graduate.

1.1. Research Objectives

Based on this research, there are certain objectives to be achieved:

1) To investigate the subjects required by the industries and relevant according to the industrial needs.
2) To observe the academic development in class in relation to industries.

1.2. Research Methods

An online survey has been conducted and disseminated to various industries in Malaysia. The target respondents for this research are engineers from industries who expert in electrical engineering. The engineers are ranging from different ages, numerous and diverse language, nationality and cultural background. Likert scale with the range of 1 to 5 (strongly agree to strongly disagree) is used for each question. The questionnaire is divided into 6 categories which are:

a) National requirement
b) Higher education providers (HEPs)
c) Personal development
d) Common core
e) Discipline core
f) Software

2. Data Analysis

There are many types of subject that essential for the students of Faculty Engineering Technology to study. The part of research is conducted by the higher designation and experienced staff in each company. Thus, the subjects that required by industries is observed clearly. The result from the survey is discussed in detail as follows:

2.1. Respondent Companies

There are 32 companies responded the questionnaire as listed in Table 1.

Table 1: Tabulation of the respondents from various companies

No.	Company Name
1.	Sophic
2.	Ponterosso Technics
3.	Sapurakencana Pinewell Sdn.Bhd
4.	Indkom Engineering Sdn. Bhd.
5.	Score Energy
6.	Malaysia Airlines Berhad
7.	Statschippac Malaysia Sdn Bhd
8.	Toyo Engineering & Construction Sdn.Bhd
9.	Fujitsu Component (M) Sdn. Bhd.
10.	Petronas Carigali Sdn Bhd
11.	Risda
12.	E.A Technique (M) Berhad
13.	We Energy Sdn Bhd
14.	Celestica Electronics (M) Sdb Bhd
15.	Mdc It Solutions Sdn. Bhd
16.	Yh Crane Engineering Service
17.	Esstar Vission Sdn Bhd
18.	Hamelin Elba Sdn.Bhd
19.	Hirose Electric (M) Sdn. Bhd
20.	Agility Logistics Sdn Bhd (Pahang)
21.	Agility Logistics Sdn Bhd (Penang)
22.	Naito Asia Sdn Bhd
23.	Aviation Design Centre Sdn Bhd
24.	Bernama Systems & Solutions Advisor Sdn Bhd
25.	Ssi Schaefer
26.	Kinetics Process System Pte. Ltd.
27.	Venture Sdn Bhd
28.	Super Power Electric & Engineering Service
29.	Sabah Electricity Sdn Bhd
30.	The Puteri Pacific Johor Bahru
31.	Venture Technocom Systems Sdn. Bhd.
32.	TNB

2.1.1. National Requirement

Figure 1 shows the respondent's perception of the national requirement subjects. The national requirement subjects are included Islamic Studies, Moral Studies, Islamic and Asian Civilization, Ethnic Relations, Malay Language for International Students, Malaysian Nationhood, and Current Development, and Malaysian Studies and Culture.

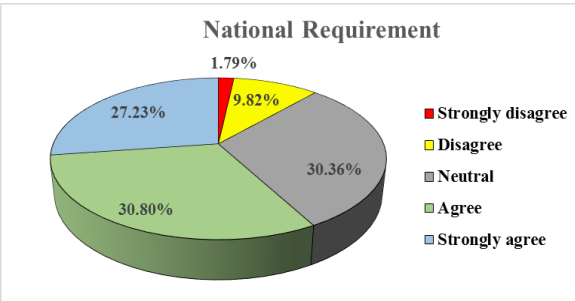


Fig. 1:. Respondent's perception of the National Requirement Subjects

Most respondents agree that national requirement subjects are required by industries with 30.80%. Meanwhile, 27.23% of the respondents strongly agree. On the other hand, only 1.79% of the respondents strongly disagree and 9.82% of the respondent disagree that the national requirement subjects are required by industries. Besides, 30.36% of the respondents keep neutral.

2.1.2. Higher Education Providers (HEPs)

Figure 2 illustrates the respondent's perception of the Higher Education Providers (HEPS) Requirement subjects. The HEPs requirement subjects are Co-Curriculum I and Co-Curriculum II. We can see that half of the respondents agree of HEPs subjects must be taught at universities. Meanwhile, 25.00% of the respondents strongly agree with the subjects. Only 3.13% of the respondents strongly disagree and none of the respondents disagree that the HEPs requirement subjects are required by industries. Moreover, 21.88% of respondents keep neutral. Since the majority of the respondents agree and strongly agree the HEPs subjects are required by industries, hence, certainly the HEPs requirement subjects are helpful in industries. For example, PALAPES and KOR SISPA are examples of co-curriculum subjects that help to improve students' discipline.

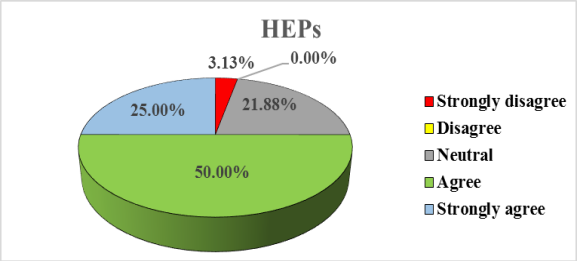


Fig. 2:. Respondent's Perception of the HEPs Subjects

2.1.3. Personal Development

Figure 3 illustrates the respondent's perception of the personal development subjects. The personal development subjects consist of an Academic English, Effective Communication, Foreign Language, Technical Writing, and Creativity and Innovation. From the pie chart, we can see that 68.75% of the respondents strongly agree and 19.38% of the respondents agree that personal development subjects are required by industries. On the other hand, there are almost none of the respondents strongly disagree and disagree that the personal development subjects are required by industries. Moreover, 8.13% of the respondents keep neutral. Since the majority of the respondents agree and strongly agree of the personal development subjects, thus, obviously the personal development subjects are helpful in the future workplace. The effective communication is an example of a subject that helps students to improve their communication skills.

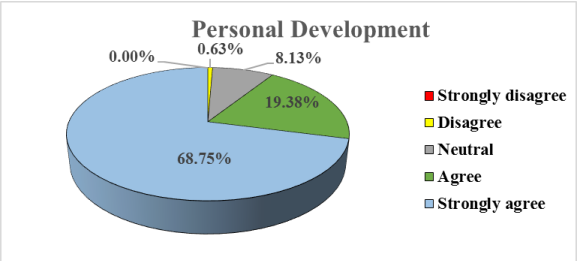


Fig. 3. Respondent's Perception of the Personal Development Subjects

2.1.4. Common Core

Figure 4 shows the respondent's perception of the common core subjects. The common core subjects are Mathematics for Engineering Technology I, Mathematics for Engineering Technology II, Mathematics for Engineering Technology III, Physical Science for Technologists, Entrepreneurship, Engineering Economy, Occupational Safety and Health, Engineering Management, and Engineers and Society.

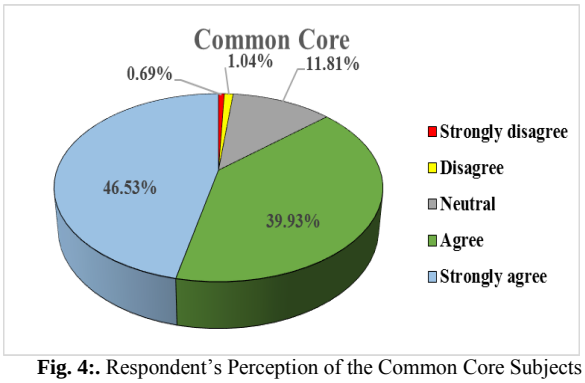


Fig. 4:. Respondent's Perception of the Common Core Subjects

From the pie chart, we can see that 46.53% of the respondents strongly agree and 39.93% of the respondents agree that common core subjects are required by industries. Besides, there is only have 0.69% of the respondents strongly disagree and 1.04% of the respondents disagree that the common core subjects are required by industries. Moreover, 11.81% of the respondents keep neutral. The majority of respondents agree and strongly agree that the common core subjects are required by industries. Therefore, we can conclude that the common core subjects are helpful in the future workplace. For example, the Occupational Safety and Health can help us to improve the knowledge about the safety in a workplace.

2.1.5. Discipline Core

There are total of 61 subjects listed as discipline core subjects offered by three programme under Electrical Engineering Technology Department as shown in Table 2. Meanwhile, Figure 5 illustrates the respondent's perception of discipline core subjects.

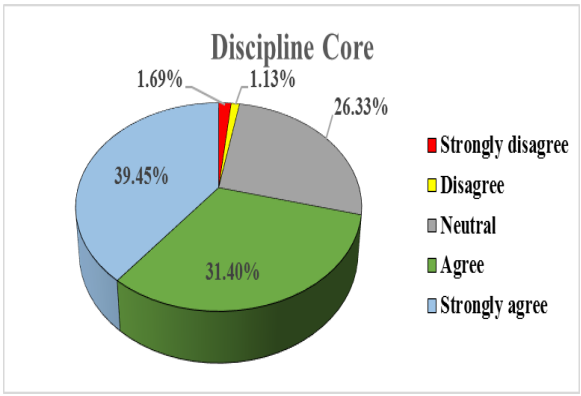


Fig. 5:. Respondent's Perception of the Discipline Core

From the pie chart, it shows that 39.45% of the respondents strongly agree and 31.40% of the respondents agree that discipline core subjects are required by industries. About 1.69% of the respondents strongly disagree and 1.13% of the respondents disagree that the discipline core subjects are required by industries. Moreover, only 26.33% of the respondents keep neutral. The majority of respondents agree and strongly agree that the discipline core subjects are required by industries. It can be concluded that the discipline core subjects are helpful in the future workplace. The discipline core subjects are required by industries maybe because the discipline core subjects are included the scientific knowledge of many sectors of industry, it can help us but depends on our sectors of the workplace.

Table 2: Tabulation of discipline core subjects

No	Subject Name
1	Material Science
2	Electrical Principles I
3	Electrical Principles II
4	Electronic Principles
5	Electromagnetic Technology
6	Instrumentation and Control
7	Computer Programming
8	Electronic Communication System
9	Electric Power System
10	Digital Electronics
11	Electrical Machine
12	Microcontroller Application
13	Industrial Communication Systems
14	Industrial Electronic
15	Safety and Operation Management
16	Industrial Robotic
17	Application of Automation System
18	Microprocessor and Microcontroller
19	Computer Architecture
20	Embedded System and Applications
21	Multimedia Technology
22	Computer Network
23	Operating System
24	Broadcasting Technology
25	Network Technology
26	Multimedia Communication
27	Wireless Communication
28	Cellular Communication Technology
29	Fiber Optic Technology
30	Computer Data Security
31	Electrical Machines
32	Electronic Control Technology
33	Digital Devices and Circuits
34	Engineering Drawing
35	Power Electronic Converters
36	Electrical Building Installations
37	Power System Fundamental
38	Power Plant Instrumentation and Control
39	Power Quality
40	Power Transmission And Distribution Technology
41	Power Electronic
42	Electronic Drives Technology
43	Power System Protection Technology
44	Industrial Power Systems
45	Electrical Laboratory
46	Electrical Power Application Laboratory
47	Pneumatic and Hydraulic Technology Laboratory
48	Industrial Maintenance Laboratory
49	PLC Programming and Application Laboratory
50	Automation Engineering Laboratory
51	Industrial Control Laboratory
52	Computer Integrated Manufacturing Laboratory
53	Micro computing Laboratory
54	Multimedia Laboratory
55	Communication System Laboratory
56	Computer Network Laboratory
57	Bachelor Degree Project I
58	Bachelor Degree Project II
59	Industrial Training I (Year 4 Semester 2 for 6 months)
60	Industrial Training II (Year 3 Semester 3 for 2 months)
61	Industrial Training III (Year 2 Semester 3 for 2 months)

2.1.6. Software

Figure 6 is about the respondent's perception of the required software used in industry. The software are AutoCAD, Solid Work, Matlab, and Labview. We can see that 36.72% of the respondents strongly agree and 32.81% of the respondents agree that the taught software are required by industries. Moreover, there is none of the respondents strongly disagree and 3.13% of the respondents disagree that the software are required by industries. Besides, 27.34% of the respondents keep neutral. The majority of respondents agree and strongly agree on the software used by industries. It means that the software are helpful in the future workplace. For example, the AutoCAD can help the civil engineer to draw the plan of the house and can help the mechanical engineer to draw the structure of the machine. The respondents also have suggested other software required by industries such as PSCAD, PSSE, ETAP PSS Adept, CATIA, ETAP and SKM, BENTLY NEVADA OEM SOFTWARE, Visual studio, Pspice, MICROSOFT PROJECT/EXCEL, NASTRAN (FEA), and Microsoft Visio.

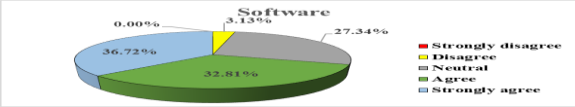


Fig. 6:. Respondent's Perception of the Software

3. Conclusion

The results from online survey obviously show that majority of the respondents strongly agree that the subjects offered to students in the Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia are required by industries and related to their job scopes. Thus, the gap between industries and university (i.e. different expectations) can be minimized. Besides, it allows the students to work together with their colleague and supervisor smoothly in the future workplace. Nevertheless, there are certain opinions and suggestions given by each company to improve the standard of the students in Universiti Tun Hussein Onn Malaysia.

Acknowledgement

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References

[1] Accreditation Board for Engineering and Technology Inc. (1999) 'Criteria for Accrediting Engineering Programs.' Cycle: 25.
[2] Davies, L. (1990). 'Experience-Based Learning within the Curriculum :A Synthesis Study' Print book. Council for National Academic Awards.
[3] Fischer, J., Belcher, R., Cairney, T., English, B. and Harding, S (2002). 'Greater Involvement and Interaction Between Industry and Higher Education.' B-Hert Position, pp. 3-7.
[4] Jalal, A.H. (2017). 'Rethinking Our Education.' New Straits Times.
[5] Kamsah M.Z. (2004). 'Developing Generic Skills in Classroom Environment: Engineering Students' Perspective.' Congerence on Engineering Education (CEE 2004). pp. 14–15.
[6] Little, B. and Harvey, L. (2006). 'Learning Through Work Placements and Beyond.' Higher Education Careers Services Unit (July). pp. 31–40.
[7] Malaysian Qualifications Agency (2011). Programme Standards : Engineering and Engineering Technology.
[8] Malaysian Qualifications Agency (MQA) (2015). 1 MQA Code of Practice for Programme Accreditation.
[9] Moreland, N. (2005). 'Learning & Employability Series 2: Work-Related Learning in Higher Education'. pp. 1–36.
[10] Ngah, E. (2011). 'The Need for Competent Work Ready English Language Learners' Procedia - Social and Behavioral Sciences,29. pp. 1490–99.
[11] Technology, Engineering, and Accreditation Council (2015). 'Engineering Technology Programme'
[12] Yuzainee, M.Y, Rahmat, R.A.O.K, and A Zaharim (2013). 'Employment Preference for University of Fresh Engineering Graduates' In 12th International Conference on Information Technology Based Higher Education and Training (ITHET), pp. 1–4.
[13] Zaharim, A., Md. Yusoff, Y., Omar, M.Z., Mohamed, A. and Muhamad, N. (2009). 'Engineering Employability Skills Required By Employers In Asia.' Proceedings of the 6th WSEAS International Conference on ENGINEERING EDUCATION Engineering 6(9), pp. 195–201.