

# Exploring for Technological Innovation Potential in Engineering Education

Fairul Azni Jafar<sup>1\*</sup>, Noraidah Blar<sup>2</sup>, Mahasan Mat Ali<sup>1</sup>, Kazutaka Yokota<sup>3</sup>

<sup>1</sup>) Advanced Manufacturing Centre (AMC), Faculty of Manufacturing Engineering, <sup>2</sup>) Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

<sup>3</sup>) Research Div. of Design and Eng. For Sustainability, Graduate School of Engineering, Utsunomiya University, 7-1-2 Yoto, Utsunomiya-shi, 321-8585, Japan

\*Corresponding e-mail: fairul@utem.edu.my

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**ABSTRACT** – Engineering based education is increasingly become important. Perhaps, the current way of conveying teaching and learning processes need to be considered back in order to increase the quality of Engineering Education in preparation for the IR 4.0 era. This research work is mainly focusing on the scope of MTUN, and we are trying to explore for any possibility of carrying out technologically innovation for the engineering education. At the early stage of this research work, we have conducted a survey study in order to obtain feedback of the targeted group of students whose going through the current engineering education themselves.

## 1. INTRODUCTION

The role of Malaysian engineers in the technical development of industries, infrastructures and ensuring the general well-being of the country cannot be underestimated. In order to produce good engineers, engineering education plays a big and important role. With the emerging of Industrial Revolution 4.0 (IR 4.0), engineering schools today are facing challenges they have never faced before to produce graduates who are relevant in the 21st Century.

Traditional educational methods include storytelling, discussion, teaching, training, and direct research. In modern education especially in Malaysia education environment, there are several methods such as student centred learning (SCL), problem based learning (PBL), outcome based approach (OBA) etc., introduced in order to improve the quality of education hence enhancing the traditional education methods.

Engineering based education is also inevitable to implement all the methods explained before. However, are those methods really improving the quality of engineering education especially is remaining uncertain. According to Mohd-Yusuf et al. [1], it is not surprising to hear the numerous complaints from industries especially those about the absence of critical skills among graduates. This fact increases the question about the level of quality of engineering education in general.

This issue inspires this research work where the objective of this study is to find solutions to improve the quality of engineering student through different perspectives of delivering the teaching and learning

process. The first step taken to find the solutions is by conducting a survey study in which the results are presented in this paper, before we continue with the next necessary steps which is to propose a new technology based innovation framework for engineering education.

## 2. SIGNIFICANT OF THE STUDY

IR 4.0 has given a new impetus to educational transformation in engineering education [2]. In recent years, education experts recognize the profound impact that a myriad of technological innovations in ICT is influential on education. They agree that education in IR 4.0 will be shaped by innovations and will indeed have to train students to produce innovations. Higher education in IR 4.0 is a complex, dialectical and exciting opportunity, which can potentially transform society for the better.

IR 4.0 is challenging which is based on information computer technology and advancement in robots, cloud technology, artificial intelligence, big data, internet of things (IoT) and virtual reality; all these are playing a greater role in community, economy and people. Universities must prepare a blueprint that addresses the University-IR 4.0 approach to address the present needs.

When Malaysian Technical University Network (MTUN) come into the topic, the issue about education quality will be important especially in term of technical knowledge and skill. Considering the development objective of those universities under MTUN, which is to enhance the technical education and vocational training (TVET), a part of applying those methods (SCL, PBL, etc.), there is a possibility that the method of conveying the teaching and learning process itself need to be enhanced so that the engineering graduates will have the capability of practical and analytical thinking [3].

## 3. METHODOLOGY

The purpose of this survey study is to know the feed-backs from existing engineering students on the condition of their current studies as well as their opinion on teaching methods that they prefer and they believe could help them to improve their understanding.

Five questions have been prepared based on the discussion among our research group members as shown in Table 1.

The survey study was conducted to the existing 3rd year students of the Faculty of Manufacturing Engineering UTeM. The total respondents are 218 students, consist of 129 male and 89 female students. All the answers given by the respondents were recorded and later analysed in term of graphical chart.

Table 1 Survey questions.

No	Question
1	Which of the following methods that you believe will help you much by the traditional education method?
2	Would you consider/suggest for any improvement to improve the effectiveness of the traditional education method?
3	How do you think the traditional method can be improvised?
4	Do you think the environment in technology could help improving the technical education?
5	What kind of technology that, do you think will help improving the technical education?

#### 4. RESULTS AND DISCUSSION

The first question of the survey required the students to choose between three methods that they believe is helping them more with the current engineering education. 48 of the students choose lecture, 126 students choose tutorial, and 109 of them choose lab session. Since tutorial and lab session are the preferred choices, we believe that the students are looking for more hands-on activity as the most effective way to understand the learning.

The next question is asking the students whether they are agreed if the current education method is to be improved. Most of them, with 201 students, agreed compare to the other 17 students. And this result brought us to the third question where we asked the students on which approach that will be the best for the improvement. Result of this question can be seen in Figure 1, where it is again showing that most of the students are looking for more exercises or hands-on activities. Interestingly, we can also see that video and technology assistance were also chosen by half of the respondents.

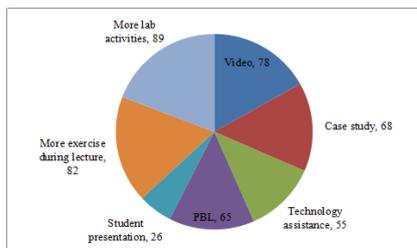


Figure 1 Result of the third question.

So, what does this means? We believe that the result of the third question triggered for a consideration on some technological based improvement in the teaching method for engineering education especially

for MTUN students. This is understandable as most of the students who came to MTUN are from technical or vocational background. Perhaps, these students would be able to have a better understanding through technology or technical based learning methods.

Question 4 asks if the students agree that technology can help them improve their technical education. Most of the students are agreed with the question. There are 198 students choosing yes and only 16 choosing no. This statistic further supports the findings of result in question 3.

The students were then asked to choose what kind of technology that can make them improve their education study. As shown in Figure 2, the preferred technologies are video presentation (115 students) and internet (150 students).

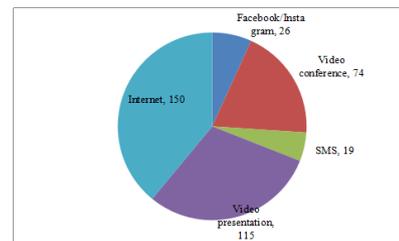


Figure 2 Result of the technology preferences.

Based on the results of this survey study, it can be understood that the technology for teaching assistance is deliberately open for innovation. Lecturers in engineering education should put more consideration on various video platforms implementation as well as embedding internet in their teaching method. With innovative approaches of technology assistance tools, the transformation of teaching methods and teachers is certain. The traditional teacher will soon be a leader, facilitators, and innovator equipped with real world skills.

#### 5. CONCLUSION

Given the current and future challenges in engineering practice, as well as the requirements on engineering graduates, engineering education clearly need to be transformed from the current practice. Although transformation is clearly needed, it is not always obvious what engineering education need to transform into, and how to do it. This study obtains findings of the significant requirements on preferred engineering teaching method. The findings of this survey study is conceivable towards the transformation.

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