The Effectiveness of OBE Implementation during Emergency Remote Teaching: A Case Study in FKEKK, UTeM

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Abstract – *An emergency remote teaching can be either a success or a failure as students play a critical role in achieving successful learning. When students do not comprehend the outcomes they need to reach at the end of the course, they will not be able to study effectively. This study aimed to determine student's perception of outcome-based education in engineering programmes, as well as their awareness and commitment towards their learning activities. The quantitative data was collected through an online survey questionnaire from 382 undergraduate students of the Faculty of Electronic Engineering and Computer Engineering (FKEKK), Universiti Teknikal Malaysia Melaka. To embrace the true spirit of outcome-based education (OBE), the faculty has conducted various OBE activities at the beginning of every semester. The study confirms that OBE promotes self-regulated learning during emergency remote teaching. In addition, PLOs attainment for two student cohorts who undergo different teaching and learning modes (physically & remotely) validated the findings.*

Keywords: *emergency remote teaching; online learning; outcome-based education.*

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I. Introduction

Most institute of higher learning (IHL) in Malaysia have adopted the outcome-based education (OBE) method as a mandatory strategy since 2007. This approach shifts the educational focus from what is taught to what is learned. During the early stages of its implementation, issues related to OBE has been seriously debated and are still being argued especially during emergency remote teaching (ERT). This is because it is crucial to establish a high quality of education that produces highly competent professionals.

II. The OBE

OBE is one of the educational paradigm shifts in which helps the students to advance in their professional careers and develop their skills, while also allowing educators to be more creative with their instructional content design and teaching approaches by adopting appropriate teaching tools. OBE is the method where the curriculum and instruction are guided by the cumulative attainment of the learning outcomes that students should demonstrate by the end of a course or programme [1]-[3]. It is believed that OBE provides a meaningful learning experience for the students. [4] outlines several advantages of OBE, such as relevance, intelligibility, provision of a framework, accountability, self-directed learning, flexibility and guide for assessment.

A. The Malaysian Engineering Education Model

In Malaysia, the drive toward using OBE in teaching and learning at the tertiary level has become a hot topic since 2005, although OBE was developed and being practiced since the 1950s. Other than the three important learning domains of cognitive, psychomotor, and affective learning, the Ministry of Higher Education has identified twelve learning outcomes that are critical in providing students with a well-rounded engineering programme [5]-[7]. The learning outcomes are engineering knowledge, problem analysis, design/development solution, investigation, modern tool

usage, the engineer and society, environment and sustainability, ethics, communications, individual and teamwork, life-long learning, and management and finance. The same learning outcomes are also being observed by Engineering Accreditation Council (EAC) as a requirement to the accreditation status granted [8]-[10].

B. FKEKK OBE implementation

Fig. 1 illustrates in detail the process involves in the implementation of OBE in FKEKK. Based on the OBE approach, designing a new programme starts with the development of Programme Aims, Program Educational Objectives (PEOs) and Program Learning Outcomes (PLOs). These should have been in accordance with UTeM's vision, mission, and philosophy. The courses are then developed, which includes outlining the Course Learning Outcomes (CLOs) and developing full course content. Hence, educators and students' awareness of the university's PEOs, programme PLOs, and course CLOs is the main key to measure the success of OBE implementation.

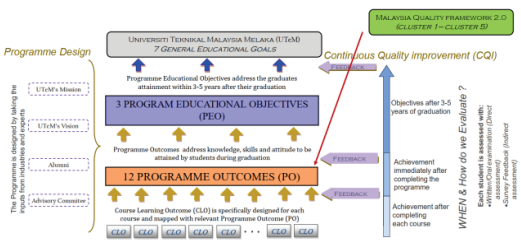

Fig. 1. OBE implementation in FKEKK

The attainment of CLOs is obtained through a direct assessment every semester. The attainment of twelve PLOs is cumulatively measured immediately after the student immediately complete four or three years of the study programme. Three to five years after graduation, the PEOs is measured through indirect assessment (alumni and employer survey feedback). Based on the CLOs, PLOs and PEOs attainment and the feedback from the stakeholders (alumni, industry, academia and other relevant external parties), continuous quality improvement is done to further improve the programme.

C. Impact of COVID-19 on IHL

Coronavirus disease 2019 (COVID-19) is an infectious disease that devastatingly impacted many sectors worldwide including the education sector. Most institutes of higher learning (IHL) especially for technical programmes are facing difficult decisions in contemplating the best plan for teaching and learning activities remotely during this emergency Movement Control Order (MCO) [11]. Educators were suddenly confronted with the challenges in preparing teaching material for online classes as well as overcoming the technical hurdles that came with online classes yet to achieve the outcomes for each course in the programme. In the guideline [12], EAC points out that IHL should focus on achieving the programme outcome while maintaining the quality standards of the education during the COVID-19. IHL must ensure that the attainment of twelve programme learning outcomes (PLOs) is well-planned to ensure that the graduates are adequately prepared to enter the engineering profession.

Face-to-face and ERT have a lot in common. Students must attend classes, learn the content, submit assignments, and sit for a test and final examination. While lecturer must still deliver lectures, supervise tutorial and laboratory sessions, grade assessments as well as motivate students to learn. Except that all sessions are done online; synchronous and asynchronously. The outcomes of the practical-based courses are achieved through open-source simulation tools that can be accessed freely by the students. Unfortunately, the feeling of doing hands-on practical sessions is missing. Some lecturers had taken an initiative to provide the student with electronic kits to ensure hands-on session is conducted successfully. There are also mobile apps that could support experimental learning at home.

There are successes and failures in shifting from face-to-face to online learning, especially in emergency remote teaching and learning. [13]-[15] highlight issues and challenges during the implementation of ERT from the lecturers' and students' perspectives. Whereas [16] highlight new strategies and new prospects in conducting online courses during the COVID-19 pandemic.

III. Methodology

This descriptive research method [12] is in use where the quantitative data were gathered using an online questionnaire survey carried out on a volunteer basis to 382 students of the Faculty of Electronic Engineering and Computer Engineering, UTeM. The profile of the respondents is tabulated in TABLE I. Bachelor of Electronic Engineering (BENG) is a four-year engineering Programme offered by the faculty since 2016/2017. Bachelor of Computer Engineering (BENR) is in their second year since 2019/2020 and Diploma in Electronic Engineering (DEN) is a three-year diploma Programme. The survey was distributed on Week 1 of the semester and at the time the survey is conducted, all student is at their place since teaching and learning

activities were done remotely due to movement control order (MCO).

This survey aims to identify the implementation of OBE activities during remote teaching and learning, as well as to determine the level of students' awareness and their perception towards commitment for OBE implementation in learning and teaching activities. The survey questions were divided into four (4) focus sections as in TABLE II.

TABLE I
RESPONDENTS PROFILE

Academic Programme	Year of Study	Number of respondents	Gender	
BENG	1	44	M	25
			F	19
	2	87	M	44
			F	43
	3	47	M	24
			F	23
	4	97	M	42
			F	55
BENR	1	45	M	32
			F	13
	2	27	M	17
			F	10
DEN	1	0	M	-
			F	-
	2	33	M	28
			F	5
	3	2	M	1
			F	1

TABLE II
RESPONDENTS PROFILE

Section	Focus elements	Number of questions
1 General Awareness on OBE	This section focuses on the awareness and student knowledge on the PEOs, PLOs and CLOs, as well as the method used to measure each OBE component.	7
2 Commitment towards OBE Implementation	Section two concentrates on the effort done by the Faculty and lecturer to ensure OBE information is widely available and accessible.	5
3 Students OBE Perception	Students' insight on the true spirit of OBE is covered in section three.	6
4 Online Learning and Teaching	Section four identifies either outcome-based education can still be achieved during emergency remote teaching, where some of the practical session has been converted to simulation-based learning.	7

A comparison of PLOs attainment for several courses was done comparing two separate cohorts, to support the findings of the survey. The courses for the 2018/2019 cohort are completed before the pandemic, whereas the courses for the 2019/2020 cohort are completed during MCO.

IV. Results and Discussion

A. Data Analysis

The findings of the four focus sections are illustrated in Fig. 2 up to Fig. 5 and discussed thoroughly.

During the first week of a new semester, the students have been briefed on the general educational goals, Faculty objectives, three Program Educational Outcomes (PEOs), 12 Programme Learning Outcomes (PLOs) and Course Learning Outcomes (CLOs) for each course, as well as the method used to measure each of the outcomes and the milestone for each stage. Other than a briefing, videos and posters are widely available through the faculty website and various social media platforms which can be easily accessible. Fig. 2 illustrates a good extent of student awareness on the OBE components in which their achievement for their cognitive, affective and psychomotor learning domain is measured continuously from semester one until 3-5 years after graduation. By being exposed these outcomes, students are expected to plan their study and accomplish the CLOs of each course, which contributes to the achievement of the PLOs and PEOs simultaneously. The assessment methods for different learning domains were also explained to prepare the student that there will be an assessment for generates learning and to assess what have they learned throughout the semester. The assessment is mapped to different PLOs and PEOs, cumulatively measured for an individual student to indicate whether they are competent enough to enter professional practice. Student development after graduation were also tracked to further reflect the quality of the programme.

It is proven that OBE works well with science and technical education like engineering and sciences although designing a sustainable programme and

constructing learning outcomes can be tough as well as time-consuming. With strong support and commitment from faculty members, the implementation of OBE in the programme is visible and lecturers' role has evolved from knowledge disseminators to facilitators of knowledge. Lecturers' commitment toward OBE implementation is agreed by the student and is illustrated in Fig. 3. Most of the question has a YES answer. Yet 3.1% has not been briefed on the OBE during week 1, 2.4% specify that the lecturers did not explain the CLOs of the course and less than 2% did not agree with the question.

In OBE, students are expected to understand what they are doing and why; able to analyze and make a decision; and apply knowledge, reflect on what have they learned and self-reflect on their achievement. This becomes more important during emergency remote teaching where students' is expected to be fully in-charged of their learning progress. When they fail to manage their learning, they are not competent to progress. Reflections on student's perception towards OBE is illustrated in Fig. 4. Based on the responses, OBE has promoted student-centred methods which empower the students to be more responsible for their learning and enhance better student engagement with the curriculum.

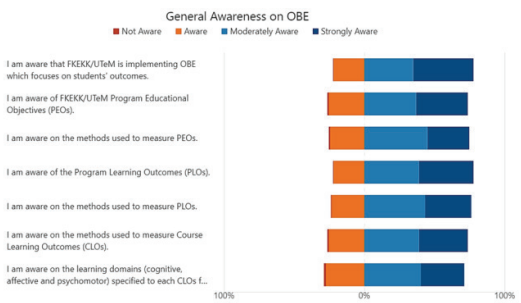

Fig. 2. Responses on OBE general awareness

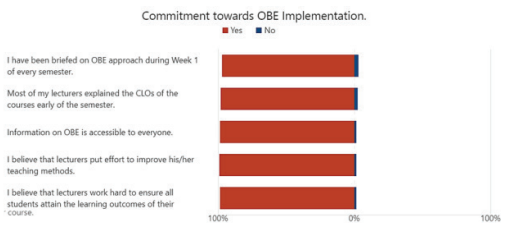

Fig. 3. Responses on Faculty and lecturer commitments towards OBE implementation

However, 8.3% of the respondents representing 32 out of 382 students did not agree that OBE can be achieved during online learning. This is one of the examples that prove why online learning is not meant for everyone, although technology advocates insist that online teaching is the best path forward.

Online teaching and learning is the best emergency replacement during the pandemic but moving to online as a permanent is not the best solution to higher educational problems especially for technical programmes. Few challenges faced by the students is first to adapt to online learning, wrong expectations to the course, poor time management, lack of self-motivation, poor student support and issues related to the practical session.

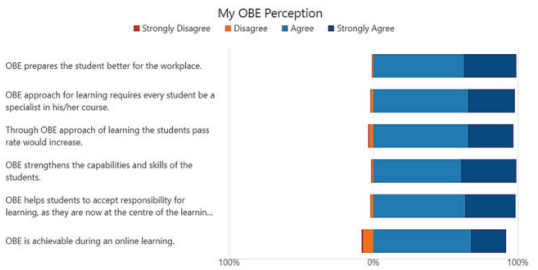

Fig. 4. Responses on students' perception towards OBE

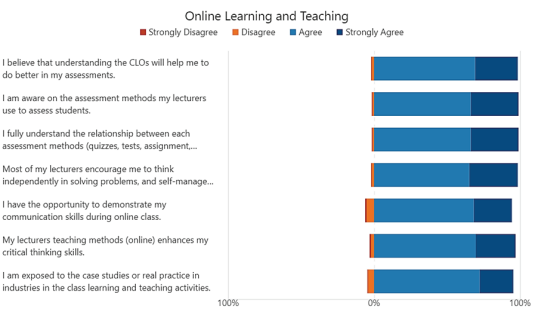

Fig. 5. Responses on online learning and teaching

Fig. 5 shows the response on online learning and teaching. Based on the responses, it is agreed that by knowing the CLOs of the course, method of assessment and teaching implementation, the student could perform better throughout the semester. Regrettably, 5.8% disagree that communication skills can be demonstrated during an online class. More interaction and discussion need to be imposed during online learning.

B. PLOs Attainment

The result of PLOs attainment for several courses was compared, as illustrated in Fig. 6. This is a single indicator used to assess student performance based on different teaching and learning methods. Course (a) – (c) involves theoretical and calculations, while (d) more to the practical-based course. In general, PLOs attainments increased during ERT compared to face-to-face mode except for the practical-based course.

The operationalization of how lecturers conduct the session was not the focus of this study, but we believed that the advent of technologies, teaching and learning activities have made it possible for students to gain better education and experience, and performed well as portrays in the accomplishment of PLOs, even though the gap was statistically insignificant.

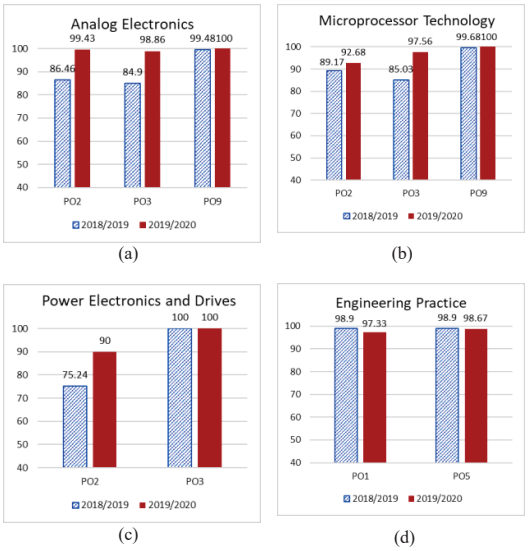

Fig. 6. PLOs attainments for Cohort 2018/2019 and 2019/2020

This also strongly support the fourth section of the survey. The finding suggests that the method of instruction may not be as significant as other factors if the students understand their objectives in learning. By understanding the importance of OBE, students are trained to be more responsible, independent and creative in terms of improving their learning throughout the ERT period. Furthermore, all course contents are accessible at anytime and anywhere.

V. Conclusion

In overall, students in FKEKK UTeM have a high level of understanding and agreement with all statements connected to OBE awareness and application. Students expressed a high level of agreement with lecturers' efforts to ensure that learning objectives were met. The study proved a significant relationship between commitment by the lecturer and the level of student awareness. Furthermore, OBE promotes a self-directed learning approach in which it helps a lot during the emergency remote teaching. PLOs attainments positively support the findings of the study.

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