The study on distance learning approach in Data Communication and Networking course at UTeM

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ABSTRACT – Integrations of structured learning elements are the main component in distance learning in UTeM during pandemics. This study was conducted with a questionnaire survey to students of the Bachelor of Computer Science (Artificial Intelligence) Hons, aim to identify the effectiveness of the online and distance learning approach implemented in the Data Communication and Networking course. Results illustrated that more than 70% of the respondents have agreed that they have achieved the learning outcomes of the course. Thus, the student's understanding related to theory and technical competency in data communication and networking is proven and can be a benchmark for future implementation in teaching and learning course.

1. INTRODUCTION

The world is being hit by COVID-19 and it is no exception to Malaysia. So it simultaneously, in this pandemic situation specifically, changes the way of teaching and learning, from face-to-face to online methods [1]. In the context of Malaysia and Universiti Teknikal Malaysia Melaka (UTeM), it is known as Movement Control Order (MCO), which causes teaching and learning (T&L) to be implemented in the distance learning approach since March 2020 until now [2]. It is a huge challenge to ensure the quality of T&L remains at the expected level, the same as physical face-to-face learning [3]. The T&L should remain conducted according to instructional theory as usual, but with modifications to the online method with the objective of achieving the T&L goal [4].

The aim of this study is to identify the effectiveness of distance learning approach in improving the students understanding of Data Communication and Networking course. For this study, this course is offered to Bachelor of Computer Science students at Fakulti Teknologi Maklumat dan Komunikasi (FTMK), UTeM. It has fourteen-week lectures and labs offered yearly with the purpose to build the understanding of data communication and networking concept and terminologies, to be able to differentiate the types of network media, network topology and network technologies, and to be able to manipulate network configuration using guided and unguided media.

This study however only focuses on the recent implementation of the course, specifically to Bachelor of Computer Science (Artificial Intelligence) (BITI) students during semester 2 of 2020/2021 session; evaluating the effectiveness of teaching and learning which runs online, in the context of student acceptance and understanding in achieving learning outcomes.

2. COURSE IMPLEMENTATION

The distance learning implementation for this subject remains similar to the face-to-face implementation, involving fourteen-week of lectures introducing the fundamental concepts and terminology of data communication and networking, encompassing both technical and managerial aspects and to help students better understand the challenges and opportunities faced by modern business. Each hands-on/practice in online lab session shall be parallel to the lecture topic in online lecture sessions.

The concept and guidelines are delivered during lectures according to the education strategy that is being implemented widely. It is translated from the model of teaching and learning strategies, pioneered by Professor Robert Fitzgerald which requires the element of structured learning, active learning, teacher presence, collaboration, feedback and inclusiveness; applied into teaching and learning sessions although it is conducted in distance learning [5-7]. It is implemented into the platform of teaching and learning known as ULearn in terms of information delivery methods, layout of teaching materials, and handling processes.

However, the hands-on/practice is based on the lecturer's strength/expertise in guiding the student to complete their proposed project online. The knowledge transfer was implemented in student-centred learning approach [5], assisted by simulation learning tools including Packet Tracer and Wireshark. Lecturers use the ULearn platform to organize teaching materials with constructive alignment, based on the structured and user-friendly information organization theory and meet the scope of the course to achieve the criteria of structured learning.

The lecturer then gives instruction to the students, with the objectives of developing the students who are then capable to manipulate the concept and guideline of each topic; ensure student engagement and student participation [8]; with the help of adaptive video by ensuring the principle of less content-more application, implemented to create an atmosphere of active learning. Students are encouraged to discuss their ideas and finding in the interactive discussion during lab sessions using an online forum that provided in ULearn.

Ensuring the existence of lecturers in the distance T&L, the type of social media platform that will be used must have the consent of all students [9]. Communication through mediums such as WhatsApp Group and

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Microsoft Teams carried out to ensure the pedagogical presence, technological presence, managerial presence, social presence, and supportive presence throughout the distance learning process [10].

A simple exercise related to the topic of each lecture is designed to enable students to implement the concept and the practice gained during lectures in their proposed lecture assessment and lab task. Each of these exercises is divided into several individuals and group tasks, enabling collaborative principles and feedback to be carried out by students during the learning process. Element of teamwork and collaborative learning applied in each given exercise with students guided to share learning experiences, which is then assessed with a formative assessment and also summative assessment [11]. Active learning is an objective pursued in this context and it is translated with the goal of gaining the active involvement of students [10].

To ensure that teaching materials are well received by students, content inclusiveness is ensured in delivering information in ULearn and also WhatsApp Group; by ensuring the best teaching practices, indigenous, good interface design, suitable technical design, international approach and satisfying language. Every piece of information conveyed, begins with an introduction to the content, accompanied by a description that supported by the diagram, aims to support student understanding [12]. The presentation of information is concluded with questions, which catalyses student engagement, as a technique to ensure that learning objectives are achieved.

This study involves 56 students taking this course and the data collected using questionnaire survey which only focusing on the achievements of the learning outcomes of this course and it is answered by students at the end of the semester.

3. ASSESSMENT AND EVALUATION

Assessment for this subject is divided into coursework assessment (70%) and final examination (30%); both completely online. Coursework evaluation involves a 14-week evaluation that includes formative assessment and summative assessment. It includes quizzes, Mid Semester tests, Weekly Lab assessments, Project and Lab tests as the assessments. Quiz, Mid Semester Test, and Lab Test are formative type assessments, while weekly Lab Assessment and Project is a summative type assessment. All coursework evaluations are conducted according to the education strategy explained in Section 2. Course Implementation, resulting in 92.86% of students achieving more than half of the course work marks (at least 35/70).

End of semester survey is conducted using google form to gauge the students' perception of their achievements on each of the learning outcome (LO) of this course using five point Likert-scale (1=Strongly disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree and 5=Strongly agree). According to the teaching plan, by the end of the semester, students will be able to achieve the objectives of these three LO.

LO1: Build the understanding of data communication and networking concept and terminologies.

LO2: Differentiate types of network media, network topology and network technologies.

LO3: Manipulate network configuration using guided and unguided media.

The response for LO1, LO2 and LO3 are shown in Figure 1, Figure 2 and Figure 3 respectively. Based on responses for LO1 in Figure 1, 78.5% students agreed that they have achieved the objective of LO1 and 19.6% neither agree nor disagree, while 1.8% disagree.

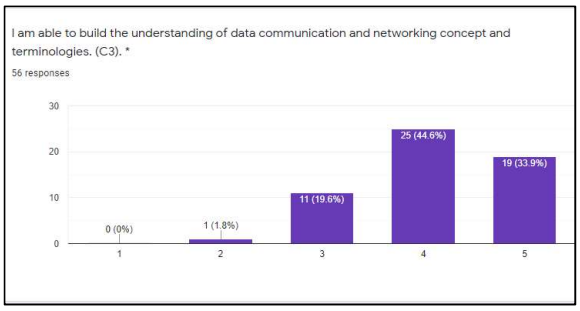

Figure 1 Responses from LO1

Based on responses for LO2 in Figure 2, 73.2% of the student agreed that they have achieved the objective of LO2 and 26.8% neither agree nor disagree, while 0 % disagree.

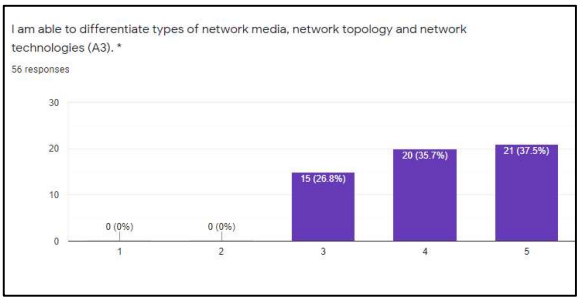

Figure 2 Responses from LO2

Refers to responses for LO3 in Figure 3, 64.3% of student agreed that they have achieved the objective of LO3 and 23.2% neither agree nor disagree, while 12.5% disagree.

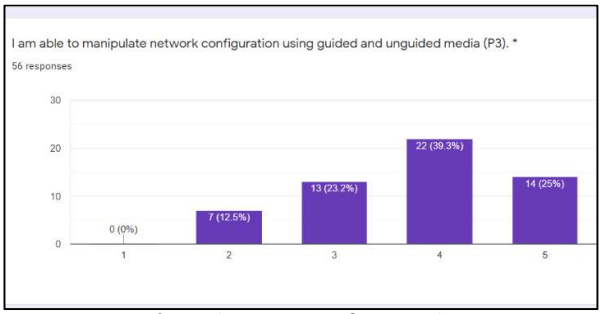

Figure 3 Responses from LO3

Overall, more than 70% of the respondents have agreed that they have achieved three learning outcomes of this course, which is the important factor in determining the effectiveness of the hands-on-approach in teaching and learning.

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Using the same google form survey, students were also asked to give general comments related to this course. Here were some positive comments given by the students.

- Student 1: "It was very well done on the lab exercises and lecture assessment helped improve understanding on the course".
- Student 2: "I am able to understand deeper about how data transmission and it make me appreciate just how much advanced and complex it can be while also be silently integrated into our daily live. Overall, I enjoy the courses more than I expected".
- Student 3: "I want to thank our lecture for studying this course. Know I know what is data communication and types of data communication and networking".

4. CONCLUSIONS

The integration of element of structured learning, active learning, teacher presence, collaboration, feedback and inclusiveness in delivering the distance learning are absolutely crucial, and it has a direct effect to the learning outcomes as shown in Figure 4. It is effectively improving the students understanding and technical ability in data communication and networking, as shown on the average course work marks and findings from the questionnaire. This study serves as a benchmark and useful experience for other academicians to do distance teaching and learning for their course.

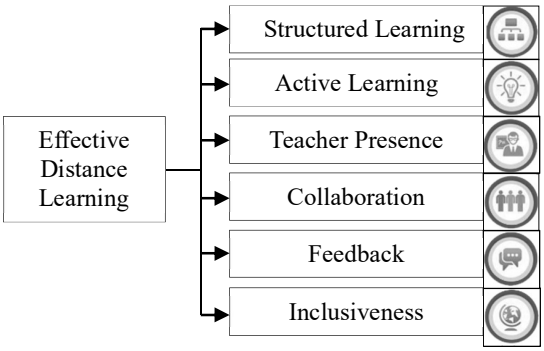

Figure 4 Framework of effective distance learning

5. ACKNOWLEDGEMENT

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