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Gauging Student Learning Attainment through Seven Variations of Instructional Screencast Video

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ABSTRACT

This paper aims to investigate the effectiveness and the efficiency of a series of instructional screencast videos to learn a 3D modeling software. Seven variations of screencast video were developed using screen capturing software for self-paced learning among students who were taking a modeling course in the Bachelor of Design in Animation programme. A quasi-experiment was conducted in December 2014 with 35 students in a Malaysian public university. In the pre-test, all students were given similar tasks on modeling with lighting. The purpose of the pre-test was to determine if the students had prior knowledge and skills in 3D modeling. The result showed that none of the students could complete the given task, meaning that they were all fit for the quasi-experiment. Next, the students were randomly assigned to seven groups and each group of the students was given a variation of the screencast videos as treatment, while the control group was given a non-manipulated screencast video. Upon the completion of the treatment, the students were instructed to complete a modeling with lighting task which was similar but not identical to the task given in the pre-test. All students were able to complete the given task after the treatment, thus the effectiveness of all instructional screencast videos was assured. However, in terms of learning attainment, the screencast video with caption was revealed as the least efficient variation since the students spent the most average time to complete the task. Simply put, screencast video can be developed for effective learning of 3D modeling software, in which its efficiency can be enhanced by adding appropriate narration and subtitling.

Keywords: screencast video, instructional screencast, 3D modelling, learning, captions, subtitles, narration

INTRODUCTION

The emergent scope of learning with the use of communication and information technology requires educators to develop their teaching and pedagogical approaches to enhance innovation in the classroom (Rocha & Coutinho, 2010). In this sense, educators often search for effective ways to create productive learning environments (Hartsell & Yuen, 2006). One of the most efficient and effective ways to improve learning performance is by using digital technology. Educators need to be aware of the needs of Generation Y and Z due to the extensive use of digital technologies like computers and internet among students. Screencast video is a type of digital technology that can be used as an alternative learning method. In general, screencast video can be utilized as digital recording to capture action on a computer screen. In addition, screencast video is also used in demonstrating specific software applications or operating systems because screencasts often contain narration. Therefore, students and teachers can engage with the video and discuss various topics by adapting this learning approach (Helft, 2009). The usage of screencast video in educational settings is shown in Table 1.

Table 1: Usage of Screencast Video in Educational Settings

Teachers	Learners
Deliver learning contents	Presentation
Deliver demonstration	Develop tutorials
Deliver feedback	

Pros and Cons of Using Video Technology in Educational Settings

Learning through digital technologies has reached new heights in education nowadays. Educational institutions, from primary to tertiary levels have evolved from the habit of using chalkboards, notebooks and textbooks in the classroom due to the access to technologies like laptops and smart boards. Video technology is one of the digital learning methods that is popular among educators.

Video is an important element in multimedia as it adds to the impact of multimedia applications (Rozinah, 2000). The video concept is basically very similar to television broadcast, but the concept has developed dramatically

over the past six decades (Smaldino, Lowther & Russell, 2008). According to Bell and Bull (2010), digital videos created by teachers can better engage students to observe, answer questions and interpret the messages conveyed.

Video can be found in many forms, for example, video tapes, DVDs, computer-based video and online video. Segments of video are suited for use in the classroom learning environment, particularly for small groups or individual learners to discuss various topics as a reference or as learning resources (Helft, 2009). In the educational environment, educators often use video technology in teaching and learning to introduce new topics, present learning contents, or provide remedial measures for students. Table 2 shows the pros and cons of learning by using the video method.

Table 2: Pros and Cons of Learning through Video

Pros	Cons
Easier for visual learners Video used for learning purposes mostly contain visual elements while audio narration can be added as an additional element. With regard to learning, the combination of audio and visual content may allow the learner to grasp information easily.	**Requires equipment** Learning through video requires equipment like speakers or headsets, computers or laptops, keyboards and mouse.
Flexible learning Video learning allows playback features which may help learners to pause, rewind and stop.	**Limited for editing** Video is normally linear and once created it will take a longer time to edit for corrections.
Portable Video technology makes learning materials portable, enabling learners to experience lessons anywhere and at any time they desire.	

Using Screencast as Educational Video Technology

Screencast video is a learning tool often used in the teaching and learning environment. Screencast can be defined as digital recording that records all activities demonstrated by the instructor on a computer screen (Betty, 2008). In addition to video, screencast is able to record audio track which consists of the output sound from the computer when the screen is

being recorded. Besides, external sources like music and audio narration may be used to replace the output audio track. According to Peterson (2007), the combination between screencast and audio track could explain the action demonstrated by the instructor.

Screencasting software is a tool for creating screencast video. It is necessary for an instructor to determine which screencasting software is suitable for creating instructional videos. There are various types of screencasting software which can be used in screencast development for example, Jing, Screencast-O-Matic, Camtasia, and Adobe Captivate. In this study, the free version of Screencast-O-Matic was chosen to produce seven screencast video with the playback length of less than 15 minutes. The screencast video can be published into certain file formats for example, Audio Video Interleaved (AVI), animated Graphics Interchange Format (GIF), Motion Picture Expert Group 4 (MP4) and Flash Video (FLV).

Screencast video is a form of digital learning that enhances learners' achievement. Pinder-Grover, Millunchick and Bierwert (2008) used a screencast video to enhance students' learning performance in science and engineering, in which the majority of the participants agreed that the use of screencast video in their study helped them to understand certain concepts. Participants also reported that they learned more and had a better understanding as compared to other forms of teaching materials.

In addition, a survey conducted by Mullamphy, Higgins, Belward and Ward (2010) found that more than half the respondents in their study, agreed that screencast video was a very useful learning tool, compared to only 1% of respondents who felt that screencast video was less useful or useless to them. This is a significant positive change compared to 15 years before that when Folkestad and DeMiranda (2002) revealed only a slight increase in terms of understanding, when compared to students who used the textbook. Apart from the technological change over time, the increment of positive attitude towards the use of screencast video could have resulted from the heightened consideration for students' cognitive ability in the design of a multimedia application, which was an issue raised by Sweller (2010) in the past. To address this issue, Mayer (2001) presented a theory of multimedia learning for creating effective multimedia presentations that combine visual and verbal information.

Meanwhile, with reference to Mayer's theory, Veronikas and Maushak (2005) carried out a study to examine the effectiveness of using audio narration in instructional screencasts. They claimed that there are no significant differences between students who use screencast with both text and narration and students who use screencast that only contains either text or narration. Likewise, DeVaney (2009) who studied the effects of online video tutorials discovered no significant differences in terms of students' academic performance after using various types of instructional video. Nevertheless, both studies claimed that students showed a positive attitude towards instructional video screencasts. In contrast, Ahmad et. al's study (2011) indicated a significant difference between screencast with narration and without narration. Moreover, this study revealed that screencast with narration is not only effective but also efficient for enhancing students' learning performance. This study intends to examine the effectiveness and efficiency of using screencast video in learning 3D modeling software, in order to uncover any statistically significant difference among seven types of instructional screencasts.

METHODS

A quasi-experimental study was conducted to compare the effectiveness and efficiency of seven variations of screencast video on student learning attainment. This study involved 35 undergraduates who were taking MMG3083 Modeling course during Semester 1 of the 2014/2015 Session in the Animation Laboratory of the Faculty of Art, Computing and Creative Industry in Universiti Pendidikan Sultan Idris (UPSI). The students were in their fifth semester of the Bachelor of Design in Animation with honours programme. The participants comprised 22 female and 13 male students, ranging between 22 to 27 years old.

Two measurements for successful use of the screencast video were used in this study, i.e. if the students knew how to complete the given modeling task, and the time consumed by individual participants in the post-test in completing the task. The total duration of the quasi-experiment was around 120 minutes.

In the pre-test, all participants were given a task to set up lighting for a 3D model in half an hour. The test was carried out to verify whether the participants had prior knowledge and skills in modeling and lighting. None of the 35 participants demonstrated possession of prior knowledge or skills, thus qualifying them to take part in this study. Next, the participants were randomly assigned into seven groups of five people, i.e. one control group and six experimental groups.

In the treatment, each group was given one out of seven types of screencast video: screencast with captions, screencast with narration, screencast with subtitles, screencast with captions and subtitles, screencast with captions and narration, screencast with narration and subtitles, and screencast with narration, captions and subtitles (see Figure 1). All participants were required to watch the screencast video for 30 minutes through intranet to ensure there was no lagging of video screening.

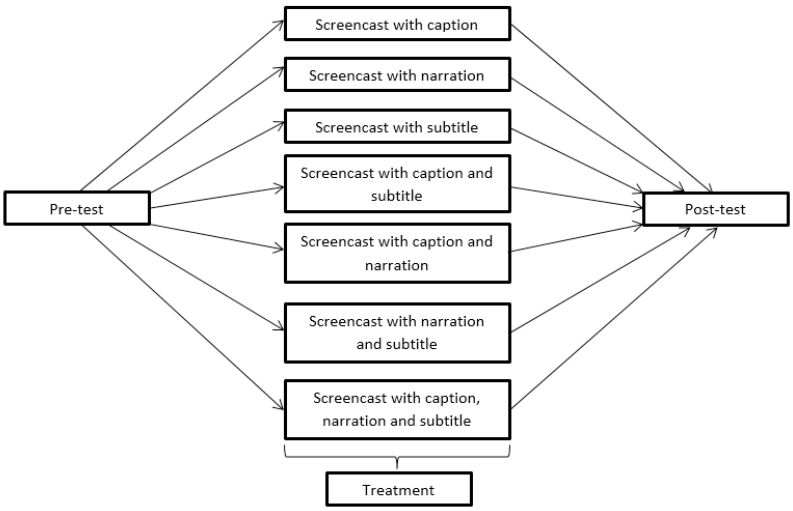

Figure 1: Pre-Test, Treatment and Post-Test

In the post-test, the participants were given half an hour to complete a modeling with lighting task that required the same level of knowledge and skills as the task given in the pre-test. After that, participants were given a post-test within 35 minutes. The task provided to the participants during the post-test differed slightly from that given during the pre-test. The duration

of time used by every participant to finish the post-test task was recorded. The data collected from this study were analyzed using SPSS.

FINDINGS

The results of the post-test were analyzed using Kruskal-Wallis tests and Mann-Whitney U tests to compare the medians of seven variations of screencast video, i.e. to identify significant differences if any, in the participants' performance based on the seven variations of screencast video used. The findings of this study were divided into four sections i.e. difference in terms of median among the seven variations of screencast video, difference between screencast with captions and screencast without captions, difference between screencast with narration and screencast without narration and difference between screencast with subtitles and screencast without subtitles. The data collected in the post-test was tested using Kruskal-Wallis and Mann-Whitney U tests.

Difference between Seven Variations of Screencast Video

The average time spent by 35 participants in the post-test to complete the given task was 17 minutes and 29 seconds, in which the median score was 17 minutes across all seven variations of screencast video. The differences between the efficiency of participants in completing the given task using seven variations of screencast video were compared in Table 3. The comparison was further analyzed using Kruskal-Wallis tests, but no significant difference was found in the medians, $X^2(6, N=35) = 6.69, p = .35$.

Table 3: Time Spent by Each Group of Participants to Complete the Given Task

Type of Screencast Video	N = 35	*Median* (minute)	*Mean* (minute: second)	*Standard Deviation* (minute: second)
With narration (control group)	5	15	16:36	10:29
With captions	5	20	18:12	7.07
With subtitles	5	11	14:24	7:04
With captions and subtitles	5	15	18:36	10:23
With captions and narration	5	18	20:36	6:50
With narration and subtitles	5	11	11:36	5:47
With captions, narration and subtitles	5	23	22:24	4:02

Differences between Screencast with Captions and Screencast without Captions

Four of the seven variations of screencast video were created with captions (screencast with captions only, screencast with captions and subtitles, screencast with captions and narration, and screencast with captions, narration and subtitles), while the other three were prepared without captions (screencast with narration only; screencast with subtitles only, and screencast with narration and subtitles). A Mann-Whitney U test revealed a significant difference in the duration of time spent to complete the given task between screencast with captions (Md = 20; Mean = 19:57; n = 20) and screencast without captions (Md = 11; Mean = 14:12; n = 15), U = 85.0, z = -2.170, p = .03, r = .37.

Difference between Screencast with Narration and Screencast without Narration

Four of the seven variations of screencast video were created with narration (screencast with narration only, screencast with narration and

subtitles, screencast with captions and narration, and screencast with captions, narration and subtitles), while the other three were prepared without narration (screencast with captions only; screencast with subtitles only; and screencast with captions and subtitles). A Mann-Whitney U test revealed no significant difference in the duration of time spent to complete the given task between screencast with narration (Md = 17; Mean = 17:48; n = 20) and screencast without narration (Md = 19; Mean = 17:04; n = 15), U = 139.5, z = -.350, p = .726, r = .06.

Difference between Screencast with Subtitles and Screencast without Subtitles

Four of the seven variations of screencast video were created with subtitles (screencast with subtitles only, screencast with narration and subtitles, screencast with captions and subtitles, and screencast with captions, narration and subtitles), while the other three were prepared without subtitles (screencast with captions only, screencast with narration only, and screencast with captions and narration). A Mann-Whitney U test revealed no significant difference in the duration of time spent to complete the given task between screencast with subtitles (Md = 15; Mean = 16.45; n = 20) and screencast without subtitles (Md = 18; Mean = 18:28; n = 15), U = 136.00, z = -.350, p = .64, r = .08.

DISCUSSION

The pre-test of this study showed that students were not able to complete the modelling with lighting setup task for a 3D model. In other words, none of the students were able to complete the given task before going through the formal learning session. Therefore, knowledge and skills are essential for students to set up lighting for any 3D model. This means any variation of screencast video would be useful to enhance learners' learning outcomes in 3D modeling lessons, although no statistical significant difference was found across the seven types of screencast video in terms of efficiency.

However, when a comparison was made between screencast with captions and screencast without captions, the findings showed that captions

superimposed on the screencast video actually decreased the efficiency of learning 3D modeling software, particularly in setting up lighting for the 3D model. This could be an example of multimedia overload, in which the short-term memory of learners became overloaded with captions, leading to counter-efficiency in completing the given task.

CONCLUSION

In this study, all seven variations of screencast video were found to be effective for learners who had no prior knowledge and skills to complete a 3D modeling with lighting task. The participants' knowledge and skills transformed from incapable to capable of completing the task after using the seven variations of screencast video. In conclusion, the use of screencast video is effective for learning 3D modeling software, with or without narration, captions and subtitles.

In terms of efficiency, the screencast video with captions was found to be less efficient in getting learners to complete a 3D modelling task, as compared to screencast video without captions. Thus, captions should be only used when it is necessary to avoid multimedia overload.

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A Need Analysis for a Communicative English Mobile Learning Module for Healthcare Professionals

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ABSTRACT

The ability to communicate efficiently in English is a highly sought after skill for healthcare professionals. Training for this skill is usually done in a traditional classroom setting and requires time and a venue to be allocated for the learners to participate in the training sessions. Working adults in the healthcare industry find this a constraint due to their hectic scheduling in the hospital. This study aims to identify the most suitable content for an English language communication course that caters to the specific language functions in the hospital, and to determine the feasibility of offering the course on a mobile platform. A total of 38 questionnaires were administered and a focus group discussion was conducted with 5 representatives of each healthcare profession in a private hospital namely nurses, radiographers, physiotherapists, pharmacists and hospital administrators. Descriptive statistics were used to analyse the survey data and a thematic analysis was performed to derive the themes emerging from the interview. The results demonstrated that the adult learners were able to identify their preferred content based on their own work experiences. Moreover, the preference of using a mobile device for a language course appealed to them. According to the results obtained from this needs analysis, it can be concluded that an English language communication course conducted on a mobile learning platform could be the answer to these working adults' need for English language training at the workplace.

Keywords: adult learners, communication skills, English for specific purposes, healthcare professionals, mobile learning.

INTRODUCTION

Communication skills are considered a valuable skill to navigate in the workplace. Hence, there has been an increase in workplaces that have placed an emphasis on this soft skill as it enables its users to have an edge in specific working situations. Proficiency in English is a crucial skill in the field of science, technology, engineering and mathematics. In the field of healthcare, communication in English between the healthcare professionals and patients has always been highlighted as a critical component for evaluating the quality of service (Wong et al., 2014) and to ensure patients' safety (Hull, 2015).

A poor command of English communication skills has been highlighted recently in several studies involving non-native English speaking healthcare professionals in countries such as Australia, Japan, Taiwan, Thailand and Singapore. Although healthcare professionals in Malaysia have gone through university academic programs where the medium of instruction is English, a lack of competency is apparent especially when communicating in English with patients who do not speak the national language (Jebunnesa & Abdullah, 2013). The nature of the career-specific environment of healthcare professionals require them to be proficient in English since it is the "primary lingua franca" in both private and public hospital settings in Malaysia (Arumugam & Kaur, 2011). A study done on the phenomenon of unemployment among nurses in Malaysia revealed that competence in the English language is vital for employment and to perform their duties in the hospital (Arumugam et al., 2014).

Thus, a collaborative effort between healthcare professionals and English language educators to develop courses and design materials suitable for use in the medical field was recommended (Hull, 2015). The trainings provided for healthcare professionals in traditional settings required them to be present at a particular place and time, which takes up either their work or leisure time. In order to minimize such unnecessary time utilization, the use of technology especially mobile devices is seen as one of the ways to

facilitate the adult's language learning process without being too invasive on their restricted time.

Mobile learning, as defined by O'Malley et al. (2003) is any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies. It has paved the way for adult learners who are time-constrained to attend traditional face-to-face classroom sessions and eliminated the need to be in a specific place and time to attend training. Ruey (2010) highlights the benefits of online learning through collaboration and interaction which has helped adult learners support one another's learning, as well as becoming self-directed and responsible learners.

Due to the nature of the job specificity of English language communication in the hospital setting, it has been categorized into English for Specific Purposes (ESP) which is separate from general English (Hull, 2015). ESP is an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning (Hutchinson & Waters, 1987). The categorisation of English language as having a specific purpose and function in a specific workplace setting shows the importance of the usage of the language within its specific context. Richards (2001) says that the ESP approach to language teaching is a response to a number of practical concerns: the need to prepare materials to teach learners who have already mastered general English but now need English for use in employment.

In order to specify as closely as possible what exactly it is that students have to do using the medium of English, a needs analysis has to be conducted (Robinson, 1991). A needs analysis is a process of establishing the *what* and *how* of a course (Dudley-Evans and St. John, 1998). In Thailand, Gass (2012) utilised a questionnaire, observation and interview in her needs analysis and situational analysis to prepare an ESP curriculum for Thai nurses. Billingham et al. (2013) mentions the importance of finding out the feasibility of a course to answer the question *"Can this study be done?"*

There are two objectives of this preliminary study. Firstly, to identify the most suitable content for an English language communication course

that caters to the specific language functions in the hospital as used by healthcare professionals. Secondly, this research is conducted to determine the feasibility of offering the English language communication course for healthcare professionals on a mobile platform.

METHOD

Questionnaire

A multi-method approach which involved both quantitative study and qualitative research methods were adopted in this needs analysis. Data were collected through a questionnaire for the healthcare professionals and a focus group discussion was conducted with senior healthcare professionals to support the findings. The questionnaire contains 21 questions and was developed by the researchers to gain insights into the potential learners. The questionnaire was adapted from several literatures (Gass, 2012; Johnston et al., 2012) and questions deemed necessary were added by the researchers based on the objectives of the study.

The participants involved in the study were 38 healthcare professionals who were randomly selected from the different departments in a private hospital located in Kuala Lumpur. The participants comprised healthcare professionals from the departments of nursing, radiography, physiotherapy, pharmacy and hospital administration.

Focus Group Discussion

Focus group discussions are frequently used to obtain knowledge, perspectives, and attitudes of respondents about issues as well as to seek explanations for behaviours in a way that would be less easily accessible in responses to direct questions, as in one-to-one interviews (Kreuger, 1988; Kitzinger, 1995). Due to the relaxed nature of the interaction between the moderator and the participants during group discussions, attitudes and perceptions are developed through interaction with others in the groups (Kreuger, 1988). In order to show dimensions of understanding that often remain untapped or inaccessible, focus group discussions are a form of data collection utilised by the researchers to fulfill the study objectives.

In the focus group discussion, 5 participants representing each department in the hospital were asked to provide their opinion on the types of scenarios that require them to use English, the type of contents necessary in an English communication course for healthcare professionals, and their willingness to participate in an English communication course if it is offered for their training on their mobile devices. One of the researchers acted as the moderator for the group and the discussion was recorded on an audio recorder and later transcribed.

The participants from the focus group discussion were seniors in the department with at least 5 years of working experience. The focus group session was conducted in a meeting room in one of the branches of a private hospital in Kuala Lumpur and lasted 45 minutes.

RESULTS AND DISCUSSION

Results from the Questionnaire

The study respondents were 38 healthcare professionals, working in 5 different departments in a private hospital in Kuala Lumpur. The majority were from the nursing department and the pharmacy department. A complete profile of the respondents is described in Table 1 below.

Table 1: Demographic Information

		Frequency	Percentage
Gender	**Male**	4	10.5
	Female	34	89.5
Age	**21 – 25**	5	13.2
	26 – 30	13	34.2
	31 – 35	7	18.4
	36 – 40	6	15.8
	41 – 45	6	15.8
	46 and above	1	2.6

cont...

Highest academic qualification	**SPM**	13	34.2
	STPM	6	15.8
	Diploma	12	31.6
	Bachelor degree	6	15.8
	Master degree	1	2.6
Department	**Nursing**	9	23.7
	Physiotherapy	7	18.4
	Medical Imaging	5	13.2
	Pharmacy	9	23.7
	Administration	5	13.2
	Other	2	5.3
Working experience	**Less than 1 year**	1	2.6
	1 – 3 years	2	5.3
	3 – 5 years	5	13.2
	5 – 7 years	7	18.4
	More than 7 years	23	60.5

Based on Table 1, the respondents consisted of 89.5% females and 10.5% males. The majority of the healthcare professionals were aged between 26 to 30 years (34.2%), followed by the age group 31 to 35 years (18.4%). The study found that the highest academic qualification among the healthcare professionals made up 34.2% of SPM holders, and 31.6% diploma holders. Only one respondent had a Masters degree. In terms of department, an equal proportion of nurses and pharmacists (23.7%) provided their responses, while the medical imaging and administration staff was also equal in numbers of respondents at 13.2% respectively. The majority of respondents have been working for more than 7 years, while the rest have less than 7 years of work experience.

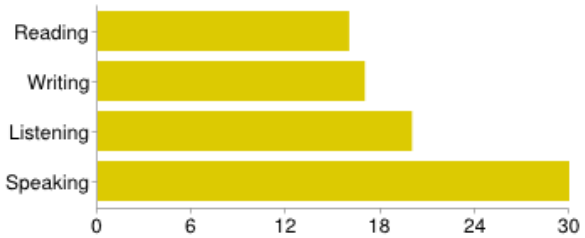

Figure 1: Language Skills Frequently Used

Figure 1 shows that of the four language skills frequently used by the respondents in their workplace, speaking skills were the most frequently used at 78.9% when communicating in English. Listening skills were identified as the second most important skill at 52.6% while reading skills were least frequently used in their work environment. This finding is concurrent with Tavil's (2010) finding that language skills such as speaking and listening should be taught in an integrated manner to improve oral communicative competence in English. Practicing these skills in isolation is counterproductive due to the nature of interaction where one would have to listen before one can produce an appropriate response. However, this does not mean reading and writing skills are unimportant. It only means that there is an urgency to respond to the need of the healthcare professionals in utilising the most critical skills used in their workplace.

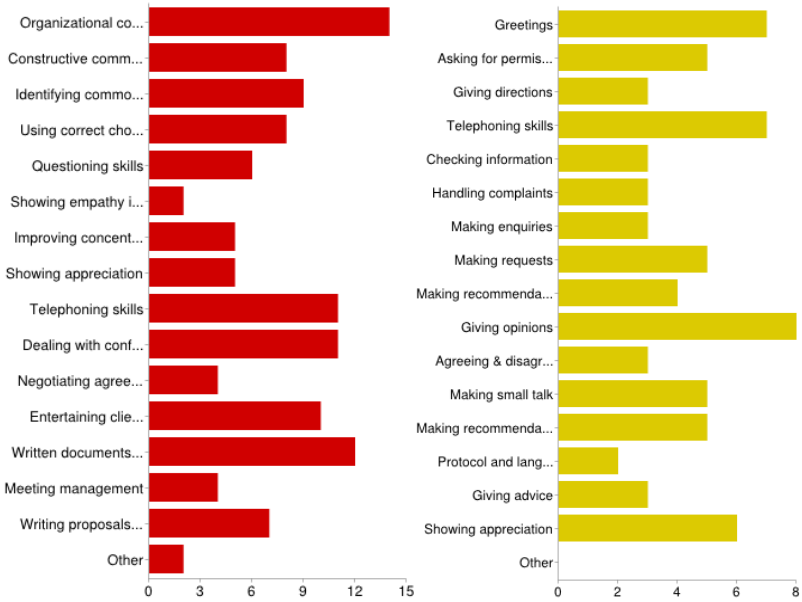

Figure 2: Content Suggested by Healthcare Professionals

The healthcare professionals identified the most common content based on their experience in Figure 2 as giving opinions (21.2%), telephoning skills (18.4%), greetings (18.4%) and showing appreciation (15.8%). Organisational communication, writing documents and dealing with

conflicts were also favoured as suitable content. Showing empathy and meeting management seems to be less important when communicating in English.

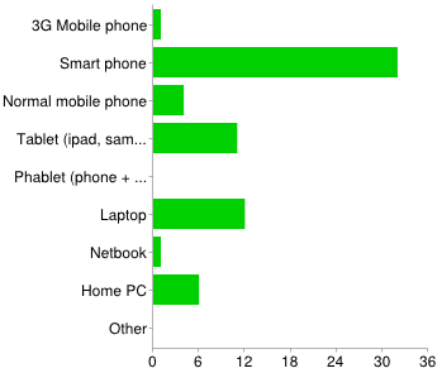

Figure 3: Devices Owned

In Figure 3, the healthcare professionals mentioned the devices that they own with smartphones topping the list at 84.2%, followed by laptops and tablet PC at 31.6% and 28.9% respectively. Most of the respondents mentioned they owned more than 2 devices.

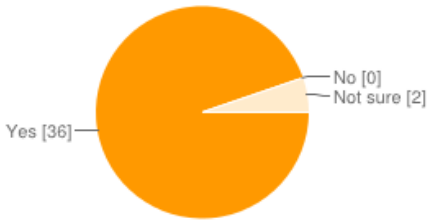

Figure 4: Interest in Participating

The respondents demonstrated their interest in participating in the course on a mobile platform as shown in Figure 4 with 94.7% saying 'yes' to indicate their agreement to participating in an English language communication course using a mobile platform while the remaining 5.3% were unsure.

Results from the Focus Group Discussion

Based on the findings of the focus group discussion conducted with the 5 representatives, the types of scenarios that require them to use English language were identified as the reception area at the entrance, accidents and emergency, ward area, pharmacy counter and admissions and discharge. The areas highlighted were the ones with high level of interaction between the healthcare professional and patients. The group agreed that a high level of communication occurred whenever there are large numbers of patients waiting to be served in the hospital. Liaw et al. (2014) used the different scenarios as they appear in the daily interaction with patients and physicians in designing her curriculum on interprofessional communication. The healthcare professionals involved rated the training program highly due to its usage of scenario modeled after the different situations occurring in a day ward. Although her findings were related to interprofessional communication, it sets the basis for the learning context to occur as it happens in the workplace.

Members of the focus group identified the areas mentioned as critically in need of improved communication skills in English since more foreigners are coming to hospitals, while some educated and urban Malaysians prefer to speak in English. The group agreed that the type of content suited for an English communication course should reflect the skills of speaking, listening and writing. Reading skills were not their main concern due to the nature of their jobs that do not require a lot of reading. One respondent from the pharmacy department said the only reading he does is reading doctor's prescriptions. When presented with the list of content suggested for them in the questionnaire (Figure 2), they agreed on the speaking and listening skills namely, greetings, telephoning skills, giving opinions, and showing appreciation. Other speaking skills identified on the list related to organizational communication were seen as not practical in their work environment. Most agreed that practicality in terms of highest usage of the content was valued as necessary for them to learn.

Finally, all the healthcare professionals agreed that they would like to participate in an English communication course if it is offered for their training as a module available on their mobile devices. When asked the reason, all of them highlighted the device in their possession as the main

factor to consider learning using mobile devices. Time constraint to attend traditional classes was also mentioned as a factor for their preference to have the module readily available on their mobile devices. Only the nurses were concerned about not being allowed to use mobile devices in their working environment due to the possibility of spreading bacteria when using the devices. However, although they are not allowed to use their devices during work, they can still access their devices during their break time.

CONCLUSION

This paper has reported a needs analysis to identify the contents for an English language communication module for healthcare professionals. When the overall results were considered, the study shows that speaking and listening skills are essential in English language communication among healthcare professionals due to the constant interaction they have with patients in the departments of the hospital that they are working in. Their training needs to incorporate contents related to the scenarios familiar to their workplace and practical enough to accomplish their tasks. These findings indicate the practicality of mobile learning for adult learners in the hospital setting. The module is to be offered on a mobile platform utilising the healthcare professional's personal devices. Due to the availability of the devices and their time constraints to attend a classroom based training, it is recommended that the English language communication content be offered as a mobile learning module. The implication of this needs analysis is on the design process and development of a mobile learning module for English communication for healthcare professionals, incorporating the skills to be practiced and the most suitable contents as identified.

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Perception of the Use of LMS/i-Learn Portal and Telegram

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ABSTRACT

The purpose of this study is to identify the perception of Universiti Teknologi MARA (UiTM) students regarding the use of the Telegram mobile application and the UiTM Learning Management System (LMS) known as the i-Learn Portal for the purpose of discussion and dissemination of audio files for the Listen-Interact-Reflect-Act/Answer (LIRA) assignment tasked for the sample group. It is also served as reminders for assignments, quizzes and tests due dates. In terms of connection and mobility, most of these students have difficulty in accessing and communicating using the webpage, hence not being able to utilise it to its fullest. Telegram is seen as more convenient as the interface is much like other mobile instant messaging systems that facilitate students in responding to their lecturer and to communicate with their peers at any time. The study conducted on the students who took Integrated Language Skills: Listening (ELC120) course found that students preferred to use Telegram compared to the i-Learn Portal. They were found to express their emotions (using emoticons) more freely and could responded better to questions in Telegram. Based on these findings, it is suggested that a combination of both i-Learn Portal and other mobile applications should be made available to better engage students using technology as part of their learning tools.

Keywords: UiTM, LMS, i-Learn Portal, Telegram

INTRODUCTION

E-Learning has long been established as part of tertiary level teaching and learning and has significantly impacted the development of educational technology. The use of computers has evolved as participation of students in virtual discussions are emphasised in producing graduates who are competitive and technologically savvy. Discussions, extra notes and online quizzes are just some of the activities that require students to be connected to the Web. In most courses, it is a supplementary teaching and learning tool. Students are also encouraged to use this tool in their own study time. In UiTM, the e-Learning tools used are i-Learn Portal and i-Class Portal for uploading online quizzes or assignments among other functions, as part of assessment stipulated for certain courses in the university.

Arising from this concept is mobile learning, otherwise known as m-learning where communication between students and instructors is extended in mobile applications using smartphone devices, commonly used among students. Compared to other e-learning tools, mobile learning promotes students' continuous learning through conversation between instructors and students. It has become a growing trend for instructors to use mobile applications to encourage students in their learning process other than through the LMS. Among the popular applications used are Whatsapp and Telegram. The survey and discussion in this study was able to determine the students' preferred learning tool; i-Learn Portal or the Telegram application.

LITERATURE REVIEW

i-Learn Portal

The i-Learn portal was first established in 2005 (Saaid, Shahril Asmar Rashid & Jamaluddin Abd, 2014) and has since been the technological hub for communication between lecturers and students as outlined in UiTM's curriculum. Integrating e-Learning into students' learning process, introduced in the early 90s, has now significantly impacted higher education advancement as most students and educators have been exposed to the use of web as a teaching tool. This study focused on the course ELC120

(Integrated Language Skills: Listening), an English servicing course for UiTM diploma students specifically on the LIRA (Listen-Interact-Reflect-Act/Answer) assessment.

Telegram Application

The number of users for Telegram spiked after t.the four-hour blackout that affected Whatsapp users in 2014 (Constine, 2014). In many ways, Telegram has advanced and improved their services with more functions to adapt with the changes in smartphone messaging. While advancing and competing with other messaging applications, it is also acknowledged in M-learning because of its multiple functions of downloading files from pictures to audios, videos and even documents (Nunez, 2014). Telegram is also accessible through computers with internet connectivity and based on these unique features, Telegram can be an educational tool that takes m-learning to a more efficient level.

Previous Studies on e-Learning and m-learning

Several studies have focused on the perception and readiness of students in e-learning as well as m-learning. A significant study done by Saaid et al. (2014) reported that the i-Learn Portal does promote effective learning among the students. The study also found the i-Learn Portal to be user-friendly, thus facilitating navigation around it. However, the percentage of usage of the students in this study shows that they access the i-Learn portal mostly from the university system and from the laboratories but not much when they are outside the campus. This is also supported by another study by Srichanyachon (2014) on the perception of students regarding the LMS. The study reported that students have a moderate opinion on LMS usage due to factors such as lack of equipment which affected their learning process.

A study by Jazihan, Ahmad Fauzi and Wong (2012) suggests that students have high personal innovativeness towards m-learning; this indicates that students are ready to accept new technology which is essential in embracing the technology used in m-learning. Therefore, the readiness

of students also plays a significant factor in determining their perception towards using m-learning. Another study by Gikas and Grant (2013) reported that mobile learning allows students and instructors to communicate at all times and this, according to the authors, is seen as "fully productive".

Based on the studies above, this study also hopes to get students' feedback based on their experience when using the i-Learn Portal and Telegram. The objectives of this study are to:

1. assess students' perception of the use of i-Learn Portal and Telegram.
2. explore students' perception of communication via i-Learn Portal and Telegram.

This study focuses specifically towards an assessment of one English servicing course at Universiti Teknologi Mara (UiTM). Therefore, this can be considered an exploratory study which needs to be refined with further studies into this area.

METHOD

For the purpose of this study, the i-Learn Portal and Telegram were used simultaneously in giving instructions, uploading materials and carrying out online activities for the students throughout the semester. Subsequently, a set of questionnaire was distributed among the students at the end of the semester.

Participants

The participants in this study were Diploma in Creative Technology (Arts Management) students of the Faculty of Film, Theatre and Animation. 19 participants; 13 females and 6 males, ranging between 19 to 24 participated in this study. The demographics of the participants however, were not analysed for this study.

i-Learn Portal

The instructions were given to the students and materials were uploaded on the i-Learn Portal from time to time throughout the semester by the instructor. Students were required to login to receive the instructions. They also had to retrieve the uploaded materials in order to carry out the activities specified in the instructions. Figures of the instructions given and materials uploaded are as follows:

Figure 1: A Screen-Shot of Instruction Given Via i-Learn Portal

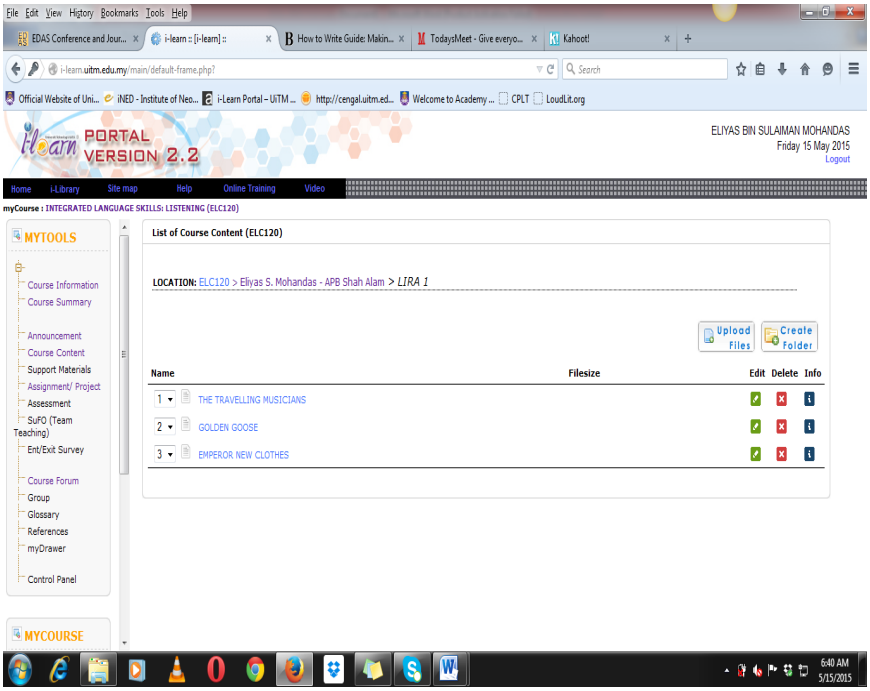

Figure 2: A Screen-Shot of Materials Uploaded Via i-Learn Portal

Telegram

Concurrent with the use of the i-Learn Portal, specific instructions were given and materials were uploaded via Telegram by the instructor to the students. A group chat was established by the instructor to enable him to communicate with the students. Students were asked to download the mobile application and then were added to the group by the instructor. Nonetheless, the distinctive feature of Telegram that allows anyone to add anyone else to the group chat facilitated the establishment of the group chat. The group then was named ELC 120 (1B/R). The group chat was also used as the medium of discussion among the students throughout the semester. Figures of the instructions given and materials uploaded are as follows:

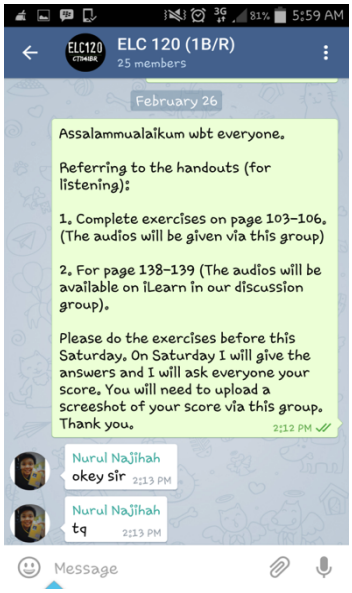

Figure 3: A Screen-Shot of Instruction Given Via Telegram

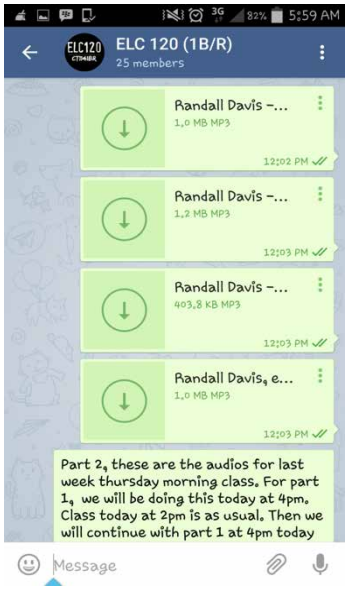

Figure 4: A Screen-Shot of Materials Uploaded Via Telegram

Questionnaire

Ultimately, a set of questionnaire was designed and distributed to the students at the end of the semester. This questionnaire was aimed at getting students' feedback on the use of i-Learn Portal and Telegram in carrying out learning activities. The questionnaire was divided into two parts; Part A consists of 10 items regarding i-Learn Portal and Part B consists of 10 items regarding Telegram. The items in Part B consists of the same statement where "i-Learn" was replaced with "Telegram". The scale used for the questionnaire is as follows: 1- strongly disagree, 2- disagree, 3- partially disagree, 4- neutral, 5- partially agree, 6- agree and 7- strongly agree.

Item	Statement
1	I know most of the functions in i-Learn Portal.
2	I always use i-Learn Portal.
3	Using i-Learn Portal is an effective way to learn ELC courses.
4	It is easy to use i-Learn Portal.
5	i-Learn Portal is an effective platform for lecturers and students to communicate virtually.
6	i-Learn Portal is suitable for lecturers to upload notes, lecture materials and quizzes.
7	i-Learn Portal is suitable for students to download notes, lecture materials and quizzes.
8	I always use i-Learn Portal to check notices and announcements.
9	i-Learn Portal is an appropriate method to monitor lecturers' / students' blended learning.
10	I prefer to use i-Learn Portal for the purpose of learning ELC courses.

Figure 5: Items in the Questionnaire for Part A

RESULTS AND DISCUSSION

	i-Learn Portal		Telegram	
Item	**M**	**SD**	**M**	**SD**
1	4.16	0.688	4.84	0.834
2	4.58	0.692	4.58	0.507
3	5.47	0.964	5.42	0.961
4	5.00	0.816	6.11	0.875
5	3.89	0.737	6.11	0.994
6	4.53	0.513	4.89	0.809
7	4.53	0.697	4.68	0.885
8	5.32	0.820	6.26	0.733
9	5.21	1.032	5.05	0.848
10	4.89	0.315	5.74	0.806
Total	4.76	0.241	5.37	0.320

Figure 6: Descriptive Statistics for Data Collected from the Questionnaire

Figure 6 above shows the data analysed for both the i-Learn Portal and Telegram items. Items 1, 4, 5, 6, 7, 8 and 10 show frequencies that students favoured the Telegram application. The user-friendliness and the availability of Telegram on their smartphones enabled easier access in engaging in ELC120 outside of the classroom. Based on the data, the participants found it easier to communicate with their colleagues and instructor, checking on notices and announcements, as well as downloading notes, lecture materials and quizzes. Being able to repeatedly listen to the audios downloaded through Telegram whilst they are on the move is also an added advantage of using this application. Item 2 shows the same mean; (4.58 ± 0.692) for i-Learn Portal and (4.58 ± 0.507) for Telegram. The active usage of the i-Learn Portal for the participants matched Telegram as both tools provided the same instructions and downloading of the audios for the assessment. The preference of which tool to use depends on the availability of the gadget that is convenient for the students. Items 3 and 9 shows preferences towards the i-Learn Portal with frequencies of (5.47 ± 0.964) and (5.42 ± 0.961) respectively which show students favoured the i-Learn Portal. Participants prefer for the communication between them and the instructors to be conducted through Telegram. However, they still favoured the i-Learn portal for the blended learning process. This is consistent with (Jongpil et al., 2012) in which their findings show students' perception towards i-Learn Portal is more of educational but more interactive and informal when using Telegram.

	Paired Differences		t	df	Sig. (2-tailed)
	M	SD			
Pair 1 LMS-Telegram	-.611	.338	-7.871	18	.000

Figure 7: Paired-samples Test for the Questionnaire Data

Figure 7 shows the paired-samples test done to get an accurate representation of the participants' perception of the use of i-Learn Portal and Telegram. Results indicate that there is a statistically significant difference in students' perceptions of LMS and Telegram ($M = -0.611$, $SD = 0.338$), ($t = -7.871$, $p = 0.000$) which confirms that students prefer Telegram to LMS in the context of this study.

CONCLUSION

In conclusion, students' preference for using Telegram for their learning process is significant to the advancement of m-learning particularly to optimise their learning process in using mobile gadgets. Further studies are suggested to confirm the effectiveness of students' learning when using Telegram or other features that can enhance i-Learn, as well as Telegram, to make it more applicable to students' and instructor's needs.

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TOWARDS MOOC AND OER: THE CHALLENGES AHEAD

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ABSTRACT

The recently launched Malaysia Education Blueprint (Higher Education) has seen bold steps to improve and strengthen higher education quality in the country. Particularly challenging for the youngest public university, the National Defence University of Malaysia (NDUM) is embracing all 10 shifts outlined in the blueprint. This paper aims at examining the roles of and challenges faced by academics in adopting technology for teaching and learning. Looking at the scenario at the NDUM today, it appears that the academics are still uncertain about adopting the current learning management system (LMS) for aiding their teaching processes. The methodology used in this paper is mainly content analysis of existing policy documents. A brief survey was also conducted among academics and the data was used to support the arguments and findings from the content analysis. Initial findings suggest that the academics themselves, who attended the training on using the LMS, were not confident to teach other colleagues. What can be discerned from this is perhaps the level of readiness or acceptance towards the use of technology in teaching and learning is still low. If this persists, Massive Open Online Course (MOOC) and Open Educational Resources (OER) may be a daunting objective to be achieved at the NDUM.

Keywords: LMS, MOOC, OER, teaching and learning

INTRODUCTION

The recently launched Malaysia Education Blueprint (Higher Education) has seen bold steps to improve and strengthen higher education quality in the country. Particularly challenging for the youngest public university, the National Defence University of Malaysia (NDUM) is embracing all 10 shifts outlined in the blueprint. For a start, all higher learning providers must have a platform to allow teaching *with* technology, thus the term LMS becomes significant. A Learning Management System (LMS) refers to the platform used to operate online content and courses. Bates and Sangra (2011) claimed that LMSs are the main driver of e-learning in tertiary education. This is because about 90% of tertiary providers in the United States have LMSs (Lokken & Womer, 2007). In Malaysia, LMSs are *obligatory* for public and private higher learning institutions. Some tertiary providers in Malaysia prefer to use open source platform of the LMS such as Moodle. Universiti Teknologi Malaysia and Universiti Malaysia Sarawak are two public universities that utilise Moodle. As for the National Defence University of Malaysia (NDUM), its LMS was purchased at the end of 2009 from a private vendor.

This paper aims at examining the roles of and challenges faced by academics in adopting technology for teaching and learning. The main objective is to investigate the readiness of academics to be involved in Massive Open Online Course (MOOC) as stipulated in the newly launched Malaysia Education Blueprint (Higher Education), which highlights the need for Malaysia to offer quality online courses through MOOC. In so doing, this paper is arranged into four main sections including this introduction. The second section reviews the literature on LMSs as well as MOOC and OER, and the third section analyses and discusses the findings. The last section concludes the discussion of this paper. Before moving further, the next sub sections look at the defence university and the methodology adopted in this paper.

The National Defence University of Malaysia (NDUM)

The NDUM was gazetted by the Malaysian Parliament in November 2006 to replace the Military Academy of Malaysia (MAM). The MAM was a smart partnership between the Ministry of Defence, Malaysia, which

provided military training, and Universiti Teknologi Malaysia, which provided academic support. The change of status marks the shift of focus from just producing *mere* engineers for the Malaysian Armed Forces (MAF) to producing 'intellectual leaders of character'. After nine years of existence, the most important aspect that *may be* of question is the teaching and learning component, especially on the adoption of new technologies. Much of this lack of adoption could be contributed to the lack of resources and lack of experience in using new technologies. Suffice to say at this point that in order to produce graduates for the MAF, students must be exposed to the use of technology, and they must be comfortable using it whenever necessary.

METHODOLOGY

The methodology used in this paper is mainly content analysis of existing policy documents. These include the draft of the e-Learning policy, ICT policy as well as human recourses policies and guides. The researchers' opinion is that, as a brief paper, content analysis of documents is sufficient at this stage. Data from the Centre for Academic Development were also used to support the discussion in this paper. These data include the number of trainings conducted, the number of academics who attended the training and the number of academics who have uploaded their materials on the LMS. Furthermore, a brief survey was also conducted among academics and the data was used to support the arguments and findings from the content analysis. This survey was conducted after a Training of Trainers (ToT) session for using the LMS for e-Learning committee members at the NDUM. As a result, the number of respondents for the survey was small with only 14 respondents.

The items in the questionnaires were adopted from an online survey on the use of LMSs. For the purpose of this paper, there were six main questions that includes issues on the use of the LMS at NDUM and issues on the training for the use of the LMS. Two types of likert scale were used; for basic questions, a-two likert scale of "Yes" and "No" was used. For others, a-five point likert scale was used with 1 being "Strongly Disagree" and 5, "Strongly Agree." The data were then analysed using the Statistical Package for Social Sciences (SPSS) Version 18. The data analysis only includes frequency statistics, which will be reported in the third section of this paper.

LITERATURE REVIEW

LMSs allow education providers to incorporate important elements of teaching and learning (Dalsgaard, 2006). The main function of any LMS is to facilitate course management and give students the benefit of having supplementary tools for learning. During the early years of LMSs, many institutes of higher learning were sceptical about the use of any online platforms to assist teaching and learning. The issues involved governance, management and technical supports as well as professional development (Benson & Palaskas, 2006).

The Beginning of LMSs

The first two popular LMSs were WebCT and Blackboard. An instructor at the University of British Columbia created a "standard Web-based shell or learning management system" or what was then known as WebCT (Bates & Sangra, 2011). WebCT integrated spaces for learning objectives, for developing content, for uploading documents and for testing students using multiple choice questions. Universiti Teknologi Malaysia was once a user of WebCT. Nonetheless, the university opted for Moodle in 2004 for economic reasons.

WebCT was then bought by Blackboard. Blackboard was founded in 1997 by Pittinsky and Chasen. Blackboard is used by more than 70% of colleges in the United States (Bradford et al., 2007). In Malaysia, Universiti Tun Hussein Onn, a public university, is currently using Blackboard as its LMS (Embi, 2011). Sunway University College in Malaysia too is utilising Blackboard. Out of 20 public universities in Malaysia, it appears that only one university uses Blackboard and out of hundreds of private institutions in Malaysia, only one uses Blackboard. What this implies is that maybe Blackboard is too expensive, and thus it is not prevalent in Malaysia.

This scenario leads to the use of open source which is free such as Moodle. The next sub section examines this.

What Happened Next? – Open Source LMSs

Moodle is fast becoming a dynamic LMS in Malaysia. According to Embi (2011), out of 20 public universities, nine use Moodle as the LMS. In fact, Moodle is the leading open source in North American and European universities (Itmazi & Megias, nd). The factor that drives this is mainly because of the zero cost implication to these higher learning institutions. Other than its free nature, Moodle is attractive because of other aspects explained next. Beatty and Ulasewicz (2007) argued that Moodle is much more interactive than Blackboard. Additionally, most courses offered online use Moodle as a supplementary learning tool. This is supported by Martin-Blas and Serrano Fernandez (2009) who argued that Moodle as a LMS has helped to reinforce students' abilities and knowledge. They further concluded that Moodle is the best platform for educators to "organise, manage and deliver contents."

In addition, Moodle happens to be an effective tool for evaluation. Suchanska and Keczkowska (2007) further suggested that Moodle changes the roles of educators and students in classrooms. The teaching and learning becomes more enriched because various multimedia are used. Moodle too is perceived favourably by library officers in a study conducted in Italy (Fontanin, 2008). According to Fontanin (2008), the English course developed to train in service librarians was a success because the platform used to deliver the course is effective.

Given this constructive acceptance of Moodle, one may wonder whether it is suitable for all courses at all levels. The bigger question is whether all higher learning providers can really benefit from using Moodle as their LMS. While much has been argued about this, this paper focuses solely on a customised LMS purchased from a local vendor and now installed at the defence university. What is happening to this LMS after six years of existence at the NDUM? Should the defence university shift to Moodle? An even more critical question is, in the advent of MOOC in the Malaysian education landscape, what will happen to the existing LMS? Unfortunately, this paper is not able to answer all these critical questions. These could be the research questions in the next research. The focus now is on looking at the future of online learning. The next sub section discusses the birth of MOOC.

The Future of Online Learning – OER, OCW and MOOC

The democratisation of education has strengthened the need for education providers to expand their services to anyone regardless of their locations. Various movements are actively promoting equality in education. First coined in 2002, the Open Educational Resources (OER) movement allows those who are in quest of knowledge to benefit from learning materials and contents freely available online. The aim of OER is to provide more equal access to knowledge and educational opportunities (Lim, 2011). What OER offers are educational materials that are made "freely and legally available on the Internet for anyone to reuse, revise, remix and redistribute" (*White Paper: Open Educational Resources: Breaking the Lockbox on Education*, 2013). Some useful OER sites are Open Courseware Consortium, MIT; Carnegie Mellon Open Learning Initiative and OpenLearn, OUUK. Currently, there are nine OER initiatives by Malaysian public universities (Embi, 2013). According to Embi (2013), there are other institutional OER initiatives in Malaysia, including Wawasan Open University and Open University Malaysia.

Consequently, providers of contents and learning materials are not only disseminating knowledge but they are also offering free courses online to the general public. The free courses and materials can be used by other academics and students alike as academics can place the links of the OER in the LMS, and students can also explore various learning materials elsewhere.

There are various types of OER, and one of them is Open Courseware (OCW). OCW could be defined as learning materials that are organised as complete courses including the assessments. According to Caswell (2009), OCW has several institutional benefits such as showcasing the institution educational quality, connecting to students before, during and after enrolment and promoting the researchers and faculties' intellectual works.

The acceptance and usefulness of OER and OCW have led to another buzz concept, MOOC. MOOC emerged from OER movements. Since its inception in 2008, MOOC has become an alternative platform for online learning rapidly. This can be seen in many instances where tertiary education providers started to inaugurate their MOOC initiatives. For example, in 2013, Taylor's University, Malaysia began to offer courses through MOOC.

Recently, another university, Universiti Putra Malaysia has also launched its MOOC initiative called PutraMOOC in April 2014.

Regardless of the critiques on MOOC (see Delbanco, 2013; Gans, 2014), this latest development has sparked the interest and determination of the Ministry of Education, Malaysia in utilising MOOC. In their monthly speeches to the representatives of the universities, and during various meetings and gatherings at the ministerial level, the Minister of Education II, Malaysia and the Secretary General II of the Ministry have put a great emphasis on the involvement of Malaysian tertiary education providers in MOOC. For example, in 2014, the Ministry has initiated four pioneer MOOCs, developed by four public universities, including Universiti Putra Malaysia, Universiti Malaysia Sawarak, Universiti Kebangsaan Malaysia and Universiti Teknologi Mara. These MOOCs, which are TITAS, Introduction to Computing, Ethnic Relations and Entrepreneurship use Open Learning (https://openlearning.com) under Malaysia MOOC as the platform. In fact, by 2015, all public universities will need to upload the e-content of their courses to a yet to be identified online learning platform. What this means is that the government is adamant about the use of not only digital technologies but also the concept of resource sharing and content development.

FINDINGS AND DISCUSSION

This section presents the findings of the content analysis of policy documents as well as the data from the survey and the Centre for Academic Development. Simultaneously, discussion on relevant issues will also be made. As previously mentioned, three main documents were analysed in order to identify the roles of academics and challenges they face in teaching with technology. The first document is the e-Learning Policy of the defence university. The policy was recently presented to the Committee of Academic Development and Management, and was presented for further approval at the Senate of the defence university. The policy outlines critical aspects of using e-learning at the NDUM. The policy emphasises the roles and functions of different bodies in the university; particularly important for this paper is the roles of academics on adopting technology for teaching and learning. There are eight roles of academics on using e-learning as listed below:

1. All academics are responsible for increasing the use of and enhancing the quality of content. These contents must be uploaded to the LMS in stages depending on the needs or whenever necessary.

2. All lecturers are responsible for the materials uploaded to the LMS.

3. All lecturers must ensure that the materials uploaded are relevant to the course and are of high quality.

4. All lecturers must ensure that the materials uploaded to the LMS are not in violation of any copyrights, intellectual properties and must be free of plagiarism.

5. All lecturers must provide appropriate feedback to students on the online forum.

6. All lecturers are responsible to safeguard students' work.

7. All lecturers must evaluate and assess students based on the postings/ assignments/forum/emails on the LMS.

8. All lecturers must go through the training and workshops relevant to the use of the LMS, or its tools organised by the Centre for Academic Development, Centre for Information Technology and Communication and/or any other agencies.

What can be discerned from this document is that the NDUM is serious about making technology part of teaching and learning since the roles of academics are clearly outlined in the policy.

The second document analysed, nonetheless, fails to support the significance of teaching with technology. The Information and Communication Technology (ICT) Policy was presented and approved by the University's EXCO (Executive Committee) on 14th January 2015. This policy mainly outlines the importance of ICT on the running of the defence university especially on the data security and management and development of ICT. The search for the key word 'teaching' only resulted twice. The same goes to the word 'learning,' which only appears two times too. What

this suggests is that there is an inconsistency of accepting the importance of technology in the teaching and learning process. This inconsistency also appears in the documents on human resources (academics) on the utilisation of technology. The most obvious loophole is the fact that there is no indication of e-learning or teaching with technology in the annual appraisal form; this suggests that no marks will be awarded to those who are actively developing e-content for the LMS. Further, the promotion exercise too has no marks awarded for using the LMS. It can be argued that this may be one of the factors that hinder academics from using technology in their teaching, or from utilising the LMS.

Table 1 below summarises the data from the survey. The respondents were asked four basic questions. Based on the table, it appears that all respondents were first timers to the LMS training. A few of the respondents felt that the LMS was quite difficult to be used (mean = 1.21), and a handful of the respondents were not going to use the LMS in the coming semester (mean = 1.15). When asked whether the respondents are able to coach other academics, most of them answered "No" (mean = 1.64). What can be concluded from the table is that these respondents are in need of more training on the use of the LMS, despite their roles as the e-learning committee members or champions at their respective faculties.

Table 1: Data on the Survey (Basic Questions)

		First time attending training	Easy to Use the LMS	Use the LMS next semester	Can coach others to use the LMS
N	Valid	14	14	13	14
Mean		1.00	1.21	1.15	1.64
Std. Deviation		.000	.426	.376	.497

Table 2 below illustrates the responses about issues on the LMS. Most respondents opted for likert scales of 2, 3, 4 and 5 for Item 1, 2, 3, 4 (the means range from 3.29 to 3.71). For Item 5, 6, 7 and 8, the respondents opted for all scales including 1 (the means range from 1.93 to 2.79). In considering Item 5, for example, it is understood why some respondents chose "Disagree" or "Strongly Disagree" (*I have some technical problems with the LMS*). This shows that some were having technical problems with

the LMS, and some were not. The same goes for Item 6 (mean = 1.93) which suggests that the respondents were not worried about logging in to the LMS. The most important finding from this table is that most respondents were confident that the training has allowed them to perform functions such as uploading material and creating assessments on the LMS (mean = 3.71 for both Items 3 and 4). As academics, these two are of the utmost importance because the roles of academics, as stipulated in the e-Learning Policy, also emphasise these, amongst others.

Table 2: Data on the Survey (Issues regarding the LMS)

		1	2	3	4	5	6	7	8
N	**Valid**	14	14	14	14	14	14	14	14
Mean		3.50	3.29	3.71	3.71	2.79	1.93	2.50	2.57
Std. Deviation		.760	.914	.611	.726	1.251	.917	.941	.852
Minimum		2	2	3	2	1	1	1	1
Maximum		5	4	5	5	5	4	4	4

1. Can use the LMS independently after the training
2. The LMS is user-friendly
3. The training is sufficient to allow for uploading of materials
4. The training is sufficient to allow for creating of assessments
5. Technical problems with the LMS
6. Problems logging into the LMS
7. Problems uploading materials
8. Will be able to trouble shoot should there be problems with the LMS

Table 3 below summarises the findings on the training of the LMS. It appears that the respondents were interested in learning about utilising the LMS when most of them opted for scales between 3 and 5 for Items 3, 4 and 8. The researchers argue that the level of competency for each academic is different, resulting in some respondents, who felt that it is not necessary to spend more time on some of the modules in the LMS. The highest mean is for "More time for Assessment Manager," 4.14, which indicates that this is the area in the LMS that the academics are not confident of using. The Assessment Manager, in actual fact, has two layers of management. The first is the Quiz Bank layer, where all questions will be stored, based on topics or weeks. The second layer is where the academics need to assign the questions in the Quiz Bank to their appropriate test sequence.

Table 3: Survey Data (Training of the LMS)

		1	2	3	4	5	6	7	8
N	**Valid**	14	14	14	14	14	14	14	14
Mean		3.79	3.50	4.14	3.93	3.21	3.14	3.21	3.93
Std. Deviation		.699	.855	.663	.616	1.051	.864	.893	.730
Minimum		2	2	3	3	2	2	2	3
Maximum		5	5	5	5	5	4	4	5

1. The module is easy to understand
2. Time for training is adequate
3. More time needed for the Assessment Manager
4. More time needed for the Assignment Manager
5. More time needed for the Notes Manager
6. More time needed for the Document Manager
7. More time needed for the Forum Manager
8. More time needed to explore the LMS during training

Supporting all the findings from the tables above are some data generated by the Centre for Academic Development on the number/ percentage of academics who have started to use the LMS for Semester 2, Academic Session 2014/2015 and the frequency of training together with the number of academics who attended the LMS training. The first set of data shows the percentage of academics (excluding those from the Medical faculty; Foundation centre and on sabbatical/post-doctoral/study leave) who have at least 30% of the teaching materials uploaded on the LMS as of April 23, 2015, which amounts to only 21% (40 of 191 academics). The researchers argue that this percentage will increase in due time since most of the academics are uploading their materials based on topics, themes and weeks. This is because at the time this paper was being written, it was only the 7th week of the semester. Thus, it is foreseeable that more academics will be uploading the required materials on the LMS as time goes by.

The second set of data is illustrated in Table 4 below. The series of training were conducted according to faculties. This, supposedly, would open up more opportunities for the academics to share ideas and notes on developing their materials to be uploaded. These training sessions were held twice (Levels 1 and 2) for all faculties except for the Engineering faculty. Based on the table, it appears that *not all* academics were able to attend the

LMS training sessions due to factors that cannot be explained in this paper. Nonetheless, it shows to some extent that there is some resistance to using the LMS. More research is needed to look into this matter.

Table 4: Data on LMS Training Sessions

Year/Number of Academics*	2013**	2014**	2015
First Level	17	92	0
Second Level	0	63	18
Total	17	155	18
Grand Total		190	

* These academics may have attended both Levels 1 and 2

** The numbers include those from all faculties and academic centres except for Foundation centre

CONCLUSION

This paper aims at examining the roles of and challenges faced by academics at the NDUM to adopt the LMS as part of their teaching and learning repertoire. The researchers opine that the academics have mixed opinions and feelings about using the LMS. The resistance may be contributed to various factors. One of them is the fact that albeit the university's e-Learning Policy that promotes the use of technology, the ICT Policy and the Human Resources documents have not taken into consideration the efforts to utilise technology in the teaching and learning process. If measures are not taken to address this issue, the vision of the Ministry of Education, Malaysia to see the NDUM produce MOOCs and OER may not materialise. Even if there are some academics who are keen to develop MOOCs and OER at the NDUM, without appropriate support from the top management, middle management as well as peers, it would be a daunting task to accomplish, and yet, a rewarding one once the original contents and materials are ready and complete to meet and satisfy the needs of the students.

To conclude, clearly the roles of the academics at the NDUM must be spelled out not only in the e-Learning Policy, but all relevant policies that involve teaching and learning. Without proper guidance, it will be a

massive challenge for the academics to determine and achieve their Key Performance Indexes (KPIs). Perhaps, this is one of the many factors that stops the academics from using the LMS; neither the policies nor documents clearly stipulate the terms and conditions except for extracts from minutes of meetings that direct the academics to utilise the LMS.

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ONLINE LEARNING: STUDENT PARTICIPATION AND SATISFACTION

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ABSTRACT

This research focuses on student participation and satisfaction toward online learning at Universiti Teknologi MARA, Pahang. This has become a major concern of lecturers because of the challenge in engaging students in online learning, thus, creating a need to study the activities used in online learning. In addition, the poor participation of students in online learning activities has created a major problem in implementing online learning. Three research objectives were developed for this research; the first attempts to identify the type of online learning activities among students; the second investigates the approaches used by lecturers to encourage student participation in online learning; and the third attempts to identify the level of satisfaction among students toward online learning. The findings revealed that the online learning activities preferred by students are group discussion, followed by online tests or quizzes and searching for online notes. Furthermore, uploading of assignments by lecturers in the group forum was found to be a favored approach to encourage student participation in online learning. Finally, the findings also indicated that student participation in online learning was moderate, while, satisfaction with online learning at UiTM Pahang was rated as fair. These findings should alert the authorities at UiTM Pahang to find ways improve the effectiveness of student online learning time.

Keywords: Online learning, Student Participation, Student Satisfaction

INTRODUCTION

Online learning is one of teaching and learning methodologies being used at higher education institutions (HEIs) in Malaysia for knowledge sharing, interaction and communication between lecturers and students. In order to implement online learning in HEIs, knowledge of student participation and satisfaction would help improve student academic achievement. Previously, the traditional pedagogies required the lecturers to interact, facilitate and communicate with students face to face. Nowadays, the trend of higher education pedagogies in Malaysia has changed to incorporate more online learning. This research would thus be interesting to investigate student participation and satisfaction during online learning sessions. Student participation is important to ensure that the online learning outcomes meet the objectives of the subject matter learned throughout the semester. As such, student satisfaction also needs to be studied to ensure that students are satisfied with the learning process.

In the past several years, online learning systems have been taking center stage in HEIs (Geri & Gefen, 2007). The significant growth of online learning at HEIs around the world remains at record highs (Anastasiades, Vitalaki, & Gertzakis, 2008; Littlejohn, Falconer & McGill, 2008; Shee & Wang, 2008). Raja Maznah (2004) has mentioned that most public universities in Malaysia have some form of strategic plan for implementing solely digital universities. This plan includes the teaching and learning program conducted via online or web-based mode to replace traditional classroom learning. According to Raja Maznah, universities in Malaysia are ready for the online delivery learning that supports distance education. Nowadays, most HEIs in Malaysia is ready for online learning. With support from the government under the 9th Malaysian Plan (2006-2010), building world-class human capital through lifelong education has been highlighted. Using the concept of continuous learning, the government encourages all the public and private HEIs to establish a center of life long learning (Chai & Poh, 2009) within their organizations. In addition, the setting up of the virtual universities, Universiti Tun Abd Razak (UNITAR) in 1998 and the Open University of Malaysia (OUM) in 2000 is proof of government commitment in supporting the implementation of online learning in HEIs in Malaysia.

Online learning environments are not highly teacher-centered which require students to take a more active role in their learning. In particular, students have to realize their responsibility for guiding and directing their own learning (Hartley & Bendixen, 2001; Hsu & Shiue, 2005), for time management (Hill, 2002; Roper, 2007), for keeping up with the class, for completing the work on time (Discenza, Howard & Schenk, 2002), and for being active contributors to instruction (Garrison, Cleveland-Innes & Fung, 2004).

Stefan (2008) has described different ways of online participation which are participation as accessing e-learning environments, participation as writing, participation as quality writing, participation as writing and reading, participation as actual and perceived writing and participation as taking part and joining in a dialogue. He also defined online participation as a process of learning by taking part and maintaining relations with others. It is a complex process comprising doing, communicating, thinking, feeling and belonging, which occurs both online and offline. Research also has argued that online learning is best accomplished when learners participate and collaborate (Bento & Schuster, 2003; Leidner & Jarvenpaa, 1995; Webster & Hackley, 1997). Many researchers seem to agree that participation is a key driver for learning (Stefan, 2008). Davies and Graff (2005) even examined the relationship between the level of online participation and grade, while Vonderwell and Zachariah (2005) studied factors that influence learner participation.

In conjunction with implementing effective online learning among students at HEIs, poor student participation and level of satisfaction toward online learning courses are the main concerns of this research. This is because student participation and satisfaction would ultimately impact their academic performance. Participation has been argued to be an intrinsic part of learning (Wenger, 1998). Even though there are many educational benefits associated with using computer technologies, there are also disadvantages. Critics have argued that online learning and the use of information technology may put certain student populations at a disadvantage (Pu-Shih Daniel Chen et al., 2010). In addition, some researchers have asserted that the lack of face-to-face interactions in online learning might reduce instructional effectiveness for students of a particular learning style (Bullen, 1998; Terrell & Dringus, 2000; Ward & Newlands,

1998). Though most online courses do not require students to have advanced computer skills in order to complete the courses, they nevertheless require students to become familiar with essential ICT skills such as using e-mail, participating in online chatting, posting to a Web-based discussion board, and using word processing, presentation and spreadsheet software.

Hence, this research was conducted among students at UiTM, Pahang to study the following:

1. To identify the type of online learning activities used among students at Universiti Teknologi MARA, Pahang

2. To investigate the approaches used by lecturers to encourage student participation in online learning at Universiti Teknologi MARA, Pahang

3. To identify the level of satisfaction among students toward online learning at Universiti Teknologi MARA, Pahang

LITERATURE REVIEW

Information and communication technologies (ICT) particularly those related to the Internet, have changed the way services are delivered in higher education. With the advancement of web applications, students have been exposed to new features that support and alter their learning environment. Among the important advancements in the digital age is online learning. Murray, Pérez, Geist, and Hedrick (2012) proposed that by 2014 most students in HEIs would be taking some classes online. According to Han and Johnson (2012), online learning which is more cost effective and convenient compared to the traditional educational environment has increased opportunities for more learners. Chakraborty and Nafukho (2014) have stated that the professional and educational communities involved in learning need to fully utilize the virtual learning environment. Understanding student expectation from a university online environment should increase their satisfaction and consequently, have a positive impact on student academic performance. Therefore, this study will try to provide an in depth look at student participation and satisfaction in online learning.

Most authors describe online learning as access to learning experiences via the use of some technology (Benson, 2002; Carliner, 2004; Conrad, 2002). Some researchers describe online learning as "wholly" online learning (Oblinger & Oblinger, 2005), whereas others simply reference the technology medium or context with which it is used (Lowenthal, Wilson & Parrish, 2009). Research has argued that online learning is best accomplished when learners participate and collaborate (Bento & Schuster, 2003; Leidner & Jarvenpaa, 1995; Webster & Hackley, 1997). Many researchers seem to agree on that participation is a key driver for learning (Stefan, 2008). Davies and Graff (2005) examined the relationship between the level of online participation and grade. Furthermore, Vonderwell and Zachariah (2005) studied for factors that influence learner participation. In addition, Simonds, Thomas and Brock (2014) claimed that age, experience and exposure toward different online activities have a significant influence on students' online participation and choices of activities. They claimed that adult learners usually prefer to watch lectures through videos, while the younger generation favor an interactive approach. Instructors have to be creative in applying the appropriate learning strategies to encourage the learners to participate actively.

Fredericksen, Picket, Shea, Pelz and Swan (2000) indicated that online learning courses contain learning activities that are not only Web-based activities or online learning activities. It appears that in the context of education, there is a consensus in the literature that learning activities refer to the actions and operations those individuals perform in order to achieve a desired learning outcome mediated by educational tools (Lapre, Mukherjee & VanWassenhove, 2000). In context of online learning implementation, the online activities are mediated by online learning tools (Lam, 2004).

Lecturers would usually discuss and explain the learning outcome in class and then apply this information to activities, problems, and tasks in subsequent learning sessions. At present, in the Malaysian scenario, educational institutions have begun supporting conventional teaching methods with e-learning environments (Khalid, Yusof, Heng & Yunus, 2006). The Ministry of Education (MOE, 2012a) has encouraged educational institutions to utilize Information Communication Technology (ICT) in teaching and learning in order to create capable and innovative graduates. There is no doubt that technology plays an important role in changing the

way learning content is presented (Kamaruddin, 2010); however, there is still much scepticism amongst Malaysians over the efficiency of using online learning as a medium of teaching and learning (Chung, 2008; Luo, Boland & Chan, 2013).

The study by Hrastinski (2008) reveals numerous practices used to encourage student participation in online classes. Abrami, Bernard, Bures, Borokhovski, and Tamim, (2011), stated that it is important to have frequent interaction in online learning, observed by instructor. Four types of interactions can help increase student participation online; 1) student-faculty interaction which includes communication in the form of chats, emails, and video conferences; 2) student-content interaction that facilitates learners' accessibility to the course materials and information provided in online class environment; 3) technology-student interaction which enables learners to navigate the learning management system and various technological tools that aid in delivering content; and (4) student-student interaction which involves the communication and exchange of information in chat sessions, discussions, group work and team activities among the learners (Abrami, Bernard, Bures, Borokhovski & Tamim, 2011; Angelino, Williams & Natvig, 2007; Chen, 2007 in Chakraborty & Nafukho, 2014). In order to increase student participation Simonds and Brock (2014) also posted a list of activities used in online learning activities such as, 1) Live chats led by the instructor; 2) Live lectures/audio sessions; 3) Watching archived lectures asynchronously; 4) Instructor comments in online discussion boards; 5) Student comments in online discussion boards; 6) Emails from the instruction; 7) Emails from the students/peer; 8) Exploring web links/ online materials; 9) Viewing pre-recorded video lectures; 10) Listening to pre-recorded audio files; 11) Reading lecture notes; 12) Telephone conversations with the instructor; 13) Telephone conversations with the students; 14)Participating in online small group projects; 15) Reading power points; and 16) Reading course texts and articles.

It takes time to adopt and adapt to changes in technologies. Online learning not only allows institutions to serve more students at a lower expense, but it also improves teaching methodologies, increases the learning involvement, and enhances communication among students and instructors, sometimes even beyond the interaction that is possible in a traditional classroom (Chakraborty & Nafukho, 2014). Student satisfaction is also

another important element in online learning implementation. In order to fulfill student satisfaction in online learning, it is important that the instructor give clear instructions regarding how to access course content and learning activities (Chakraborty & Nafukho, 2014). In the same study, the authors agreed that the satisfaction level among students increased when they could easily navigate the videos containing the guides to using online learning. One of the major successful indicators is the use of video conferencing that can enhance interaction among users. Besides that, online learning is also more humanistic as it can be personalized with real time connection where the student can be fully engaged in the learning process (Chakraborty & Nafukho, 2014). The advancements in ICT are such that no one can perfectly predict the future of higher education. Many of the respondents' report of satisfaction and frustration were tied to the environmental nature of online classes with satisfying experiences described in terms of flexibility and frustration being described as a personal disconnect or some variant of that theme. Other descriptions were related the superiority or inferiority of instructional design and online learning environment(s). Those concepts were commonly reported in the answers to the questions where respondents were asked to describe their overall levels of satisfaction and frustration with online education. Those overall themes are reported in the following paragraphs followed by some specific instances of satisfaction and frustration. In a study by Tohm (2012), most of the online users were satisfied with online learning because of the flexibility of the medium, high connectivity to others in the online classroom community while another with the same overall satisfaction level reported feeling that their interaction with the instructor was more individualized and personal.

Theoretical Framework

Figure 1: Theoretical Framework of the Research

Figure 1 above shows the theoretical framework for "Online Learning: Student Participation and Satisfaction. The variables used are adopted from the literature review.

METHOD

In this research, the respondents were the students doing their Bachelor in Office Systems Management from the Faculty of Business Management at UiTM, Pahang. 100 sets of questionnaire were distributed and all were usable for this study. The questionnaire, containing 42 items, comprised five close-ended sections. The breakdown of the sections in the questionnaires is as follows:

Table 1: Instrument Sections

Section	Item	Number of question	Type of question
A	Demographic	5	Closed-ended question
B	Online learning activities	14	5-point Likert Scale
C	Student participation in online learning	10	5-point Likert Scale
D	Lecturers' approach in online learning	8	5-point Likert Scale
E	Student satisfaction toward online learning	5	5-point Likert Scale

The students completed the questionnaire during the class period on the date the survey was circulated. The data from the questionnaire were analyzed using the Statistical Package for Social Sciences (SPSS), version 22.0. Descriptive measures such as the mean and standard deviation were used to identify the activities in online learning, lecturers' approach in online learning and student participation in online learning. This study also investigated the correlation between student participation and satisfaction toward online learning among the Bachelor of Office Systems Management students at UiTM, Pahang.

RESULTS AND DISCUSSION

Reliability Analysis

The result of the Cronbach's Alpha,shown in Table 2, shows that the followings sections are acceptable and reliable. Sekaran (2003) suggested that reliability which is less than 0.60 can be considered poor, those in the 0.70 range can considered acceptable and those over 0.80 can be considered good.

Table 2: Internal Consistency of the Constructs of the Survey Instrument (Reliability Analysis Result)

Construct/Scale	N of items	Cronbach's Alpha	Result
Online learning activities	14	.860	Good
Student participation in online learning	10	.763	Acceptable
Lecturers' approach in online learning	8	.907	Good
Student satisfaction toward online learning	5	.810	Good

Demographic Analysis

Table 3 below shows the demographic profiles of the respondents (N=100) in Section A. The first five questions of the survey were on respondents' gender, age, semester (part), credit hours to be completed in the current semester, time spent on online learning and types of online activities.

Table 3: Respondents' Demographic Profile: Gender (N=100)

Gender	Result (percent)
Male	12%
Female	88%

Table 4: Respondents' Demographic Profile: Age (N=100)

Age	Result (percent)
21-23 years old	92%
24-26 years old	8%

Table 5: Respondents' Demographic Profile: Semester (part) (N=100)

Semester (part)	Result (percent)
3	34%
4	24%
5	29%
6	13%

Table 6: Respondents' Demographic Profile: Credit Hours to be Completed in Current Semester (N=100)

Credit hours to be completed in current semester	Result (percent)
Less than 10 credit hour	1%
11 - 20 credit hour	16%
21 - 30 credit hour	83%

Table 7: Respondents' Demographic Profile: Time Spend on Online Learning (N=100)

Time spent on online learning	Result (percent)
Less than one hour per day	11%
2 – 3 hours per day	70%
4 – 5 hours per day	19%

It can be concluded from Tables 3, 4, 5, 6 and 7 that the majority of the respondents are female (88%) aged between 21-23 years old (92%) from semester 5 (29%). Most of the respondents reported spending between 2-3 hours per day for online learning activities.

Research Objective 1: To Identify the Online Learning Activities among Students

Table 8 shows the type of online learning activities which the students of the Bachelor of Office Systems Management engaged in which included accessing lectures, online notes, tutorial/exercises, and assignments; participating in group discussions, online presentations and online tests/ quizzes; searching online databases; blogging; social media; instant messaging; and email.

Table 8: Online Learning Activities Frequencies (N=100)

Type of online learning activities	N	Percent	Percent of cases
Lectures	43	6.6%	43%
Online presentation	38	5.8%	38%
Notes	81	12.4%	81%
Group discussion	85	13.0%	85%
Online test/quiz	84	12.8%	84%
Online database	52	8.0%	52%
Tutorial/exercise	77	11.8%	77%
Assignments	80	12.2%	80%
Blogging	6	0.9%	6%
Social media	34	5.2%	34%
Instant messaging	40	6.1%	40%
Email	34	5.2%	34%
Total	654	100.0%	654%

Dichotomy group tabulated at value 1.

Table 8 above shows that the most popular type of online learning activities among students is group discussion (13%), followed closely by doing online tests or quizzes (12.8%) and accessing online notes (12.4%). This shows that group discussion is the main online activity among students at UiTM Pahang. The group discussion may include sharing sessions and discussion on the subject or chapters between the students and lecturers. However, the results also show that the lecturers tend to conduct online tests or quizzes in order to encourage students to participate in online learning. Likewise, the students search for and/or download notes given by their lecturers as part of online learning activities.

Table 9: Online Learning Activities (One-Sample Statistics, N=100)

Online learning activities	N	Mean	Std. Deviation	Std. Error Mean
Sharing assignments with other classmates (via forum/ discussion)	100	3.75	1.009	.101
Sharing assignments with other classmates (via email)	100	3.00	1.101	.110
Participating in chat sessions (with lecturers)	100	3.91	.818	.082
Participating in chat sessions (with classmates)	100	3.97	.810	.081
Reviewing chapter slides online	100	4.24	.653	.065
Submitting course assignments online	100	4.20	.682	.068
Registering for courses	100	4.34	.699	.070
Reading other classmates' discussion in the group forum	100	3.98	.841	.084
Reading lecturers' discussion in the group forum	100	4.15	.783	.078
Reading emails from other classmates	100	3.13	1.116	.112
Checking grades online	100	3.81	1.051	.105
Reading emails from the lecturers	100	3.36	1.040	.104
Watching videos online	100	4.15	.770	.077
Developing personal blogs or websites	100	2.27	1.171	.117

Table 9 above identifies the activities that contribute the most to student online activities. The results were obtained by analyzing the data using One-Sample Statistics. Although registering for courses online is mandatory and cannot be strictly considered as part of online learning, this item was included because the researchers wanted to find out if any other learning activity would supercede this mandatory activity. The findings reveal otherwise. Following registering for courses was reviewing chapters and online slides notes (M=4.24). Thirdly, they used online facilities to submit course assignments (M=4.20) to their lecturers.

Research Objective 2: To Investigate the Lecturers' Approach to Encourage Student Participation in Online Learning

Table 10: Lecturers' Approach (One-Sample Statistics, N=100)

Lecturers' approach to encourage student participation in online learning	N	Mean	Std. Deviation	Std. Error Mean
Uploading assignments in the group forum	100	4.28	.637	.064
Explaining the assignment in detail given in the online discussion	100	4.03	.784	.078
Encouraging question and answer sessions in group discussions	100	4.04	.764	.076
Giving feedback during group discussions	100	4.13	.734	.073
Using simple language to deliver their message in group discussions	100	4.11	.695	.069
Understanding students' difficulties in online learning	100	3.72	.933	.093
Supervising chapters in group discussions	100	4.00	.682	.068
Providing answers/results/marks for assessments	100	3.95	.821	.082

Table 10 above shows the respondents' perception to the approaches used by lecturers to encourage student participation in online learning. The highest mean was uploading assignments in the group forum (M=4.28), followed by giving feedback in group discussions (M=4.13) and using simple language to deliver their message to the students in group discussions (M=4.11). These findings reveal that the students will participate in online learning when their lecturer uploads assignments in a group forum. In addition, giving feedback in the group forum and the use of simple language to deliver messages in the group discussion or group forum can enhance student participation in online learning activities.

Research Objective 3: To Identify the Level of Satisfaction among Students toward Online Learning.

Table 11: Descriptive Statistics (N=100)

	N	Range	Sum	Mean	Std. Deviation	Variance
Mean_satisfaction	100	2.80	381.60	3.8160	.63544	.404
Mean_ participation	100	2.90	364.70	3.6470	.48335	.234
Valid N (listwise)	100					

Table 11 above shows the level of student satisfaction and participation toward online learning. The overall mean for student participation in using online learning is (M=3.64) which is at the moderate level. By comparison, student satisfaction using online learning can be considered as fair at (M=3.81) showing that the majority of students are fairly satisfied with online learning. Therefore, these findings have revealed the current level of satisfaction and participation toward online learning among students at UiTM Pahang.

CONCLUSION

This research has shown that group discussions, online tests or quizzes and searching for online notes are the main online activities that Bachelor of Office Systems Management students at UiTM Pahang engage in. It also was found that lecturers can encourage student participation in online learning by uploading assignments in a group forum. Moreover, the research has identified the level of student satisfaction towards online learning to be fair while participation towards online learning at UiTM Pahang is moderate. Thus, based on these findings, future research can uncover the factors that influence the student participation and satisfaction in online learning and the subsequent impact on academic performance among students at UiTM Pahang. The authorities at UiTM Pahang should take note of these findings to improve the effectiveness of online learning implementation among students and lecturers. This is important to ensure that the students are satisfied and interested in participating in online learning as a way of comprehending the subject matter throughout the student learning time at UiTM Pahang.

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PROMOTING MEANINGFUL LEARNING VIA AN ONLINE PROJECT-BASED MODULE

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ABSTRACT

This paper will discuss the use of an Online Project-based Module (m-PAT) to promote meaningful learning among students using the project-based learning approach. m-PAT was applied in a project-based learning for a topic in Physics. A mixed method case study design was employed, where the findings of quantitative data were confirmed using the findings of qualitative data. A total of 42 form four students from a secondary school in Klang Valley, Malaysia were chosen based on purposive sampling. The data were collected through questionnaire, student reflection, online discussion, and open-ended questions after each participant generated a physics-learning blog by using the m-PAT as a platform. Quantitative data were analyzed descriptively in form of mean scores and standard deviations to observe the distribution of students' feedback towards the attributes for meaningful learning during the m-PAT implementation. Thematic analysis was used for the qualitative data to produce a tabulated matrix related to the attributes of meaningful learning. The findings prove that m-PAT has a high potential as an online platform to promote a meaningful learning for students. Further research with a larger number of participants is needed to support the present findings.

Keywords: Meaningful learning, Online project-based module,

INTRODUCTION

The willingness and commitment of the Ministry of Education (MOE) in promoting the integration of Information Communication Technology (ICT) and the Internet in education (MOE, 2004, 2006, 2012) accelerated the development of the Internet network infrastructure in Malaysian schools. Students indicated that they were very interested in and adept at using online applications such as searching for information, socializing through social networking sites and producing websites and blogs (Safar & Fatimah, 2000; Musa & Narimah, 2001; Multimedia Development Corporation (MDEC), 2006; Pew Internet & American Life Project, 2007, 2011). The students seemed to be ready for the integration of ICT in Teaching and Learning (T&L) in school, although ICT integration implemented in schools was mostly focused on word processing application (MOE, 2012), information search on Internet and courseware utilization for T&L (Ashfahani, 2014). Following this, policies and frameworks for the project-based learning approach both for primary and secondary education were emphasized by MOE (MOE, 2012). However, there is still limited research on learning modules that combine the use of ICT with the project-based learning approach developed for school level that can be used as reference by educators.

Robert (2003) defines *project-based learning* as an activity framework that centers on the T&L process regarding the development of a concept rather than being an enrichment activity at the end of the learning process. As for school-based assessment, a project is defined as a method of assessment where the students need to plan, investigate and collect the data (Malaysian Examinations Syndicate (MES, 2004). The conclusion from Robert (2003) and MES's (2004) definitions indicate that project-based learning is a comprehensive T&L activity that embraces the whole process of student-centered learning while focusing on a certain concept where the outcome of the activities is evaluated as the assessment materials. Thus, it is assumed that the implementation of online project-based learning for the purpose of assessment should provide a meaningful learning experience for students. Project-based learning is also a process-oriented learning approach which is almost similar to problem-based learning and case-based learning (Quek, 2010). Research shows that such a process-oriented learning approach has resulted in meaningful learning for students (Hakkarainen et al., 2007; Keskitalo et al., 2011; Rustam, Hwang & Huang, 2015).

Meaningful learning occurs when students construct their own knowledge, and not merely transmitted from the teacher to the students (Jonassen et al., 1999). In meaningful learning, students learn from thinking about what they are doing (Hakkarainen, 2007). Thus, the teacher's role is to stimulate and guide activities that trigger thinking among learners (Bhattacharya, 2002). Previous research (Jonassen et al., 1999; Hakkarainen, 2007; Hakkarainen & Saarelainen, 2005) has posited five attributes to show that meaningful learning occurred within a learning process: (i) Active (manipulative) learning takes place when a student is actively involved in the learning process by acquiring skills and knowledge from the learning community, practicing recently acquired skills and knowledge, manipulating objects and equipment simultaneously, and observing the outcome of the manipulation process; (ii) Constructive (reflective) learning occurs when the learning process encourages students to continuously self-reflect on their learning experiences. This enables students to construct their own mental model to explain what they have learnt (Hakkarainen, 2007). Reflection involves contemplating over the meaning and knowledge before, during, and after learning activities. Effective reflection requires teachers and students to think deeply in order to draw out the learning related experiences (Chapman, 2006); (iii) Directed (intentional) learning is driven by a specific known goal (Schank, 1994). Technology- based directed learning enables students to describe results and strategies used to achieve the outcome of learning and apply it in new situations; (iv) Authenticity (complex and contextual) learning relates the topics to the real world so that the students can connect the content with reality; Finally, (v) cooperative (collaborative) meaningful learning demands group discussions among students, sharing of ideas, and assisting one another in solving a problem. Collaborative learning is considered meaningful, as it represents working inreal life situations.

Research by Hakkarainen et al. (2007) indicated that attributes of meaningful learning occur when the process-based learning approach is used. The study used digital video as a support material in the case-based learning to promote meaningful learning among students. The results showed that designing, producing and solving the case using digital video could promote active learning, contextual learning and emotional involvement in the learning process. In addition, Keskitalo et al. (2011) used case studies to explore meaningful learning in students' Second Life through problem-based learning. Second Life is defined as a 3-dimensional space in a virtual world

that is shared by students in which they can communicate synchronously using avatars (representing students). The pedagogical model used in this study is called the *Global Virtual Education (GloVEd)* using the *teaching-studying-learning process* (TSL process) approach. The results showed that the T&L process undertaken was able to create meaningful learning attributes of active, constructive, contextual, collaborative and reflective learning.

The project-based learning approach (for the purpose of school-based assessment) has been carried out widely in schools throughout Malaysia (Neo, Neo & Tan, 2012). Online project-based learning is expected to engage the students' interest towards team learning and online activities. This method is suitable because it does not only encourage students' self-directed learning, but also supports team work and peer learning. It is also easily accessible anytime and anywhere (Valjataga & Fiedler, 2009; Hung et al., 2013) and allows students to experiment learning innovatively and creatively through multimedia presentations (Poe & Stassen, 2002; Hsieh & Chen, 2012). Additionally, online project-based learning allows an in-depth study of the chosen topic (Harris & Katz, 2001). It gives more autonomic power to students in their learning process while sustaining their interest and motivation (Worthy, 2000). It also enables students to create a project that would reflect their interests and capabilities as well as present what they have learned through meaningful artefact building in the form of reports, multimedia presentations, and the like (Harel & Papert, 1991; Kafai & Resnick, 1996). Students are also capable of exploring knowledge to construct learning strategies through technology-based collaborative learning (Shukor et al., 2014; Biasutti, 2015; Wong, 2013) as well as combining contents and skills, and improving their academic and self-development (Robert, 2003). These are evidence of outcomes of project-based learning programs. However, little is known on the meaningful aspect of this learning approach especially in the Malaysian context.

The study presented in this paper was designed with the objective of evaluating whether meaningful learning environments occur when students engage in an online project-based learning approach using an online project-based module developed for the study. The design and development of the online project-based module called m-PAT (Malaysian acronym for Online Project-based Module) was intended to serve as a platform for teachers and

students to realize online project-based learning. In this research, m-PAT was used to implement one of the school-based assessment activities in the form of project-based learning for Physics. The m-PAT was designed to provide meaningful learning for students who undertook the online project under their teachers' supervision.

METHODOLOGY

The study was conducted in two phases, i) design and development of m-PAT and ii) evaluation of m-PAT to uncover the existence of a meaningful learning environment during the learning process.

Design and Development of m-PAT

The design of an online project-based learning module is particularly important because it has been proven that there are connections between the theories of learning and the learning approaches selected for educational programs with certain learning aspects (Jou et al., 2010). In this study, the design of m-PAT included the attributes of meaningful learning using suitable learning theories and e-learning models. The constructionist learning theory that supports project-based learning (Papert, 1980; Resnick et al., 1996) was used to design the m-PAT. The constructionist learning theory originated from the constructivist learning theory by Piaget (1965). Harel and Papert (1991) suggested that both theories emphasized building knowledge structures in any learning situations. The constructionist learning theory however, adds that the building of knowledge structures will be more meaningful when a student is consciously involved in the building of a meaningful artefact (either the sand castle at seashore or Theory of Universe), which can be shared with other people collaboratively. Bers (2006) later reckoned that by building artefacts or external objects to reflect learning, students are able to develop internal knowledge simultaneously. Bers et al. (2002) identified four main characteristics of constructionist theory, namely (i) learning by actively inquiring and learning by doing; (ii) the building of artefact as a material to reflect the students' mind; (iii) collaboration to improve the outcome of the project; and (iv) self-reflection to explore students' thoughts in order to intellectually and emotionally relate

newly discovered knowledge to make learning more meaningful. These four characteristics were the basis of the m-PAT design. Artefact building in the constructionist theory encourages active, constructive, collaborative, and directed learning, which are part of meaningful learning attributes.

Online learning models or e-learning models guide educators in delivering desired e-learning outcomes(Gunter et al.,1995). The E-tivities model (Salmon, 2002) was chosen to organize the content of m-PAT, as this model favors active and interactive learning via online collaboration. The E-tivities model comprises five steps, namely (i) access and motivation; (ii) socializing online; (iii) information exchanged; (iv) knowledge building; and (v) reflection. This model was adapted to organize the sequences of modules in the m-PAT.

Moodle's Learning Management System (LMS) was used to develop the m-PAT platform. Moodle is a suitable platform, as this system was developed based on the Social Constructionist Learning Theory, thus facilitating adaption according to the suitability and requirements of the study. Furthermore, readily available modules in Moodle, such as forums, blogs, questionnaires, and tracking systems eased the monitoring of the students' activities.

The final m-PAT module comprises of five sub-modules as follows:

1. Sub-module 1 - Introduction and Access - This activity aims to train and socialize students to access the Internet using a chat room and message space.

2. Sub-module 2 - Designation of Cyber Rules - This activity aims to develop skills in searching & selecting information using Internet and participating in discussions in the online forum. At the end of the activity, students jointly determine the cyber rules for their learning community by which they should abide by while carrying out m-PAT activities. Furthermore, this activity encourages community building among learners.

3. Sub-module 3 - Development Blog (phase I) - This activity aims to develop technical skills, such as uploading photos and animations as

well as creating links. At the end of the activity, students are able to create learning spaces, which included *Introduction*, *MyProfile,* and *MyCyber Rules*.

4. Sub-module 4 - Development Blog (phase II) - This activity aims to build knowledge on the pre-determined project title (Physics Form 4). At the end of the activity, students further develop the *MyProject* space that has been pre-developed in Sub-module 3.

5. Sub-module 5 - Online collaborative discussion on the improvement of the blog (peer review). In Sub-module 5, students open their blogs for other students to view. This enables other students to express opinions and provide feedback.

6. Reflection - Students rethink the learning process based on the given questions. Reflection was carried out at the end of each m-PAT submodule (self-assessment). Students are required to write an online reflection to submit to the teacher.

In this study, m-PAT was used to implement one of the school-based assessment activities in the form of project-based learning for Physics.

The online project activities utilizing the m-PAT's five sub-modules were carried out for 6 weeks. Students completed one sub-module per week online; thus, it took 5 weeks to complete all sub-modules. The final week was allocated for the students to improve and finalize their blogs.

Before engaging each sub-module, students were divided into two groups. They were briefed and trained by their teachers at their school computer lab. A Physics teacher acted as their online mentor while four other Physics teachers from different schools acted as online observers. All the teachers were already trained to do their tasks. During the completion of the online project, students were able to communicate with their friends and teachers via chat room and forum to engage in discussion and seek guidance. Additionally, an online user manual was provided for the students, as a guide for the technical part of the m-PAT.

Each student individually built a learning artefact in the form of a blog regarding a topic in Physics. Rubrics were provided for the students to guide them in creating the content of the blogs. Next, students were required to share materials and collaborate with teachers and peers through online discussion in order to improvise their blogs.

Upon completion, the students had to print their blogs for school assessment purposes. Data were collected once the participants had completed all of the sub-modules. Figure 1 shows the front page screenshot of m-PAT.

Figure 1: Front Page of m-PAT (Sub-modules 1 to 5 can be accessed through the e-Project menu).

Evaluation of m-PAT

In examining the meaningful learning elements of the m-PAT module, a Triangulation Mixed Method design (Creswell, 2008) was used, whereby findings from quantitative data were confirmed by triangulating them with qualitative data findings. Quantitative data from the questionnaire on attributes of meaningful learning as perceived by students after participating in the m-PAT module study program were analyzed descriptively. Meanwhile, qualitative data collected from the same set of students were analyzed using thematic analysis to identify themes related to attributes of meaningful learning as experienced by the participants while participating in the m-PAT module. The two sets of data were then triangulated.

The participants consisted of 42 form four students from a secondary school in the Klang Valley, Malaysia, who were taking Physics. The particular school was chosen because it had comprehensive internet infrastructure with a technical assistant for the computer laboratory and had received the consent of the teachers and administrative staff on the initiative. Moreover, the participants had an internet connection at home and their parents' consent were obtained to allow them to carry out the online project using m-PAT at home. The internet connection and parental consent were important criteria because the project was to be carried out at home after school hours. Data were collected once the participants had completed all the sub-modules in the m-PAT. Five Physics teachers were also chosen as participants. A teacher from the same school acted as their online mentor while the other four teachers from different schools acted as online observers. These teachers also monitored students' online activities based on given checklists.

A questionnaire was used to collect the quantitative data. The researchers developed the questionnaire based on the definition of meaningful learning by Jonassen et al. (1999). The questionnaire, which comprised 42 items, was designed to measure the attributes of meaningful learning. The items were on active learning (8 items), constructive learning (12 items), directed learning (10 items), authentic learning (7 items) and collaborative learning (5 items). All the items were measured on a 5-point Likert scale (1= Strongly disagree; 2= Disagree, 3= Less agree; 4= Agree, 5= Strongly agree). Three experts evaluated the content of the questionnaire to ensure the validity of each constructed item. To establish the reliability of all items, a pilot test were carried out with 27 form four students from another school who were also taking Physics.

The research instrument was administered after the students completed all modules of the m-PAT program as explained in the previous section. The analysis revealed acceptable reliability of each attribute in the research instrument, as indicated by Cronbach's alpha greater than 0.75 ($\alpha \geq 0.75$) (Sekaran, 2000). The quantitative data were then analyzed descriptively to assess the mean and standard deviation of the student responses to the items on the existence of attributes associated with meaningful learning in m-PAT.

The qualitative data were obtained through the participants' reflections, online discussions, and open-ended questions and analyzed using thematic analysis to produce a matrix table of attributes associated with meaningful learning. Three other experts reviewed the theme coding to ensure the validity of the themes that emerged from the qualitative analysis. Cohen's Kappa value K for each relevant theme was greater than 0.70 ($K \geq 0.70$) which indicated that the interpretation was within in the substantial range of reliability index (Landis & Koch, 1977). This shows that the qualitative data for this study had a high reliability index based on the value of K. The themes that emerged from the respondents' qualitative data were triangulated with data from the teachers' observation checklists associated with the respondents' activities in m-PAT.

RESULTS

The data from the questionnaire were analyzed descriptively to observe the distribution of feedback from students regarding the existence of attributes for meaningful learning during the implementation of m-PAT. Table 1 below shows the classification of the mean scores used to interpret the level of participants' agreement on the m-PAT assessment.

Table 1: Interpretation of Mean Scores

Mean score	Interpretation of mean score
1.00 – 1.79	Very low
1.80 – 2.59	Low
2.60 – 3.39	Medium
3.40 – 4.19	High
4.20 – 5.00	Very high

(Source: Educational Planning and Research Division (EPRD), MOE, 2006)

The existence of meaningful learning attributes was evaluated based on the attributes of meaningful learning, as stated by Jonassen et al. (1999), which were active, constructive, directed, authentic, and collaborative learning. Tables 2, 3, 4, 5 and 6 show mean scores, standard deviations (SD), and mean score interpretations of the participants' agreement on the existence of meaningful learning attributes during the m-PAT session.

The evaluation of the existence of active learning during the implementation of m-PAT (Table 2) showed that the highest level of agreement was obtained for item 3 (mean score=4.67, SD=0.53). Meanwhile, the lowest level of agreement was obtained for item 1 (mean score=3.90, SD=0.73). 4 out of 8 items showed mean score values with Very High level of agreement while the remaining 4 items showed mean score values of High level of agreement. Overall, the findings of the study showed that the participants gave Very High level of agreement (mean score=4.28, SD=0.32) on the existence of active learning during the implementation of m-PAT.

Table 2: Participants' Agreement toward the Existence of Active Learning

Item		Students (n=42)		
		Mean score	**SD**	**Interpretation**
1	m-PAT activities give students a chance to ask teachers questions at any time.	3.90	0.73	High
2	m-PAT activities give students a chance to learn from their peers.	4.45	0.55	Very high
3	m-PAT activities give students a chance to seek various information and materials from the internet.	4.67	0.53	Very high
4	m-PAT activities give students a chance to develop a learning blog according to their own preference.	4.57	0.70	Very high
5	m-PAT requires students to be involved actively throughout the learning process.	4.00	0.58	High
6	m-PAT activities (*MyProject* blog) allows students to do in-depth exploration of the Physics concept.	4.07	0.75	High
7	m-PAT activities enable students to share knowledge with their peers.	4.12	0.83	High
8	m-PAT activities allow students to share ICT skills among their peers.	4.43	0.59	Very High
Overall mean and SD		**4.28**	**0.32**	**Very high**

For the evaluation of the existence of constructive learning, (Table 3), item 9 showed the highest level of agreement (mean=4.67, SD=0.53) while item 20 showed the lowest level of agreement (mean score=3.71, SD=0.83). A total of 4 out of 12 items had mean scores that represented a Very High level of agreement and the remaining 8 items had the mean scores that represented a High level of agreement. Overall, the results showed that participants in the study reported a High level of agreement (mean=4.16, SD=0.35) on the existence of constructive learning during the m-PAT session.

Assessment of the existence of directed learning during the implementation of m-PAT (Table 4) showed the highest level of agreement with item 30 (mean score=4.60, SD=0.63) and the lowest level of agreement with item 25 (mean score=3.98, SD=0.84). A total of 4 out of 10 items had mean score values indicating a Very High degree of consensus, while the other 6 items had the mean score values indicating a High level of agreement. Overall, the results showed that participants reported a High level of agreement (mean score=4.18, SD=0.30) on the existence of directed learning during the implementation of m-PAT.

Table 3: Participants' Agreement toward the Existence of Constructive Learning (Skills and Knowledge)

Item		Students (n=42)		
		Mean score	SD	interpretation
9	m-PAT activities increased the student's skills in seeking online information.	4.67	0.53	Very High
10	m-PAT activities increased the student's skills in using forum as a platform for discussion.	4.19	0.71	High
11	m-PAT activities increased the student's skills in using forum to give feedback on peers' blogs.	4.29	0.60	Very High
12	m-PAT activities increased the student's skills in constructing a learning blog.	4.50	0.59	Very High
13	Forum discussions raised awareness among students on cyber regulations.	4.45	0.59	Very High

14	The *MyProject* blog activity helped students better understand Physics concepts related to the project title.	4.05	0.73	High
15	Reflection questions helped students to rethink what they had learned in more depth.	3.88	0.89	High
16	Reflection questions helped students to recall all that they had learned in every activity.	3.90	0.66	High
17	Reflection questions helped students to recall all learning processes they went through.	4.02	0.64	High
18	The Reflection activity helped students to recall how they solved problems encountered while completing the project.	4.19	0.67	High
19	The Reflection activity encouraged students to be more aware (sensitive) towards what they had learned.	4.02	0.87	High
20	The Reflection activity helped students to achieve long-term memory in recalling what they had learned.	3.71	0.83	High
Overall mean and SD		**4.16**	**0.35**	**High**

Table 4: Participants' Agreement toward the Existence of Directed Learning

Regarding the existence of authentic learning (Table 5), item 37 exhibited the highest level of agreement (mean score=4:48, SD=0.55), while item 36 showed the lowest level of agreement (mean score=3.93, SD=0.84).

Item		**Students (n=42)**		
		Mean score	SD	interpretation
21	The scope of the project was clearly stated (on the front page of the m-PAT).	4.00	0.49	High
22	Learning objectives in each module of m-PAT (Sub-module 1 – Sub-module 5) were clearly stated.	4.19	0.74	High

23	Activities in each module were designed to meet the learning objectives.	4.07	0.60	High
24	Activities in each module were designed to assist students in completing the project.	4.31	0.60	Very High
25	Questions for the *MyProject* blog were clearly stated and easily understood.	3.98	0.84	High
26	Link references supplied were relevant and appropriate in helping students obtain information.	4.21	0.52	Very High
27	The User Manual helped students carry out activities in Sub-module 1 – Sub-module 5.	4.29	0.77	Very High
28	An example of a blog in the m-PAT helped provide ideas for students to develop their blog.	4.12	0.92	High
29	The Rubrics provided in the m-PAT helped students create projects that met the criteria for scoring.	4.00	0.58	High
30	Spaces for forum and chat room helped students to communicate with teachers and peers for assistance.	4.60	0.63	Very High
Overall mean and SD		**4.18**	**0.30**	High

Only 1 out of 7 items had the mean score indicating a Very High level of agreement while other items had mean scores indicating a High level of agreement. Overall, the results showed that participants reported a High level of agreement (mean score = 4.16, SD = 0:39) on the existence of authentic learning during the implementation of m-PAT.

Table 5: Participants' Agreement toward the Existence of Authentic Learning

Item		Students (n=42)		
		Mean score	SD	interpretation
31	The Project title was related to the real-world situation.	4.19	0.67	High
32	The *MyProject* title enabled students to relate Physics with the real-world situation.	4.17	0.58	High

33	The *MyProject* title enabled students to realize that what they learned in Physics was applicable in real life.	4.17	0.62	High
34	The *MyProject* title that was related to the real world made learning more meaningful.	4.00	0.80	High
35	The *MyProject* title that was related to the real world made learning easier to comprehend.	4.19	0.63	High
36	The *MyProject* title that was related to the real world made learning easier to memorize.	3.93	0.84	High
37	Discussions via forum and chat room helped students to solve problems they encountered while completing the project.	4.48	0.55	Very High
Overall mean and SD		4.16	0.39	High

The assessment of the existence of collaborative learning during the implementation of m-PAT (Table 6) showed that the highest level of agreement was obtained for item 42 (mean score=4.64, SD=0.48) and the lowest level for item 38 (mean score=4.10, SD=0.66). A total of 4 of 5 items had the mean score indicating a Very High level of agreement while only one item had the mean score indicating a High level of agreement. Overall, the results showed that participants reported a Very High level of agreement (mean score=4:40, SD=0.40) on the existence of collaborative learning during the implementation of m-PAT.

Table 6: Participants' Agreement toward the Existence of Collaborative Learning

Item		Students (n=42)		
		Mean score	SD	interpretation
38	Activities provided in the m-PAT promote cooperative learning to facilitate students to complete the project	4.10	0.66	High
39	Chat room and forum facilitated students' communication with peers and teachers	4.50	0.67	Very High

40	Forum and chat room facilitated discussion between students and teachers	4.50	0.67	Very High
41	Discussions with friends and teachers helped students to gain additional information	4.26	0.70	Very High
42	The construction of blogs can be improvised through feedback from peers and teachers.	4.64	0.48	Very High
Overall mean and SD		4.40	0.40	Very high

During the implementation of m-PAT, the participants were obliged to write a self-reflection at the end of each module. Participants were also required to engage in discussions with teachers and peers through chat room and forums. Self-reflection texts, online discussion texts, and open-ended questions were analyzed using thematic analysis to produce a matrix table associated with the attributes of meaningful learning. Three experts confirmed the coding themes constructed in the thematic analyses. The findings from the thematic analyses were used as a triangulation to confirm the findings from a descriptive analysis of questionnaire data. Table 7 shows sample responses reflecting different attributes of meaningful learning in the analysis of the theme.

Table 7: Participants' responses on the Existence of Meaningful Learning

Meaningful learning attributes		Examples of responses
1	**Act** – active learning - Students were actively involved in manipulating the resources, tools and learning environment provided in the m-PAT to enable them to gain information and solve problems in developing the learning artefacts (blog)	"...I was facing a problem with the content and formatting of the blog needed for 'Car Safety'. I found the solution by referring to the e-project menu and by inquiring my teacher in the forum..." (R4/e4/S10) "...I was having difficulties in incorporating links. I used the forum space as a platform for discussing the problem. Finally, I found the solution how to incorporate the links..." (R4/e4/S7)

2	**Cst** – constructive learning - Students develop meaningful skills and knowledge through the process of learning and self reflection which then applied in the development of learning artefacts (blog)	"...I am more knowledgeable in applying my knowledge into the blog..." (R3/e4/S21) "... Activities in the Sub-module 3 were really helpful in helping me become more proficient in the technical aspects such as incorporating animation, graphics, links and so forth in building a blog..."(R3/e5/S40)
3	**Dir** – directed learning - Student-directed activities and discussions to achieve the learning objectives in each learning module	"... Sub-module 1 helped me to understand better about the m-PAT and helped me to proceed to the next module ..." (R1/e5/S40) "... The manual gave me a clear instruction. I am sure this manual also help other users as well ... "(R5/e4/S19)
4	**Aut** – authentic learning - the learning that revolved around the reality of the real world so that students can relate the approach to learning and learning content with real life	"...in my opinion, m-PAT is suitable to be use during the implementation of Physic PEKA project as it is related to the real world, which is the vast usage of the internet..."(OEQ/S9) "...the *MyProject* activity in m-PAT is related to the applications of Physic in real life..."(OEQ/S28)
5	**Col** – collaborative learning - Students collaborated in group discussions using forums and chat rooms in searching for solutions to learning problems	"...they helped me by stating what I need to do in this project and helped amend my mistakes (in my blog)..."(R4/e4/S17) "...my teacher and my friends were really helpful. Furthermore, the discussion in the chat room and forum simplify the construction of this blog..."(R5/e4/S11)

Note. R= Online Reflection; e= e-project (m- PAT) platform; S= Student; OEQ= open ended question

DISCUSSION

The study shows that meaningful learning environments occur when students engage in online project-based learning using m-PAT. In the quantitative data findings, the participants reported a high level of consensus on the existence of meaningful learning attributes during the implementation of

m-PAT. Qualitative data further confirmed the findings, showing the presence of meaningful learning attributes in related themes.

The presence of meaningful learning attributes was closely related to the activities that were designed in m-PAT. Participants' active learning occurred in the form of information seeking, blogging, and consulting with peers and teachers through the forum or chat room. Learning by actively inquiring & learning by doing is one of the characteristics of the Constructionist learning theory that underlies the design of the m-PAT. This finding is in line with the results of a study by Bers et al. (2002) on active learning using computer games for the purpose of integration of Information Technology in the learning process.

Constructive learning occurred when the participants utilized the knowledge and skills they acquired in the early stages of the m-PAT module (knowledge in virtual rules, information seeking skills and online technical skills) in constructing a learning blog. This study found that the probability of directed learning took place due to certain features of the module in m-PAT which was systematically organized based on e-tivities model. Apart from the e-tivities model, directed learning also occurred with the help of the user manual and project rubrics. m-PAT learning occurred authentically because the project topic was related to real life, that is the usage of internet during blogging, and communicating online with peers regarding the project, all of which represented the authenticity of utilizing the internet in daily life. Collaborative learning occurred via chat room and forum, where the participants carried out discussions on improvising the outcome of their project (blog). The study by Salmon (2002) on designing an online module called e-moderating using e-tivities model for the purpose of teaching and learning, also revealed similar positive results.

LMS Moodle, the platform for m-PAT, provided the facility for the teacher to observe and supervise students' activities. The tracking system available in Moodle was used to observe and supervise students' activity logs. This system allowed the teacher (online mentor) to track students who exhibited tardiness in initiating the project and who failed to carry out the activity or were inactive during the discussion. With this system, the teacher was able to reprimand students from the early stage of the project. Apart from that, the teacher was able to view all discussions and blogs that were

constructed by the students in order to rectify usage of improper language and unethical online discussion as well as remind students to conform to cyber rules (for example, not giving proper credit when using a picture or information from certain websites). The teacher also provided guidance if the content of the project was deemed inaccurate.

Findings of this study are comparable with many studies on the effectiveness of the ICT integration in the teaching and learning process. These findings confirm that m-PAT is designed using suitable pedagogical approaches such as the Constructionist Learning Theory (Papert, 1980; Resnick et al., 1996), e-tivities e-Learning Model (Salmon, 2002), Technology-enabled active learning (TEAL) (Shieh et al., 2011) and the use of LMS Moodle and Open source software Moodle (Nordin et al., 2012) as a platform to promote meaningful learning. Thus, the m-PAT can be used as a platform for teachers and students to realize online project-based learning for school-based assessment activities to promote meaningful learning.

Additionally, m-PAT is designed to educate students on information management ethics and internet security when communicating online. It also enables students to channel their interest and skills in ICT in meaningful and guided ways. The fully ICT-integrated m-PAT also offers an alternative to the implementation of school-based assessment that promotes meaningful learning.

To support the findings of the present research, future studies on the application of m-PAT are needed. A larger number of students as participants and diverse subjects need to be used to obtain more proof on the viability of this approach.

CONCLUSION

The paper concludes that m-PAT has great potential as an online module/ platform for the implementation of meaningful project-based learning. Active, constructive, directed, authentic and collaborative learning are able to improve students' competency in seeking information, socializing online, and improving their technical skills. Teachers' consultancy and supervision during m-PAT activities help students use the Internet in positive ways and

prevent them from being a cyber victim. The knowledge of online ethics would encourage the students to use the Internet in ways that are more beneficial by developing blogs and websites that offer academic value in their field of interest.

The implications of m-PAT implementation in school have the potential to increase teachers' and students' competency in using ICT, promoting the use of open source software in education and literacy in ethics and virtual security. Apart from that, m-PAT also increases learning resources related to the integration of ICT in online learning which is popular among students. Efforts by MOE to upgrade the Malaysian SchoolNet network to 1BestariNet will help address the Internet infrastructure issue that might be faced by m-PAT implementation in the future. Besides, the introduction to web-based learning systems (Frog Virtual Learning Environment) in Malaysian schools will allow the wider use of m-PAT as a reference for the implementation of the online project-based learning approach, in line with strategies planned by MOE which emphasize the use of the project-based learning approach in the new curriculum standards for primary and secondary schools (MOE, 2012). In addition, the implementation of m-PAT can be done in collaboration between schools to motivate and increase the student learning participation.

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The Relationship between System Characteristics and User Motivation toward the Use of an e-Learning System among Engineering Students of Universiti Malaya

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ABSTRACT

The determination of the antecedents of the use of an e-learning system is imperative to ensure its successful adoption and continuance of usage. This study investigates the relationship between the two constructs, namely system characteristics (system functionality, infrastructure and technical support) and user motivation (perceived ease of use and perceived usefulness) towards the use of Universiti Malaya's e-learning system among engineering students. A specially-developed questionnaire was used to elicit responses with items adopted from previous related studies. Items structure analysis of the questionnaire revealed high reliability. A sample of 70 engineering students of Universiti Malaya were involved as the respondents. A series of multiple regression analysis was conducted to establish the interrelationship between the variables within the constructs and their influence towards system usage. The findings indicate that system functionality played a very strong part in influencing both the perceived usefulness ($\beta=0.099, p<0.001$*) and perceived ease of use (*$\beta=0.762, p<0.001$*). The results for infrastructure and technical support indicate that both variables have no influence on the perceived usefulness and perceived ease of use. When the intrinsic and extrinsic motivation were evaluated in terms of their effect on the use of the system, the findings revealed that only intrinsic motivation (perceived ease of use) has a positive and direct effect on the use of the system (*$\beta=0.070,$

$p<0.001$) but not on extrinsic motivation (perceived usefulness). The implications of the findings on the successful adoption and continuance of the usage of the e-learning system will be discussed.

Keywords: e-Learning System, System Characteristics, User Motivation

INTRODUCTION

An e-Learning system is deployed with the aim of improving the efficiency and effectiveness of teaching and learning processes and to provide value in terms of creating an engaging learning environment. One of important aspects of such system deployment are the acceptance, adoption and utilisation of such systems by the students and instructors. The deployment involves substantial financial requirements and human resources and the failed adoption of the system would lead to financial losses and dissatisfaction among stakeholders. Hence, discovering the antecedents to explain and predict the successful acceptance and adoption of e-learning systems among students and instructors are vital.

In the research on the adoption and acceptance of e-learning systems, the most utilised model is the Technology Acceptance Model (TAM) proposed by Davis (1989) which was subsequently improved to include other constructs (Davis & Venkatesh, 1996). TAM posits that perceived usefulness and perceived ease of use are the two determinants that strongly influence attitudes towards the use and the intention of use which, in turn, influence the actual usage of the system (Ramayah & Jantan, 2004). TAM is very influential in predicting and explaining the technology acceptance in many applications and acclaimed for its parsimony.

Much research has attempted to improve the TAM and two research paradigms have emerged (Godoe & Johansen, 2012; Nyoro et al, 2015). One paradigm is system specific. This includes system functionality (Dishaw & Strong, 1989) and support system (Sáncheza & Huerosb, 2010). This paradigm assumes that the attributes of the system characteristics affect the user's perception which, in turn, affects the extent of usage of the system.

The other paradigm is user specific which focuses on latent personality dimensions. In this paradigm, the focus is on the individual's personality which assumes that the personality dimensions such as intrinsic and extrinsic motivation (Ramayah et al, 2003), optimism, innovativeness, discomfort and insecurity (Thompson, 1998), including subjective norm (Chau & Hu, 2001) influences the acceptance, adoption and subsequent use of the system.

This research proposes that system specific and user specific are interrelated, which, in turn, affects the actual system usage (SU). The system characteristics consists of three variables namely System Functionality (SF), Infrastructure (Inf) and Technical Support (TS). The user characteristic is the user motivation which consists of the students' intrinsic motivation (perceived ease of use, PEoU) and extrinsic motivation (perceived usefulness, PU). Figure 1 shows the proposed research model.

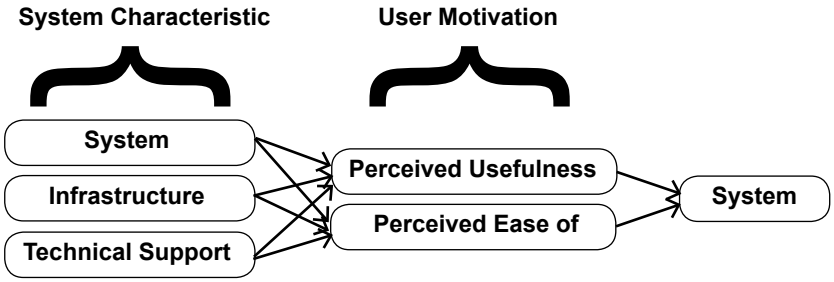

Figure 1: The Research Model Incorporating the System Characteristics and User Motivation

User Motivation

User motivation is the psychological feature that arouses an individual to act towards a desired goal. Motivation can be categorised into two different types namely, extrinsic and intrinsic motivation. Extrinsic motivation is a construct that refers to doing something because it leads to separable outcomes such as specific goals or rewards. As such, extrinsic motivation influences individual behaviour due to reinforcement value of outcomes (Ji-Won Moon & Young-Gul Kim, 2001). On the other hand, intrinsic motivation is defined as the doing of an activity because

it is inherently satisfying, interesting and enjoyable rather than for some separable consequence. As such, intrinsic motivation refers to performance of an activity undertaken for no apparent reinforcement other than the process of performing the activity (Ramayah et al, 2003).

In TAM research, perceived ease of use is usually considered a form of intrinsic motivation whereas perceived usefulness is considered extrinsic motivation (Ramayah et al, 2003). Many have found that user intrinsic motivation and extrinsic motivation are key drivers and determinants to actual system usage (Chen et al, 2000; Davis et al, 1992).

Perceived Usefulness

Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her performance" (Davis, 1989). Research has shown that the perceived usefulness is strongly correlated to the actual use of the system (Ramayah et al, 2003, Wu et al, 2010). In the context of e-Learning system usage, students who find that the system is useful are more likely to use it to support learning processes. Thus, we hypothesize that:

H1. Perceived usefulness (extrinsic motivation) has a significantly positive and direct effect on the usage of the e-learning system.

Perceived Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989). Researchers have found that perceived ease of use was directly related to the use of the system (Ramayah et al, 2003, Tselios et al, 2013). In the context of e-Learning system usage, a system that is perceived as easy to use will influence the usage of the system. If the e-learning system is perceived to be difficult to use, it is less likely to be used by the users. Thus, we hypothesize that:

H2: Perceived ease of use (intrinsic motivation) has a significantly positive and direct effect on the usage of the e-learning system.

System Characteristics

The characteristics of the e-learning system and how these characteristics relate to perceived ease of use and perceived usefulness have received considerable interest among researchers (Pituch & Lee, 2006; Kian Sam Hong et al., 2005). In this study, we propose that system characteristics consist of three constructs, namely, system functionality, infrastructure and technical support.

System Functionality

In terms of the relationship between system functionality and perceived ease of use (intrinsic motivation), a study by Pituch and Lee (2006) show the system functionality of the e-learning system is highly correlated with perceived of use. However, the study of Kian Sam Hong et al. (2005) showed otherwise. In terms of system functionality and perceived usefulness, studies by Pitch and Lee (2006) and Kian Sam Hong et al. (2005) revealed that system functionality was not related to perceived usefulness. We propose that system functionality has a positive and direct effect on the perceived of use and perceived usefulness. As such, we hypothesize that:

H3: System functionality has a significantly positive and direct effect on perceived ease of use (intrinsic motivation) of the e-learning system.

H4: System functionality has a significantly positive and direct effect on perceived usefulness (extrinsic motivation) of the e-learning system.

Infrastructure

Infrastructure of the e-learning system includes the level of access to the Internet provided by the institution both during class time as well as outside class time. We propose that good access to the learning materials and learning activities will lead the students to perceive that the e-learning system is easy to use. As such, we hypothesize that:

H5: Infrastructure has a positive and direct effect on perceived usefulness of the e-learning system.

H6: Infrastructure has a positive and direct effect on the perceived ease of use of the e-learning system.

Technical Support

Technical support comes in the form of help desks, phone hotlines for complaints and suggestions or any other form of technical support with the aim of providing the assistance for any technical problems faced by instructors and students. A study by Sáncheza and Huerosb (2010) revealed that technical support has a positive effect on the perceived ease of use and perceived usefulness of the e-learning system. We propose that a high degree of efficient technical support will lead to a high degree of perceived ease of use (intrinsic motivation) as well as perceived usefulness (extrinsic motivation). As such, we hypothesize that:

H7: Technical support has a positive and direct effect on perceived usefulness of the e-learning system.

H8: Technical support has a positive and direct effect on the perceived ease of use of the e-learning system.

The importance of this study is that the proposed model has modified TAM to include the system characteristics consisting of three variables namely the System Functionality, Infrastructure and Technical Support. The authors found no literatures that have reported such system characteristics incorporating the three variables within TAM especially pertaining to the use of an e-learning system. The authors believe that this study can make an important contribution to filling a research gap given the critical importance of system characteristics that they can serve as critical predictors to successful deployment of an e-learning system in the institution.

METHODOLOGY

A dedicated questionnaire was developed for this study. For the purpose of development of the questionnaire, a number of prior relevant studies were reviewed to ensure that a complete list of measures were included that would sufficiently explain the model proposed. Measures for the perceived ease of use and perceived usefulness were taken from research related to the Technology Acceptance Model (TAM) (Davis, 1989, Venkatesh & Davis, 2000). The measures for system functionality, support system and infrastructure was captured and adopted from Habibah et al (2015). The measures for system usage was adopted from Ahmad Hanizar (2015).

The survey questionnaire consisted of two parts. The first part elicited the subject's demographic information and the second part elicited the subject's perception of each variable in the model. All items in the second part were measured via a 7-point scale ranging from 1 (least agreeable) to 7 (most agreeable). In total, there were 6 variables with 44 items that were used in this study.

The reliability analysis showed that Cronbach's alpha coefficient obtained for all the variables were well above the acceptance level indicating they were within the measurement model. It also indicated good internal consistency and that the measurement was sufficiently reliable. (See Table 1). The questionnaire was administered to the subjects via online environment using the convenience sampling technique. The subjects were students enrolled in several courses offered by the Department of Electrical Engineering, Universiti Malaya (UM) for the 2nd semester 2014/2015 academic session.

Table 1: Reliabilities of the Variables

Variable	Number of items	Cronbach's Alpha
System Functionality	8	0.931
Infrastructure	4	0.644
Technical Support	5	0.945
Perceived Usefulness	11	0.967
Perceived Ease of Use	8	0.941
System Usage	8	0.931
Total	44	0.973

A total of 102 responses were collected. 32 responses were incomplete and had to be discarded. This left 70 valid responses for the statistical analysis, and a valid response rate of 68.7% of the initial sample. The analysis involved looking at the data demographically as well undertaking a multivariate analysis involving correlation and multiple-regression analysis in order to test the research hypotheses.

RESULTS AND DISCUSSION

Descriptive Analysis

Table 2: Demographic Profile

	Frequency (n=70)	Percentage (100%)
Gender		
Male	41	58.6
Female	29	41.4
Race		
Malay	47	67.1
Chinese	17	24.3
Indian	3	4.3
Others	3	4.3
Course		
KMEM4110	21	30.0
KEEE4336	9	12.9
KXEX1144	36	51.4
KEET4281	3	4.3
KEEE4281	1	1.4
Current CGPA		
1.00 - 2.00	11	15.7
2.00 - 2.50	2	2.9
2.50 - 3.00	10	14.3
3.00 - 3.50	35	50.0
3.50 - 4.00	12	17.1

Number of hours a week using SeLP		
Less than 1 hour	21	30.0
1-2 hours	19	27.1
2-3 hours	19	27.1
3-4 hours	6	8.6
more than 4 hours	5	7.1

The demographic profile of the respondents is presented in Table 2. From the table, it can been seen that 58.6% of the respondents were male whereas 41.4% were female. All of the respondents owned a laptop for the purpose of learning. In terms of the level of achievement, most of the respondents (67%) were good students, with a CGPA>3.0. Most of the respondents (70%) accessed the e-learning system regularly of more one hour per week.

Correlation and Regression Analysis

The purpose of this study is to investigate the relationship between the variables within the two main constructs and their relationship to the usage of the system as hypothesized. For that purpose, three multiple regression analysis were conducted. The first analysed the relationship between the perceived ease of use and perceived usefulness towards the system usage.

The second analysis was used to investigate the relationship between the variables within the construct of system characteristics (system functionality, infrastructure and technical support) towards extrinsic motivation (perceived usefulness).

The third analysis looked at the relationship between the same variables within the construct of system characteristics but toward intrinsic motivation (perceived ease of use).

Table 3. Intercorrelation matrix of the main variables

Dimension	SF	Inf	TS	PEoU	PU	SU
SF	1.000					
Inf	0.362**	1.000				
TS	0.681**	0.395**	1.000			
PEoU	0.755**	0.380**	0.491**	1.000		
PU	0.831**	0.265*	0.575**	0.665**	1.000	
SU	0.843**	0.221	0.557**	0.646**	0.850**	1.000

The result of the correlation analysis between all the variables are shown in Table 3. From the table, it can be seen all the variables were significantly correlated with system usage except for infrastructure.

The results of three multiple regression analysis are shown in Table 4. The first analysis managed to explain 73% of the variance in the use of the system. The second analysis explained 58.7% variance in the perceived ease of use and the third analysis explained 69.3% variance in the perceived usefulness.

Table 4: Regression Analysis of the Model

Dependent Variable	R-Square (R^2)	Independent Variable	Beta (β)	Standard Error of β	*t*-Statistics	Level of Significance
PEoU	0.587	SF	0.762	0.127	6.982	**p<0.001**
		Inf	0.137	0.083	1.575	p>0.05
		TS	-0.082	0.105	-0.743	p>0.05
PU	0.693	SF	0.829	0.099	8.816	**p<0.001**
		Inf	-0.047	0.064	-0.621	p>0.05
		TS	0.028	0.081	0.293	p>0.05
SU	0.734	PEoU	0.145	0.070	1.713	**p<0.001**
		PU	0.754	0.078	8.934	p>0.05

Note: Beta is the standardised regression coefficient

User Motivation and System Use

As can be seen from the table, intrinsic motivation (perceived ease of use) is positively related (β=0.145, $p<0.001$) to system usage but not extrinsic motivation (perceived usefulness) (β=0.754). Thus, hypothesis H2 is supported but not hypothesis H1. Our results for the relationship between the intrinsic motivation and system usage is in agreement with Pituch and Lee (2006) and Ramayah et al. (2003).However, our result for the relationship between extrinsic motivation and system usage contradicts with Pituch and Lee (2006) and Ramayah et al. (2003). Both studies found that perceived usefulness was highly significant in explaining and predicting system usage.

System Functionality and User Motivation

In terms of the correlation between the system characteristics with user motivation, the results show that system functionality is positively related to perceived ease of use (β=0.762, $p<0.001$) as well as perceived usefulness (β=0.829, $p<0.001$) Thus, H3 and H4 are supported. This indicates that the system functionality plays a dominant role in determining the user intrinsic and extrinsic motivation. These findings are consistent with Pituch and Lee (2006) and validates the importance of attending to system functionality when deploying an e-learning system. The system functionality is a strong determinant and predictor of the student's intrinsic and extrinsic motivation which, in turn, would influence them to adopt, accept and use the system.

Infrastructure and User Motivation

We proposed that the system infrastructure will have a positive and direct relation to user motivation (intrinsic and extrinsic) which, in turn, will affect the system usage. The results show that infrastructure has no direct impact both on the perceived ease of use (β=0.137) and perceived usefulness (β=-0.047). This result suggests that the infrastructure is the least important variable to consider when deploying an e-learning system as there is no correlation between infrastructure and the usage of the system.

Technical Support and User Motivation

We proposed that the system infrastructure will have a positive and direct relation to user motivation (intrinsic and extrinsic) which, in turn, will affect the system usage. The results show that infrastructure has no direct impact both on the perceived ease of use (β=0.137) and perceived usefulness (β=-0.047). This contradicts Sancheza & Huerosb (2010) who found that technical support is positively correlated to both perceived usefulness and perceived ease of use.

SUMMARY

This study was conducted to investigate the relationship between user motivation to the actual use of the system. At the same time, the relationship between the variables within the construct of system characteristics and user motivation were also investigated. The results revealed that intrinsic motivation played an influential role in determining the actual system use but not extrinsic motivation. In terms of system characteristics, system functionality was found to be a strong determinant of user motivation, both intrinsic and extrinsic, to use the system. Infrastructure and technical support play no significant role in influencing user motivation. Hence, this study has found certain significant variables do impact on the successful implementation of an e-learning system, which should be considered by the institution that is keen on recouping its financial outlay and human resources tied up with such an enterprise.

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e-Learning at Universiti Malaya: Determinants of Satisfaction of Use among Engineering Students

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ABSTRACT

This study was conducted to investigate the variables associated with satisfaction of use of the SPeCTRUM e-learning platform of Universiti Malaya among engineering students. Two domains were investigated, namely, student characteristics (computer attitude, perceived usefulness and computer self-efficacy and system characteristics (system functionality, infrastructure and technical support). A questionnaire, specially developed using items adopted from previous related studies, was used to elicit responses. Item-structure analysis of the questionnaire revealed high reliability. The sample was 70 engineering students of Universiti Malaya. The findings revealed that system functionality ($\beta=0.649$, $p<0.001$), perceived ease of use ($\beta=0.242$, $p<0.05$) and attitude to use ($\beta=0.150$, $p<0.05$) were found to be strong predictors and determinants of satisfaction of use. Computer self-efficacy ($\beta=-0.101$), infrastructure ($\beta=0.067$) and technical support ($\beta=0.014$) were not significantly related to satisfaction of use. The total variance explained was 88.7% suggesting a good model of fit. Implications of the findings in terms of the intervention required to ensure the satisfaction of use are discussed.

Keywords: e-Learning, Satisfaction, Student Characteristics, System Characteristics

INTRODUCTION

The Learning Management System (LMS) has been widely utilised by many higher education institutions (HEIs) all over the world as part of the academic delivery system to enhance and support conventional teaching and learning. With an LMS, a lecturer can deliver, manage, track and record the learning activities undertaken by the students. The LMS also supports various pedagogical approaches such as blended/hybrid learning. Using the embedded functionalities of the system, the instructional contents can be effectively delivered in various formats such as html, docs, ppt, pdf, etc and the students can undertake various learning activities such as collaboration, quizzes, survey, reflection, etc. anytime and anywhere. The system also supports various interactive contents such as those in flash format as well SCORM format, developed utilising various rapid authoring tools, for convenience. Currently, it is reported that the most widely and popular LMS are the open source "Moodle" with 73.8 million users and the proprietary "Blackboard" with 23 million users (Capterra, undated).

Universiti Malaya (UM) implemented its central LMS based on open source "Moodle" under the brand name SPeCTRUM in 2010. This central LMS is utilised by all the faculties campus wide. The system is linked synchronously with the university back-end database (students' information system and course catalogue) allowing automatic update of the database. The database enables each individual course being delivered to the students to be managed centrally by lecturers and administrators. Each academic year, a total of more than 4,000 courses offered by the university are automatically integrated within the system for the convenience of 1,780 lecturers and almost 14,000 students. The central deployment of the LMS is under the purview of Academic Development Centre (ADeC) with the technical assistance from the University's Information Technology Centre.

Continuous evaluation of the LMS is imperative to ensure the effectiveness of the instructional delivery while at the same time enabling the continuous development of the LMS (Wyles, 2004). The perspective of user satisfaction has garnered immense interest as it provides the indicator of success of the system deployment. Many researchers have utilised user satisfaction as a common and single dependent variable to evaluate the success of the system deployment (Ilias et al., 2009; Wu et al., 2010, Bin et al., 2010).

Alsabawy et al. (2013) stated that user satisfaction can be taken as a significant measure when evaluating the success of system deployment as the user satisfaction has high degree of face validity, aided by the availability of reliable instruments and the poor quality of other measures. In the study of the continuous use of e-service, Liao et al. (2007) concluded that the user satisfaction was the main determinant of the users' behavioral intentions of service usage continuance.

Researchers have shown that many attributes contribute to the satisfaction of system use. A study by Verdegem and Verleye (2009) found that several factors were considered fundamental to creating such satisfaction in the use of e-service which include infrastructure, access, awareness, attitude, content, usability, technical aspects and user friendliness. Arbaugh (2000) deployed user satisfaction as a single dependent variable and examined the factor affecting satisfaction in Internet-based courses and found that the flexibility of medium, the ability to develop an interactive course environment and the ease of use were the main factors influencing the satisfaction of use. Other studies found perceived usefulness, perceived ease of use, quality of interaction, learning strategies and computer self-efficacy affecting the user satisfaction of the e-learning system (Lee & Hwang, 2007). In the user satisfaction study of blended learning, Wu et al (2010) found cognitive, technological and social factors affecting user satisfaction.

User satisfaction has also been used to gauge the level of acceptance of the technology. Wu et al. (2010) highlighted that the extent of the user satisfaction can also be integrated for the purpose of gauging the acceptance level of technology deployed. A study by Lin and Chen (2012) and Ahmad (2015) utilised the Technology Acceptance Model (TAM) in order to determine the factors influencing the continuance of usage of the e-learning system and the user satisfaction. TAM has widely been used in the field of management and engineering in predicting technology adoption by end users (Nyoro et al., 2015; Abdul Jalil et al., 2015).

In this study, we propose that the student characteristics and system characteristics have a positive effect on the satisfaction of use of the SPeCTRUM e-learning system. The framework of this study is shown in Figure 1. The framework incorporated six independent variables (three

variables from student characteristics and three variables from system characteristics) and the study involved investigating to what extent these variables were associated with the single dependent variable namely the Satisfaction of Use (SoU). Student characteristics consist of Computer Self-efficacy (CSE), Attitude to Use (AtU) and Perceived Ease of Use (PEoU). System characteristics consist of System Functionality (SF), Technical Support (TS) and Infrastructure (Inf).

This proposed model that modified the TAM and introduced the system characteristics and student characteristics is very significant one. The authors found no literatures that have reported system characteristics and student characteristics within the TAM especially pertaining to the use of an e-learning system. As such, this article would make an important contribution to filling a research gap given the critical importance of system characteristics as well as the student characteristics as the determinants and predictors to successful deployment of an e-learning system to the institution.

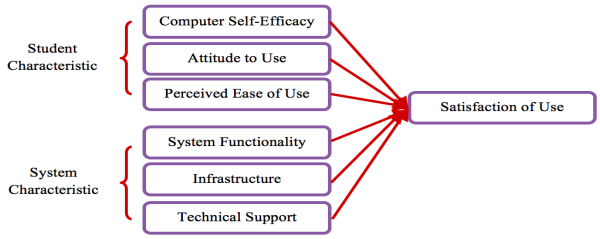

Figure 1: The Proposed Framework of the Study

Based on the above research framework and the proposed relationship between the independent variables and dependent variable, the following six hypotheses were put forward:

H_1: Computer self-efficacy will have a positive impact on the satisfaction of use of the SPeCTRUM

H_2: Computer attitude will have a positive impact on the satisfaction of use of the SPeCTRUM

H_3: System functionality will have a positive impact of the satisfaction of use of the SPeCTRUM

H_4: Perceived ease of use will have a positive impact of the satisfaction of use of the SPeCTRUM

H_5: Infrastructure will have a positive impact of the satisfaction of use of the SPeCTRUM

H_6: Technical support will have a positive impact of the satisfaction of use of the SPeCTRUM

The results of this study are important as they provide insights into the crucial determinants that would entice the engineering students to use SPeCTRUM and enhance their learning satisfaction. Comprehending the essentials of what determines student learning satisfaction could help ADeC, UM into developing effective strategies and interventions to create new opportunities and values for engineering students and instructors when using SPeCRUM.

METHODOLOGY

A total of 49 items was developed for this study's questionnaire. Each item was accompanied by a 7-point Likert scale, with 7 as most agreeable and 1 the least agreeable. The questionnaire was divided into two sections. The first section was to collect information about the profile of the respondents, whereas the second section was used to collect data on the seven constructs used in this study.

The reliability analysis showed that Cronbach's alpha coefficient obtained for all the constructs were well above the 0.7 acceptance level, indicating high internal consistency and sufficiently reliable measurement (See Table 1). The questionnaire was put online and distributed to all engineering students enrolling in six engineering courses, namely KMEM4110 - Electronics and Microprocessor, KEEE4336 - Artificial Intelligence, Fuzzy Logic & Neural Networks, KXEX1144 - Basic Engineering Calculus, KEEE4281 - Thesis, KEET4281- Thesis and

KEEW4281 – Thesis offered by the Department of Electrical Engineering, UM for semester II 2014/2015 academic session.

Table 1: Reliabilities of the Variables

Variable	Number of item	Cronbach's Alpha
Functionality	8	0.931
Perceived Ease of Use	11	0.967
Satisfaction	6	0.868
Computer Self Efficacy	7	0.908
Infrastructure	4	0.644
Technical Support	5	0.945
Computer Attitude	8	0.852
Total	49	0.976

A total of 102 responses were collected using convenience sampling but after careful analysis and discriminating processes, a total of 70 responses were finally used in the analysis. The analysis involved looking at the demographic data descriptively as well undertaking the multivariate analysis involving correlation and multiple-regression analysis in order to answer the research questions.

RESULTS AND DISCUSSION

Descriptive Analysis

The results of the demographic analysis of the respondents are shown in Figure 2 until Figure 6. Most of students involved in the answering the online questionnaire were those of the first year enrolling in KXEX1144 course and followed by final year students enrolling in KMEM4110 course (Figure 2). Figure 3 shows that there were more male respondents (58.6%) compared to female respondents (41.4%). A substantial proportion of the students (67.0%) spend at least 1 hour a week accessing SPeCTRUM (Figure 4). There were also a large number of good students with CGPA of more than 3.00 (67%) (Figure 5).

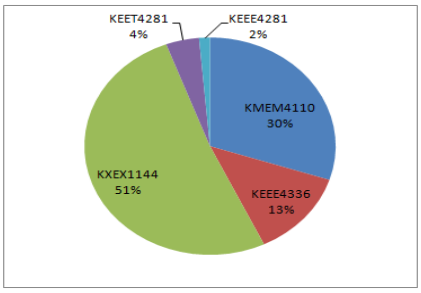

Figure 2: The Distribution of Samples According to Courses Enrolled

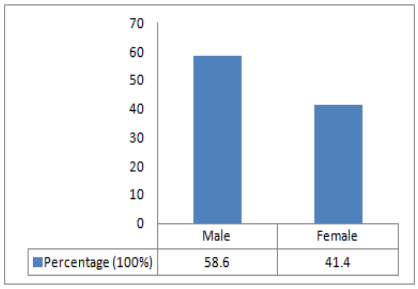

Figure 3: The Distribution of Samples According to Gender

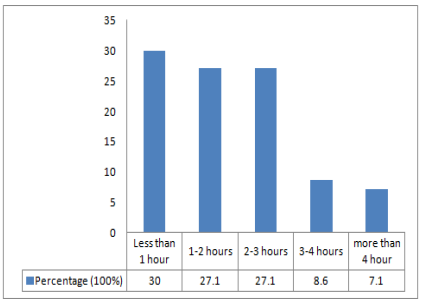

Figure 4: The Distribution of Samples According to Number of Hours in a Week using SPeCTRUM

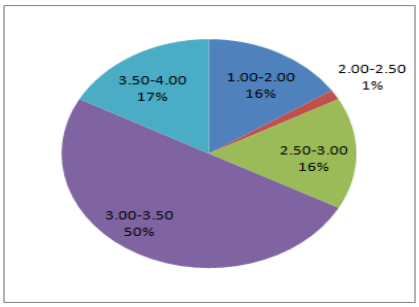

Figure 5: The Distribution of Samples According to Current CGPA

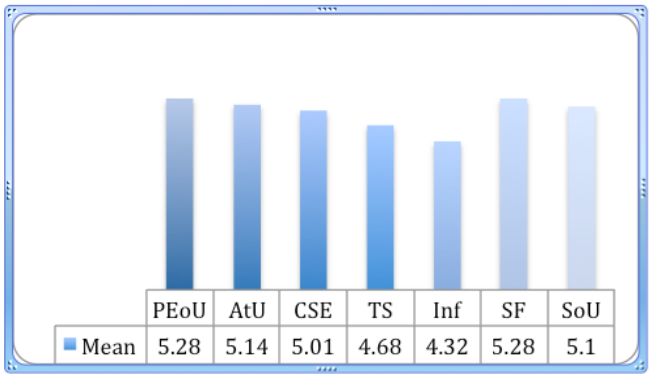

Figure 6: Means of the Variables

Figure 6 shows the mean scores of each of the variables. Most variables recorded a high mean score of more than 4.0. The lowest mean score were for the infrastructure, technical support and computer self-efficacy.

Multivariate Analysis

The correlation analysis was carried out to test the measurement model. Results for correlation analysis is shown in Table 2. The Pearson product moment correlation suggested that all variables were significantly correlated to each other. In addition, the analysis did not indicate any problems in terms of multicollinearity among variables in the model.

Table 2: Correlation Analysis between the Dimensions

Dimension	PEoU	AtU	CSE	TS	Inf	SF	SoU
PEoU	1.000						
AtU	0.726**	1.000					
CSE	0.587**	0.586**	1.000				
TS	0.491**	0.579**	0.564**	1.000			
Inf	0.379**	0.446**	0.241**	0.482**	1.000		
SF	0.755**	0.750**	0.692**	0.681**	0.379**	1.000	
SoU	0.817**	0.786**	0.595**	0.627**	0.454**	0.909**	1.000

Note:**Correlation is significant at the 0.01 level (2-tailed)

Regression analysis was conducted to examine the influence of the independent variables on the dependent variable and, at the same time, to test the hypotheses. The results are shown in Table 3.

Table 3: Regression Analysis against Satisfaction of Use

Dependent Variable	R-Square (R^2)	Independent Variable	Beta (β)	Standard Error of β	*t*-Statistics	Level of Significance
Stfn	0.887	PEoU	0.242	0.061	3.281	**p<0.05**
		AtU	0.150	0.078	2.037	**p<0.05**
		CSE	-0.101	0.053	-1.639	p>0.05
		TS	0.014	0.053	0.217	p>0.05
		Inf	0.067	0.042	1.288	p>0.05
		SF	0.649	0.085	7.310	**p<0.001**

Note: Beta is the standardized regression coefficient

The results of the regression analysis show a significant model explaining 88.7% of the variance in satisfaction of use. System functionality (= 0.649, p<0.001) was found to be a significant predictor of satisfaction of use supporting H3 of the study. Perceived ease of use (=0.242, p<0.05), and attitude to use (= 0.150, p< 0.05) were found to be positively related to satisfaction of use. Thus, H4 and H2 of the study were supported respectively. Computer self-efficacy (=-0.01), infrastructure (=0.067) and technical support (=0.649) were, however, not supported.

This study found that system functionality was a strong predictor of satisfaction of use of the SPeCTRUM. This result is consistent with many previous studies (Shee & Wang, 2008; Ho & Dzeng, 2010). If the system functionality of SPeCTRUM is able to fulfill the learning needs and enhance the knowledge and skills of the students, the students are more likely to be satisfied when using the system.

The perceived ease of use of the system was found to be strongly correlated to satisfaction of use. These are consistent with the studies (Tselios et al, 2013; Sun et al, 2008) that looked at the perceived ease of use and found that this variable was positively correlated with behavioral intention. Ease of use does influence usefulness and hence satisfaction of use but providing an easy way to use the learning platform is not sufficient. One should also be aware that, as students get more acquainted with the technology, they focus more on its instrumental values and the instructional contents and the appropriate learning design embedded in the system.

The result also demonstrated that attitude to use was also a strong determinant to satisfaction of use and consistent with Cakir and Solak (2014). Attitude is a construct that indicates a certain degree or possibility of adopting and undertaking certain actions and behaviours. As such, a favourable and positive attitude of students towards the e-learning system would suggest a greater probability that they will use it and lead to satisfaction of use.

It is interesting to note that computer self-efficacy, infrastructure and technical support did not have much impact on the satisfaction of use. This is consistent with Ramayah (2006) who found that computer self-efficacy did not influence the use of the digital library system. It is possible that the

students have already acquired the necessary skills and competency (higher mean values of computer self-efficacy) to use the system effectively, and consequently, they yielded a positive perception on the satisfaction of use yielding no significant correlation between these two variables. A similar explanation could also be put forward for the infrastructure and technical support. The provision of such facilities at UM is already at satisfactory levels in providing the access and technical support for the students to use the system.

SUMMARY

This study has identified the significant component of student and system characteristics on the satisfaction of use of SPeCTRUM e-learning system. The embedded system functionality, perceived ease of use of the system as well as the attitude to use of the students were the determinants to user satisfaction. As such, these variables can be used to explain and predict users' satisfaction on the use of the SPeCTRUM e-learning system deployed at UM.

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The Use of Analytics in Analyzing Student Engagement in e-Learning

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ABSTRACT

E-Learning web applications allow users to interact directly with any web platforms together with other users. Some learning applications and their usage in an e-learning platform have not been fully analyzed for student engagement in their learning activities. Big data is data collected in large quantities, be it in the form of structured or un-structured data. Big data can come from multiple sources. Nowadays, each application and equipment will have log data that is kept that can be translated into meaningful values. In e-Learning, each student activity will be logged and recorded. However, the raw data do not make much sense. Thus, to understand their value, analytic capabilities are highly needed. Analytics is a technology that is used to translate raw data into something more meaningful to users. Data that are being collected can be translated into data that is useful and valuable to users. This greatly depends on the translation process to statistics, computer programming and operations research in order to measure the performance of any web system. This paper reports the development of a system for the application of real-time analytics on the usage of e-learning in a tertiary institution. It includes the descriptions of the tools and statistics of the data collected by the e-learning system manager. All students' access information such as geographic information, devices used, access times, courses and activities are collected. The development of a dashboard system called Nakhoda is also described in this paper. It is a course learning analytics platform that displays summarized learning data. One finding is that devices used to access the e-learning system such as Apple Ipad, Iphone, Android-based and Symbian-based machines have shown to be the top

four mobile devices that are actively used by students. The evidence from this study suggests that the increasing use of mobile devices as a learning tool has generated a positive response from e-learning users. As a tool, analytics data can help lecturers to analyze their students' behavior, which can enhance pedagogical practices.

Keyword: e-Learning, Analytics, Big data, dashboards

INTRODUCTION

Technology has now made learning more open where the traditional approach is now supplanted as learning and teaching enters a new era with the use of various technologies. The use of online learning and the use of web 2.0 applications have increased learning opportunities (Dalsgaard, 2006; Embi, 2012; Grosseck, 2009). Typically, to apply e-learning, most universities will use a system application known as a Learning Management System (LMS) to simplify the management of learning (Mehrabi & Abtahi, 2012). The use of this application has various advantages for both instructors and students to facilitate learning and has the potential to engage students to conduct independent learning (Mehrabi & Abtahi, 2012; Wang, Doll, Deng, Park, & Yang, 2013).

Blended learning (BL) offers an attractive educational outcome by combining teaching and learning (T&L) activities through the use of information technology. Via this mechanism, a student learns at least in part through the online delivery of content and instruction, with some element of student control over time, place, path or pace (Cashman & Eschenbach, 2003; Garrison & Kanuka, 2004). In BL, a form of learning called flipped classroom is perceived to be a suitable technique for T&L (Cashman & Eschenbach, 2003; Garrison & Kanuka, 2004). This method of T&L may also be described as "just in time teaching" (JiTT). In this method, students will have to complete certain preparatory tasks before coming to class where the lecturers will discuss the answers and comments in the face-to-face classroom sessions. With the aid of an LMS, students can undertake their learning tasks through the online contents. They may take an online quiz, do an assignment and submit it online or watch video lectures before coming to class. In the face-to-face classroom with the presence of the lecturer, the

solutions to the assigned problems may then be discussed. This offers a more personalized guidance and interaction with students, instead of merely lecturing. Thus, the students come to class more prepared and motivated to learn. The lecturers can spend more time on difficult topics or common misconceptions. The Ministry of Education Malaysia (MOE) has stipulated that every course offered at public universities must implement some course contents through BL. In BL, classroom teaching is integrated with online activities (Mohd Saman & Nural Azhan, 2014). MOE has encouraged the application of BL as a pedagogical approach expecting 30% of T&L to be done through BL.

With the use of an LMS, students can access the system for the purpose of learning, suited to them. Lecturers on the other hand, can monitor the learning progress when needed (Jung, 2009; Peredo, Canales, Menchaca, & Peredo, 2011; Rodgers, 2008). Monitoring the implementation of T&L may be made on logged data stored in the LMS system. The stored data typically are student grades, activities undertaken by the students, access dates, student and course details. The data can be interpreted to show the performance of a student or the entire class that a lecturer is teaching (Agudo-Peregrina, Iglesias-Pradas, Conde-González, & Hernández-García, 2014; Davies & Graff, 2005; Kong, 2010). With the proper implementation of e-learning, lecturers can identify the problematic students. Nevertheless, lecturers would find the data displayed by the LMS difficult to comprehend unless the data is processed and visualized in a comprehensible form (Kent, Carr, Husted, & Pop, 2011).

Analytics translates such data into more meaningful representations of information (Ali, Hatala, Gašević, & Jovanović, 2012; Kent et al., 2011). Data that are translated are data that are usually valuable but this depends much on the preparation of appropriate statistical procedures, computer programming and operation research to measure performance (Ali et al., 2012). The preparation of analytics data requires the use of mathematical and statistical techniques (Kent et al., 2011). Such translated data may be used to recommend actions or to assist in T&L decision-making. Usually, these analytical tools are used to assist the decision-making process in the business context (Muntean, Cabău, & Rînciog, 2014; Wu, Chen, & Olson, 2014) where, using such data, companies are able to identify the best investments that can be made and the amount of stock and sales materials to be added and subtracted based on purchase data trend analysis (Muntean et al., 2014).

BIG DATA IN THE E-LEARNING ENVIRONMENT

Big data refers to data collected in large quantities, in the form of structured or unstructured data. Such data can come from multiple sources. Each activity that is being performed in the T&L environment is usually kept and logged for analysis purposes. In e-learning, data comes from the learners when they access and perform an activity in the e-learning course modules. Each task and activity such as accessing notes, logging into the system, taking a quiz or logging out from e-learning system will be collected and stored. For example, once a student logs into the e-learning system and interacts with the learning modules, their progress, assessment results, views and other data is being produced as big data. With the implementation of statistical techniques combined with mathematical methods, these data can be analyzed and translated into comprehensible visuals to help instructors understand and determine how the learner is acquiring information, at what pace and time and reveal any problem that may exist while facilitating instructors' understanding of learners' learning patterns.

Educational Data Mining (EDM) is a technique used in computer science to discover patterns in large data sets involving multiple techniques such as artificial intelligence, machine learning, statistics and database systems (Mohamad & Tasir, 2013). The goal of EDM is to transform the large data sets into a comprehensible structure (Mohamad & Tasir, 2013; Romero, Ventura, & García, 2008). It can be concluded that EDM consists of data mining tools that can be used to deconstruct big data into smaller more meaningful units of comprehensible, and hence, useful, information (Mohamad & Tasir, 2013). Both EDM and big data are strongly related to each other. Once this big data is visualized into an understandable structure, it becomes known as analytics.

ANALYSIS AND MAPPING OF E-LEARNING ACTIVITIES FOR VISUALIZATION

Web Analytics is a tool that collects, measures and analyzes the usage of web system activities in order to understand user patterns in accessing the system (Kent et al., 2011; Rizzotto, 2007). Web administrators have

used analytics data primarily for business and marketing research (Kent et al., 2011; Rizzotto, 2007; Ruipérez-Valiente, Muñoz-Merino, Leony, & Delgado Kloos, 2014) which may focus on user needs, products that have higher hits and sections haing lower hits (Rizzotto, 2007). In the e-learning context, there are data that can be used to make assumptions and to view user patterns for managing e-learning system facilities. Using analytics data, suggestions may also be offered to instructors as to the best day to give a quiz and which modules that will engage student more in T&L.

In developing an analytics system, the focus should be on translating the data obtained from the source into a form that can be understood by the instructors (Ali et al., 2012; Ruipérez-Valiente et al., 2014). This is to ensure that the data that appears in the analytics system can give value and help the instructor analyze student participation in using the content in the e-Learning system. The main problem encountered in the e-learning system is how we can analyze the behavior of students and monitoring their activities to ensure they carry out the activities (Hu, Lo, & Shih, 2014; Mehrabi & Abtahi, 2012; Rodgers, 2008). An LMS is able to track student activity, but somehow, most lack analytics tools to help the instructor monitor student participation and activeness (Awang & Darus, 2012). Table 1 shows the mapping of the data sources and the analytics outcomes used in analyzing student and lecturer activity in e-learning.

NAKHODA DASHBOARD SYSTEM

Based on the mapping and visualization of student activity in e-learning, a dashboard system called *Nakhoda* was developed to collect and display the visualization of the student activity. *Nakhoda* is expected to help in monitoring the implementation of the 30% T&L activities conducted online. The instructor can get an idea of what going on in their courses through *Nakhoda*. The instructor can identify those activities that students find most interesting. The instructor can develop a student profile analysis based on their activity and help the student by evaluating which are the most engaging activities that can be conducted in e-learning. Figure1 shows the structure of the *Nakhoda* system. It is an extended version of the *Laksamana* system that was developed earlier (Nural Azhan, Mohd Saman, & Abdullah, 2011). *Laksamana* is a system that has applied the push-pull technology with

temporal analysis with the aim of increasing student participation in an e-learning environment (Nural Azhan et al., 2011). However, despite the increase in student participation, *Laksamana* lacks strong analytics to help the instructor make appropriate T&L decisions regarding the best e-learning activities and monitor student activeness.

Table 1 : Data Source and Analysis Outcome

e-Learning Factor	Data measured & Sample	Information Outcome / Pattern Analyze
Device Access Type of device Number of Access Type of OS use What module they access	Student access log Server log Browser type OS type Device information Time access	System / Learning Management System that needs mobile view for particular devices Needed to develop native application for Mobile Device
eActivity in e-Learning	Page Access Server log Users access log Browser type eActivity track log	Temporal information on student access Statistical report which eActivity is the highest in LMS Requirement to expand e-Learning bandwidth (if using cloud) on certain time/days
Mod-blendedness measuring	LMS resource data Users data activity LMS activity Modules data	Information about courses that have achieved criteria Use the information to target the number of courses that can achieve criteria the following month based on statistical data analyzed

Entering Page	Server log Users access log	Information on user's first hit access. The highest hit page is the highest student engagement When combined with reference page information, we can find out whether the student is directly accessing or accessing after notification or instruction from email/message from lecturer.
Reference Page	Server log Users access log	This information can help administrator find out which push module helped engage the student the most This report can give us information on the external page that is most referred to before the student/lecturer enters e-learning
Exit Page	Server log Users access log	Information on last page users enter before closing the browser or the cookies expired. The entering page will reveal which module/action users interacted with and which page made users exit the LMS

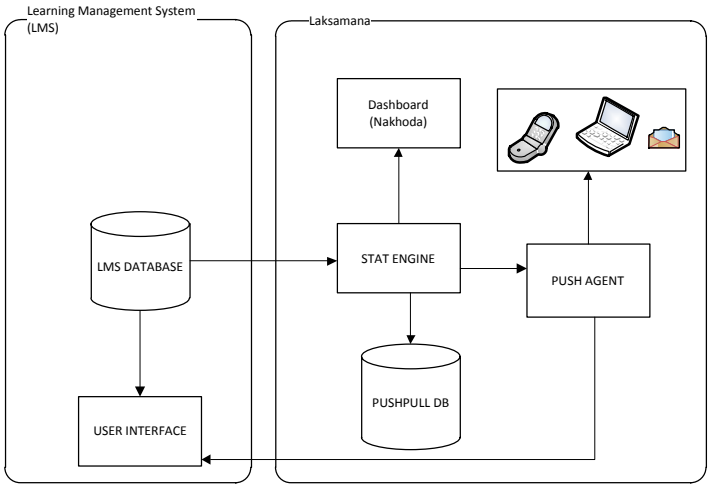


Figure 1: *Nakhoda* System Structure

Based on proposed interface and framework in Figure 1, the *Nakhoda* system was developed and integrated with *Laksamana* and the LMS. The proposed interface is based on the mapping of the e-learning information required in the analysis. This interface aims to provide an integrated meaningful visualization of the big data for lecturers to make T&L decisions. The display interfaces for *Nakhoda* were developed in a block section where each block refers to different results.

SYSTEM DISPLAYS AND ENGAGEMENT PATTERNS

Figure 2 shows the main interface for the *Nakhoda* system. Figures 3 to 5 show the various interfaces of the dashboard system with an integrated analysis that can help the instructor evaluate the implementation of the BL mode in their courses. For each student profile, the system will provide the temporal analysis of student interaction in their courses and activities provided by the instructor.

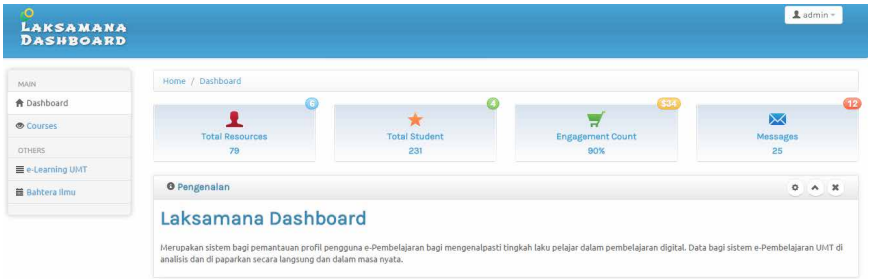


Figure 2: *Nakhoda* Main Interface

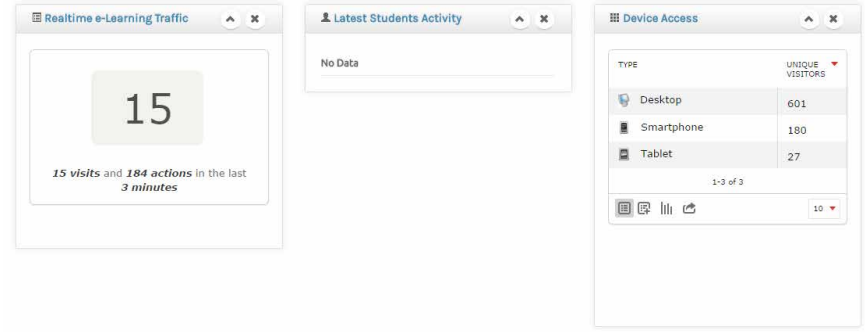


Figure 3: Some Statistical Data Displayed

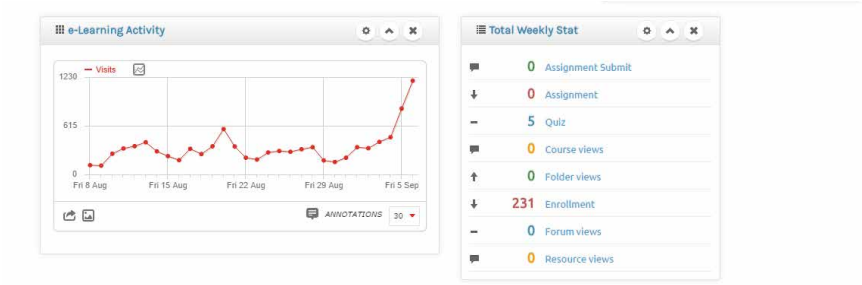


Figure 4: Some Statistical Data Displayed

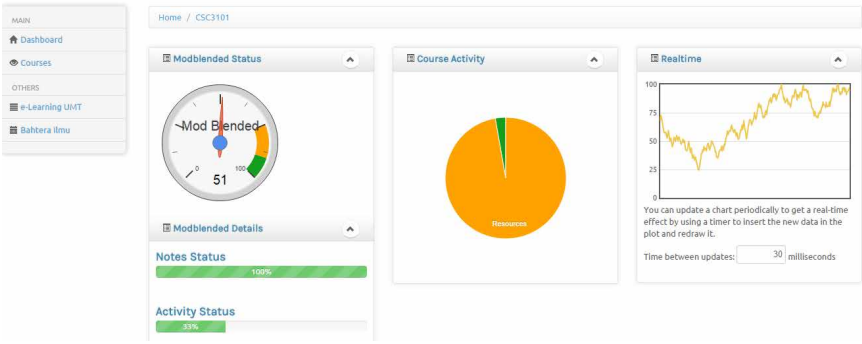


Figure 5: Course Analysis

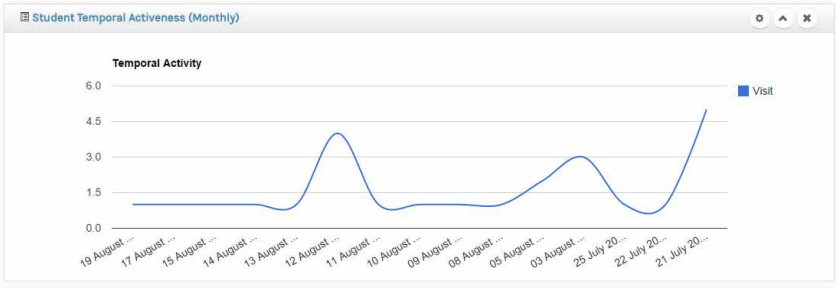


Figure 6: Temporal Activity Analysis

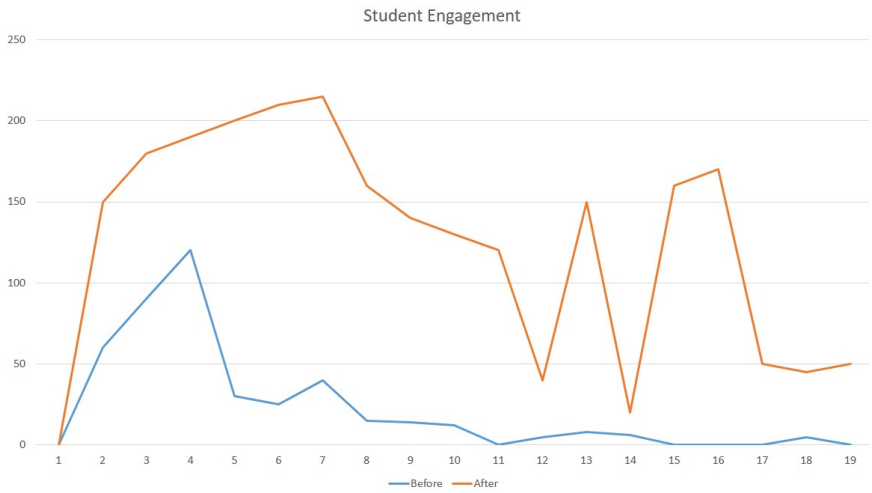
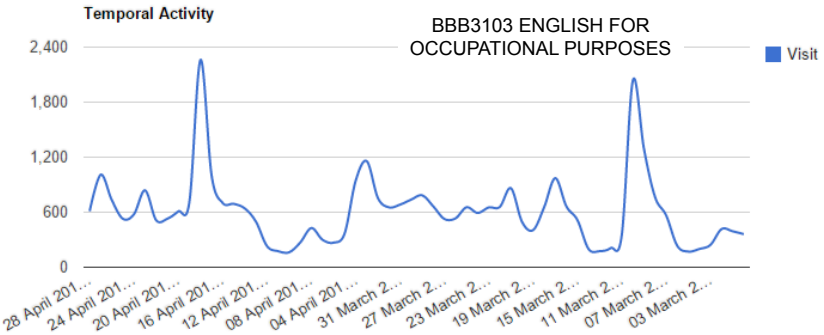


Figure 7: Increase of Student Engagement in e-learning (Nural Azhan et al., 2011)

Figure 8 shows how *Nakhoda* analyzes the patterns of student engagement based on the temporal data. These data are then compared and different patterns of student engagement are seen to emerge, assuming that each course is using a different pedagogical approach for BL. With such patterns, the best way to present our content can be facilitated, knowing which content has the highest engagement according content type or through temporal interaction.



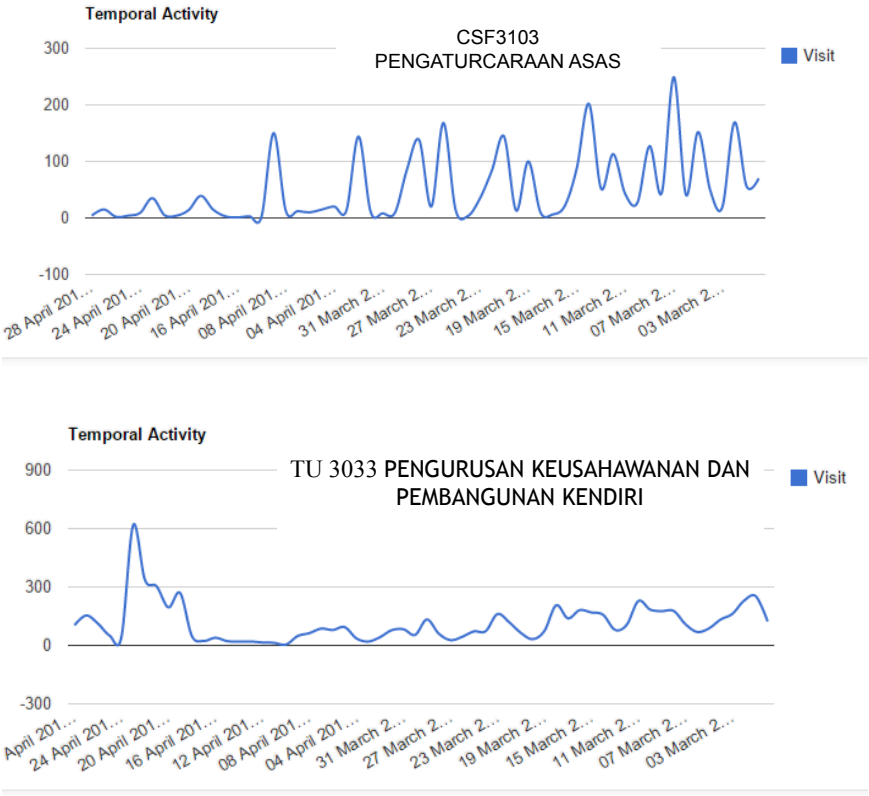


Figure 8: Different Patterns of Student Engagement in e-learning

RELATED WORK

Numerous research has been done on analyzing and translating big data into analytics. One of the tools in web analytics is Google Analytics (Educação, 2013; Google, 2015). Launched in November 2005, it is a free web analytics tool service offered by Google (Google, 2015). The main idea of Google analytics is to track and report website traffic using integrated Ad words. It is mostly used by e-commerce sites to track conversion or goals. Goals might include sales, lead generation, user views or hits to certain files hosted in the user's website (Educação, 2013; Google, 2015).

Another similar tool to Google Analytics is *Piwik*. *Piwik* differs from Google Analytics in terms of application as *Piwik* is an Open Source Web Analytics Platform. *Piwik* offers the whole system that can be installed in users' own servers (Piwik, 2014; Scott Nesbitt, 2014). With *Piwik*, the data collected is owned by the users and secured (Piwik, 2014). The *Piwik* project was initiated in June 2007 in London and then released in September 2007. *Piwik* is used to gather and analyze important information about users that access a website. e-Commerce Analytics analyzes revenue, orders, conversion rates and detailed product statistics and sees which products are the most popular (Piwik, 2014). Dychkhoff et. al. (2012) have suggested the design and implementation of a Learning Analytics Toolkit for Teachers (eLAT). The eLAT design is to process large data sets that enables the instructor to explore and correlate learning object usage, user properties, user behavior as well as assessment results based on graphical indicators. The eLAT tool has been built for teachers to know how students react to their content and teaching approach.

CONCLUSION

This paper discusses the nature and process of learning analytics. Analytics is a technology that is used to translate raw data into something more meaningful to users which depends on the translation process using statistics, computer programming and operations research. A dashboard system called *Nakhoda* has been described to implement the analytics process. It is an extension of the system called *Laksamana* developed earlier in the project. The concept of analytics with smart business elements has been adopted and used in an e-learning environment to help analyze e-learning data to improve the development of e-learning. The T&L decisions made by the instructor using this system can help enhance and improve the implementation of e-learning in the university through increased interaction between students and lecturers. Analytics offers a way to translate data into more meaningful representations of information. Such translated data will be used to recommend actions or to assist in decision-making. Usually, these analytical tools will be used to assist the decision for the business context. It helps companies identify the best investments that can be made and the amount of stock and sales materials can be added and subtracted based on purchase data trend analysis. Future works may be focused on a fully intelligent recommender system, personalized learning, rewards system and intercepting problematic students.

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Islands of Superficial Knowledge without a Canoe to get from One End to the Other: The Nature of College Mathematics

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ABSTRACT

Successful mathematics students do indeed construct a fairly large number and variety of algorithms in order to continue to achieve good results in college mathematics courses. However, what is the quality of this mathematical knowledge 'accumulated' from the courses taken? How well do the college examination grades in mathematics courses reflect the student's mathematical thinking? Utilizing both quantitative and qualitative approaches, the findings indicate that the sixty-four college students involved in this study have learnt how to do numerical computation at the expense of learning how to think mathematically. The findings poignantly revealed that the accumulation of mathematics courses taken and the grades obtained in their end of semester examination do not correlate with their mathematical knowledge. The clinical interviews findings indicate that these students have an instrumental understanding rather than a relational understanding due to their emphasis on procedure rather than the process of learning. They ignore things like context, structure and situation as being crucial for constructing mathematical knowledge. Unfortunately, the development of mathematical thinking in their learning is overshadowed by an instructional focus on decontextualized content and the imparting of facts necessary to pass end semester examinations. They end up with islands of superficial knowledge without a canoe to get from one end to the other.

Keywords: algorithms, college mathematics, mathematical thinking, teaching and learning

INTRODUCTION

What is the nature of college mathematics? Before answering this question as the foundation of the paper, we will briefly discuss the evolution of mathematics teaching and learning in colleges over the last few decades. The evolution of mathematics learning over the past few decades has been dramatic, where in the 90s, the focus had been on doing computation and applying procedures in solving a problem. Then in the later stages of the 19th century and early 20th century, the conception of mathematics learning tilted from computation emphasis to understanding abstract concepts and relationship. This was a shift in teaching with emphasis from *doing* to *understanding* (Devlin, 2014). This era led to the emergence of mathematics as the science of patterns. According to Resnik (1999), the nature of mathematics is the espionage of a system of ideas using factual subject matter towards the existing of reality. Devlin (2003) elucidated that the Science of Patterns explores the many ways mathematics helps us in understanding the perception of reality--both the physical, biological, and social worlds without, and the realm of ideas and thoughts within. According to him, this development yields the rapid growth of computing and applications have helped to cross-fertilize the mathematical sciences, yielding an unprecedented abundance of new methods, theories, and models. No longer just the study of number and space, mathematical science has become the science of patterns, with theory built on relations among patterns and on applications derived from the fit between pattern and observation.

This shift was from heavily relying on formulas to solve problems towards the teaching on *what* and *why* on the conceptualization of the problem given. Then in the early part of the current century, mathematical thinking has been the focus of attention. According to Ridgway (2001), "*thinking mathematically is about developing habits of mind that are always there when you need them - not in a book you can look up later (p. 1).* It is a pre-built thinking of mathematical thinking in the mind of an individual when solving problems. Mason and Johnston-Wilder (2004) provide a detailed list of words they believe denote processes and actions that mathematicians employ when they pose and tackle mathematical problems: exemplifying, specializing, completing, deleting, correcting, comparing, sorting, organizing, changing, varying, reversing, altering, generalizing, conjecturing, explaining, justifying, verifying, convincing, refuting" (p.109).

They propose that questions function to enable students to draw on these words in allowing them to experience aspects of mathematical thinking. While Mason and Johnston detail the words used, Stacey (2007) on the other hand emphasizes the processes applied in developing mathematical thinking. The two pairs of processes through which mathematical thinking very often proceeds: *Specialising and Generalising , Conjecturing and Convincing.* We can surmise to a certain extent that mathematical thinking is something that is cumbersome to definition but researchers in general agree that the important characteristics must include: conjecturing, reasoning and proving, abstraction, generalization and specialization (Breen & O'Shea, 2010). This is a way of thinking that permits the building up of concepts, processes and applications, exploring and unravelling problems, making and examining inferences and communicating complex ideas to the world precisely and concisely. Therefore, the ability to be able to think mathematically has substituted the process of memorising a set of procedures and the solution of routine-based problems as the focus of mathematical learning.

Now, we revert to the context of this paper on the nature of college mathematics, especially in the Malaysian setting. Has this evolution of mathematics learning and teaching affected the settings in the Malaysian paradigm? Much of the issues on the low standard of college student's mathematics performance have been barged on the foundation laid by school mathematics. This is more prevalent in the participation of Malaysian schools in the international studies of Trends in Mathematics and Science Studies (TIMSS) and PISA. Both TIMSS (TIMSS 2003, 2007, 2011) and PISA results have revealed dismal performance by Malaysian School students in mathematics over the last decade. This scenario has been debated by both researchers and mass media (Asadullah, 2014; Ghagar, Othman & Mohammadpour , 2011; Noor Azina & Halimah Awang, 2009; Mohammadpour, Moradi, & Najib ; 2009; Fensham , 2007; Malay Mail Online, 2013; Bernama, 2013) on the decry standards of mathematics in Malaysian schools over the years. While it can be argued that TIMSS and PISA rankings are never going to be "accurate" in any study, it's fair to say that it does provide some indications to the quality of our education system. For example, there may not really be any difference between a country ranked 11th and 15th, but there's likely to be a significant gap between the countries placed 15th vs 35th vs 56th . These ranking results have sent a ripple of anxiety among researchers and educators which provoked

perturbation. Inadvertently, it has to a large extent, brought education reform movements in school mathematics by the education ministry, especially with the Malaysian Education Blue Print (2013). However, the question to ponder upon is " what about the nature of college students learning of mathematics?" How is student performance being measured?

With the paradigm shifts of the nature of mathematics that have taken place as stated earlier, did the philosophical stance at the college level move in tandem with this shiftt? The fundamental Mathematics courses taught in colleges today for students (major and non-major requirement) include Calculus, Algebra (modern and linear), Number Theory, Topology, Logic, Geometry, probability etc. These courses have been taught and re-taught over the years by instructors and students are getting good grades in their transcripts based on the number of students graduating with honours (Rojstaczer & Healy, 2012; Rampell, 2011; Kristina , 2011;Parmjit, 2009; Parmjit & White, 2006; Ridhancock, 2003). However, these grades in their transcripts are not being translated into the development of their mathematical thinking (Devlin, 2003; Parmjit, 2009; Liu & Niess, 2006). The alarming pattern where faculties aspire in the development of students' thinking skills were documented by Gardiner (1998). However, research proves otherwise as when it comes to practice we focus more on facts and concepts within the disciplines and also at the lowest cognitive levels in comparison to developing intellect and values. How has this debilitating perspective of mathematics as a collection of arcane procedures and rules become so prevalent among our students at college?

These students' low level of mathematical thinking seem to indicate that the notion of college mathematics is based almost exclusively on formal mathematical procedures and concepts that, of their nature, are very remote from the conceptual world of the students who are to learn them. It seems to indicate that instructors are diligently teaching mathematics but students are not learning! These findings have been documented two decades ago and are still prevalent in today's college classroom. Successful mathematics students do indeed construct a fairly large number and variety of algorithms in order to continue to achieve good results in college mathematics courses. However, what is the quality of this mathematical knowledge 'accumulated' from the courses taken?

OBJECTIVES OF THE STUDY

This study was undertaken to investigate college students, who have taken mathematics courses (e.g. calculus courses, mathematics foundation and logic courses), repertoire of cognitive strategies in solving problems that were within the zone of potential constructions. It aims to develop a comprehensive description of college freshman's thinking and reasoning capabilities in solving these problems. Students who are considered successful are able to construct a variety of algorithms in line with achieving excellent results in college mathematical courses. Nevertheless, what the quality of the mathematical knowledge that is accumulated from the mathematical courses? Apart, from that, it is also aims to investigate how examination grades obtained from mathematical courses reflect the mathematical thinking of students.

Specifically, the questions addressed are:

1. What are the levels of college students thinking in solving non-routine problems?

2. What difficulties do college students encounter in solving non-routine problems?

METHODOLOGY

The methodology used in this study was both qualitative and quantitative in nature. Qualitative data from clinical interviews with selected students gave the researchers an in-depth understanding of these students' heuristic actions, exploration of the mathematical processes, and tacit mathematical understanding that constitute thinking mathematically in problem solving. The written assessment provided both quantitative and qualitative data about these students' relational understanding of their application of mathematical concepts in problem solving. A total of 64 students from from three different classes (semester 3 and semester 4) majoring in Physics, Chemistry and Biology were involved in the study. All these students have taken Logic and Foundation, Calculus 1 and Calculus 2 courses in Year 1 and Year 2 of their college settings. From these students performance in the written

assessment, nine were selected (three within the high achievers, three within average achievers and three within the low achievers) for the interviews to elicit information on their cognitive processes in solving problems. The academic demographic data regarding their mathematics acumen is shown in Table 1. (To be noted that the grades for the Mathematical Logic and Proving Techniques course was not available for this paper).

Demographics of Students Acumen in Mathematics

Table 1 depicts the mathematics grade obtained by students in their SPM examination and current college settings. It depicts that 96.9% (n =62) and 23.5% (n=15) of the students obtained an A grade (A+, A and A-) in the subject Modern Mathematics and Additional Mathematics respectively during their SPM examination. Whereas for the current college settings, 29.7% (n = 19) and 4.7% (n=3) of the students obtained A grade in their Calculus 1 and Calculus 2 respectively. More than two thirds of the students obtained at least a grade B in all four subjects except for Calculus 2. This demographic academic acumen results indicates that these students have an accepted level of mathematics expectancy based on the grades achieved. From this group, 71.9% (n=46) and 28.1% (n=18) entered this program via matriculation and dipoloma qualifications.

There were all together 5 items in the test and the responses were grouped based on categories in accordance to the criterion behavior exhibited in which a numerical value was assigned. Students' responses were categorized based on the reasoning employed on a 4 point scale and was than computed as correct (0 to 2) and incorrect responses (3 to 4).The 4 point scale used was :

4. all correct, good reasoning
3. good reasoning, small error(s)
2. some promising work but it is not clear a solution would be reached
1. some work but unlikely to lead to a solution
0. blank

Table 1: Distribution of Grades Obtained in SPM (Modern Math and Add Math) and College (Calculus 1 and Calculus 2)

Grade	SPM Math Grade	%	SPM Add Math Grade	%	Calculus 1	%	Calculus 2	%
A+	13	20.3	1	1.6	1	1.6	0	0
A	43	67.2	4	6.3	9	14.1	1	1.6
A-	6	9.4	10	15.6	9	14.1	2	3.1
B+	2	3.1	18	28.1	12	18.8	4	6.3
B	-	-	6	9.4	9	14.1	9	14.1
B-	-	-	6	9.4	3	4.7	10	15.6
C+	-	-	7	10.9	8	12.5	14	21.9
C	-	-	11	17.2	10	15.6	17	26.6
C-	-	-	1	1.6	3	4.7	5	7.8
D	-	-	-	-	-	-	2	3.1
Total	64	100.0	64	100	64	100	64	100
Minimum Grade B		**100%**		**70.3%**		**67.2%**		**40.6%**

FINDINGS OF THE STUDY

Table 2 shows the correct and incorrect responses for each of the five written test items attempted in the written assessment. The data can be an important indication of college student's fundamental relational thinking of mathematical concepts in solving problems.

Table 2: Item Analysis of Written Assessment Test

Item	Frequency	Percentage Correct	Incorrect
1	9	14.1	85.9
2	5	7.8	92.2
3	1	1.6	98.4
4	7	10.9	89.1
5	10	15.6	84.4

From Table 2, it can be deduced that students faced great difficulties in all the problems as the incorrect responses for all the problems are more than 85%. The highest level of difficulty is for item 3 (98.4%), followed by item 2 (92.2%), item 4 (89.1%), item1 (85.9%) and item 5 (84.4%).

Some of the verbatim during the interviews were translated to English as the students faced difficulty in corresponding in English language.

Question 1

Eva and Alex want to paint the door of their garage. They first mix 2 cans of white paint and 3 cans of black paint to get a particular shade of grey. They add one more can of each. Will the new shade of gray be lighter, darker or they are the same?

Approximately 85.9 % of the students got this item wrong with approximately 59.4% (n = 38) reasoning it as the same. The data from the interview depicted their thinking in solving the given problem:

This group of students used primitive additive reasoning. The reasoning employed is that if an equal number of cans for each type of paint are added to the mixture, the shade will remain the same. They were unable to see the proportion of white paint to the black paint before and after the addition of two cans of paint.

S_{F3} : *In my opinion, it is the same if you add one can of white paint and one can of black paint as the differences are the same. If we intend the outcome to be lighter, we should put in more white paint and if we want to have a darker effect, we put in more black paint.*
(Pada pendapat saya, sama, jika ditambah satu tin cat putih dan satu tin cat hitam,kerana bezanya sama. Jika ingin mendapatkan yang lebih terang, kita akan menambahkan lebih banyak cat putih dari cat hitam dan jika ingin mendapatkan yang lebih gelap, kita akan tambah lebih banyak cat hitam dari cat putih.)

R : *Therefore, you believe that if you add another can of white paint and another can of black paint, the color will be...?*

(Jadi anda berpendapat kalau ditambah satu tin cat putih dan satu tin cat hitam, warna kelabuhnya adalah)

S_{F3} : *Same*
(Sama)

The reasoning employed is that if an equal number of cans for each type of paint are added to the mixture, the shade will remain the same. They were unable to see the proportion of white paint to the black paint before and after the addition of two cans of paint. Approximately 45.3 % of the students gave this additive reasoning. In short, these students failed to construct a coordination of two ratios simultaneously as: 2 white to 3 black and 3 white to 4 black. Their thinking was based on the primitive additive reasoning and not the expected multiplicative thinking.

Question 2

If it takes 9 workers 5 hours to mow a certain lawn, how long would it take 6 workers to mow the same lawn? (Assume that the workers are all performing at the same rate and all working for the entire time.)

In this item, 92.2 % of the students obtain an incorrect answer with the majority failing to see an inverse proportion relationship. They algorithmically solved the question by utilizing a cross multiplicative structure:

9 workers = 5 hours
6 workers = x
x/5 = 6/9; 9x = 30; x = 30/9 = 3 1/3 hours.

Here, they did not reason the representation of each number and what they were actually computing. Logically, they should have realized that the answer they produced (3 1/3 hours) implied that more people take a longer time to finish up the job!

An interview with a student who used a similar method revealed that he was aware that less workers means longer working hours but was unable to answer why his cross multiplication strategy did not give a logical solution.

R : What's your answer?
(Apa jawapan kamu?)

S_{M6} : 3 hours and 33 minutes
(3 jam 33 minit)

R : Is your answer logical?
(Adakah jawapan kamu logic)?

S_{M6} : (Silence)

R : What is it that you are thinking?
(Apakah yang kamu sedang berfikir?)

S_{M6} : It should've been that 9 people with 5 hours. So, if 6, it must be more.
(Sepatutnya 9 orang 5 jam. Kalau 6 orang mesti lebih lagi.)

R : What must be more?
(Apa yang lebih?)

S_{M6} : Time
(Masa)

R : In your opinion, where is it that you went wrong?
(Pada pendapat kamu, mana kesilapannya?)

S_{M6} : Well, my working steps were correct (showing his steps, utilizing the cross multiplication method, in his worksheet)...I'm uncertain.
(Jalan kerja saya betul) ... Saya tak pasti.)

An interview with another student yielded a similar response.

R : You wrote 5 hours multiply by 60 minutes, then divide by 9 (From his worksheet). Why?
(Awak tulis 5 jam darab 60 minit, bahagi 9 (From his worksheet). Kenapa?)

S_{F5} : *In order to find out how many minutes a person works. After that, we multiply by 6.*
(Untuk dapat setiap orang berapa minit dia kerja. Lepas itu darab 6.)

R : *So, how long does it take for 6 people to finish the job?.*
(Jadi, 6 orang buat kerja berapa lama?)

S_{F5} : *3.33 hours*
(3.33 jam)

R : *Is your answer logical?*
(logik tak jawapan kamu?)

S_{F5} : *Yes*
(Ya)

However, this student who used proportional reasoning by cross multiplication, unitization multiplication by 6 to get the total numbers of hours work by 6 workers, did not realize that his answer was not logical. Majority of the students failed to see an inverse proportion relationship embedded in this question.

Question 3

Rahman takes 20 hours to paint a house, whereas Ah Beng takes 30 hours. How long will it take for them to paint a house if they work together?

Surprisingly, 98.4% of students obtained an incorrect answer for this question. Only one student obtained a correct response for this question.

From all the answer scripts, majority of them were just not able to get started to solve the problem.

During one of the interviews:

R : What is your answer?

S_{F1} : This question is tricky.

R : Why do you say that?

S_{F1} : (silence)

R : What are you thinking?

S_{F1}: Well most of the time, in this type of question….. the question will be like if Rahman takes 20 hours to paint a house, how long will it take to paint three or four house... something like that.

R : What about this question?

S_{F1} : Here they ask if we combine both of them
Silence for about 4-5 minutes

S_{F1}: I am not sure

Problems which involve proportions are traditionally categorized into two types: missing-value problems and comparison problems. In missing value problems, one needs to determine the unknown x in a/b = c/x where a, b and c are given. A comparison problem, on the other hand, compares a/b and c/d where a, b, c and d are given. These students faced great difficulty in this type of problem which relates to comparison of two ratios. They were just not to apply their thinking from missing value problems to comparison problems.

Question 4

An old antique bicycle has wheels of unequal size. The front wheel has a circumference of 8 feet. The back wheel has a circumference of 10 feet. How far has the bicycle gone when the front wheel has turned 20 more revolutions than the back wheel?

For this problem, 89.1% of the students obtained an incorrect response. They faced great difficulties in expressing the problem into a mathematical expression. From the interviews it revealed that the majority did not realize that both tyres travelled the same distance. Some of the heuristics by students who got it correct was:

To travel a certain distance, the front wheel has made 5 revolutions, while the back has made 4. Therefore, the ratio is 5 : 4, and the difference is 1 revolution. So, to get a difference of 20, multiply ten on each side to get 100 : 80. This shows that the front has made 100 revolutions. Hence, the wheel has travelled 100 x 8 = 800 feet.

Question 5

A dog chasing a rabbit, which has a start of 45m, jumps 3m every time the rabbit jumps 2m. In how many leaps does the dog overtake the rabbit?

In this item, merely 15.6% of the students were able to give correct response. This is an algebraic task and some students were observed using interesting heuristic action to solve the problem such as:

> *Difference in the distance of every leap is 1 m. To cover the difference of 45 m, it requires 45 leaps. Therefore, the dog will overtake the rabbit in the 46th leap.*

Majority of them saw the problem as a difference of 1 meter between each jump of the rabbit and dog. Then they classified the problem as sequences:

> *2, 4, 6, 8, ... as the sequence for the distance travelled by the rabbit and*
> *3, 6, 9, 12, ... as the sequence for the distance traveled by the dog.*

These heuristics were correct but unfortunately they got the wrong answer because they did not take into consideration that the rabbit was already 45m ahead of the dog. Another variation of these heuristics is exhibited by a student that was being interviewed.

R : You said that it's 45 divided by 3, you get 15. Why 45 divided by 3? (Awak kata 45 bahagi 3, awak dapat 15. Kenapa 45 bahagi 3?)

S_{M1} *: The dog can jump for 3 meters, the rabbit can jump for 2 meters. For the dog to outjump the rabbit, it will be 45 meters divide by 3 meters. So, the dog gets 15 jumps and in those 15 jumps, the dog can outjump the rabbit.*
(Anjing boleh lompat 3 meter, arnab boleh lompat 2 meter. Untuk anjing memintas arnab, jadi 45 meter bahagi 3 meter. Anjing dapat 15 lompatan. Jadi dalam 15 lompatan tu, anjing boleh memintas arnab).

He saw that the rabbit is 45 metres in front of the dog, therefore, in 15 leaps the dog will overcome the rabbit. This student was not aware of the extra information in the problem, that is, when the dog leaps, the rabbit also leaps.

Surprisingly, the students faced difficulty in expressing the problem into a mathematical algebraic equation of $45 + 2(x) = 3x$ where x is the number of jumps. None of the students apply this algebraic equation to solve the problems, as one will expect from college students.

DISCUSSION

The goal of the written assessment test for this study was to draw on the habits of thinking developed by college students over the various exposures to mathematics courses in their studies rather than on specific procedures they had learnt earlier. There were 64 subjects in this study where they had taken various mathematics courses since high school such as Modern Mathematics, Additional Mathematics, Mathematical Logic and Proving Techniques, Calculus 1 and Calculus 2. With the acumen of their mathematic achievement as shown in Table 1, it was expected that these students, would have a good grasp in the understanding of fundamental mathematical concepts. However, the result of this study shows that they have learnt how to do numerical computation at the expense of learning how to think and solve problems.

The data for these problems seem to show that for most students in this study, college mathematics instruction was procedural without sense-making: one learns to read the problem, extract the relevant numbers and the operation to be used, to perform the operation, and to write down the result—without even thinking about what it all means. This was depicted in *Question 2* where a majority used an algorithmic cross multiplication approach and could not apply logical thinking where more people would take lesser time to finish the job! Utilizing this algorithmic approach in solving problems simply becomes an act of symbolic manipulation without requiring that an individual makes sense of what they are doing. Students can develop structural understanding if given experiences that create a solid foundation for these concepts (Kieran, 1992).

The grades and their exposure to mathematics courses in High school (Modern Mathematics and Additional Mathematics) and College (Mathematical Logic and Proving Techniques, Calculus 1 and Calculus 2) does not indicate their mathematical thinking prowess. Evidence from these findings clearly show the "mathematical deficiency" when they ar ein college. There are many reasons for this. In some instances, students have not had the opportunity to learn important mathematics. In other instances, the curriculum offered to students does not engage them to think. Sometimes students lack a commitment to learning. The quality of mathematics teaching is highly variable.

There will be people reading this paper who might question the lack of statistical depth in the analysis used. Many thoughtful people might be critical of this but as one reads the tables of statistical data, one will ask "so what!". We strongly feel that that vital questions go unanswered while means, standard deviation, t-tests, and regression analysis pile up. There is too much reliance on statistics nowadays, and a deep look at processes is avoided. Statistics are valuable in their place and they can suggest hypotheses in preliminary studies and help to test these in well-designed experimental studies. But, if we want to understand what goes on in anyone's head when they solve problems, we have to watch them solving problems (Schoenfeld, 1992) as we attempted in this study.

There is evidence that these college students have many of the same conceptual and reasoning difficulties that are common among High School

students. There seems to be little change in the conceptual understanding before and after formal instructions on college mathematics courses taken. Although we tend to promote critical and analytical thinking, but at the end of the day, the assessment propels the learning rather than the other way round which tends to inhibit the development of both this skills. It is alarming to see that large number of students taking mathematics courses are just not learning but, to put it eloquently, actively suffering. He further noted that 'We spend a lot of time avalanching students with the answers to things that they wouldn't think of asking'(p.3).

CONCLUSION

Mathematics courses in colleges should be re-engineered where the focus of doing mathematics should be inclined towards "teaching students to think". This is in line with Polya's (1973) assertation "How to think" which is a theme that underlies much of genuine inquiry and problem solving in mathematics. One of the major aims of mathematical learning is the development of mathematical thinking and there is a widespread agreement that it should be taught as a thinking activity (Devlin, 2014; Chapman, 2011; Stacey, 2007). Consequently, the emphasis in instruction should be shifted from learning the rules for operations to understanding of mathematical concepts. One possible solution is to encourage the transition by providing students with "problem solving tools" that would permit them to be accommodative to changing needs (Treffinger, 2008). However, care must be taken so that effort to teach students "how to think" in mathematics problem solving do not get transformed into teaching "what to think" or "what to do". This is, in particular, a by-product of an emphasis on procedural knowledge about problem solving as seen in the linear framework of college mathematics settings.

In concluding this paper, we can surmise that the effectiveness of mathematics teaching to develop mathematical thinking in colleges can and should be improved substantially. If we go with the definition of teaching as an interaction process between instructors and students over a content in an environment (Cohen, 2002), it signifies that the current mode of teaching mathematics is not only ineffective but also seriously stunts the growth of students' mathematical thinking and problem-solving skills. We strongly

believe that, colleges place over emphasis on the procedures rather than the processes. So, when students "practice" these problems, they are practicing to get the correct answer. In other words, they ignore things like context, structure and situations, and students do not have the occasion to generate the "richly inter connected spaces" that Cooper (1988) has identified as being crucial for constructing mathematical knowledge. They end up with islands of superficial knowledge without a canoe to get from one to the other.

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Exploring Student Voice for Learner-Driven Learning

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ABSTRACT

Current pedagogy has witnessed a paradigm shift towards a more learner-*centred approach where the individual learner is the focus of teaching rather than the body of knowledge. As principles guiding learner-centred learning become more defined, therein lays a critical call to take heed of student voice for more effective delivery systems and teacher growth. Therefore, this paper explored student voice regarding the implementation of an English Language course offered to students under the Mengubah Destini Anak Bangsa (MDAB) programme in UiTM, Malaysia. The study involved 341 pre-diploma students from three UiTM branch campuses. Data were collected using a questionnaire and nine focus group interviews. Findings revealed that students held rather positive and favourable views towards the implementation of the program with regards to lecturer preparation, language use, lesson presentation, classroom management and classroom atmosphere. Inferential statistics revealed that there was no significant difference in the students' perceptions with regards to gender and discipline of study but a significant difference was seen with regards to language proficiency and campus locality. Students also highlighted concerns regarding student language proficiency, contact hours, the course curriculum, assignments, teaching staff and learning within a homogenous group. Students called for a more learner-driven curriculum that would address their needs and build upon their knowledge and skills so that they*

could become more holistic and confident tertiary students. The findings implied that student voice cannot be ignored as it has a role for effective feedback and learner-driven learning.

Keywords: student voice, learner-centred learning, feedback, Pre-Diploma English language Course.

INTRODUCTION

Over the past decade, Malaysia has witnessed significant gains in terms of student enrolment in higher education. Access to higher education as a result of democratization and massification of education reached a gross enrolment rate of 48% in 2012 indicating a 70% increase in enrolment in the past decade to reach 1.2 million students (Ministry of Education, 2015). In a bid to provide greater access to higher education (HE, hereafter), numerous programmes have been put in place for all types of learners including learners at risk.

There is no denying that the most challenging and daunting task that educators have to deal with is addressing learner difficulties. These difficulties range from unmotivated learners to marginalized learners. Having to work with marginalized learners who face the risk of dropping out is a concern for educators in institutions of higher learning (IHL hereafter). Therefore IHL have taken various steps and implemented in-house programmes to help motivate such students at-risk of failure. Campbell and Ramey (1995), note that IHL that take a pro-active approach in early intervention programmes to address problems faced by at-risk students have better outcomes including a positive effect on improving student academic performance. One such programme taken by a local public university in Malaysia is the Changing the Destiny of Indigenous People or the *Mengubah Destini Anak Bangsa* (MDAB, hereafter) programme.

The MDAB Programme was established in July 2010 by the Vice Chancellor of Universiti Teknologi MARA (UiTM, hereafter). Its main aim is to provide educational opportunities for the qualified but poor indigenous students from both rural and urban areas who fail to gain entry into existing pre-university courses in Malaysian public universities. This program

serves as a platform for them to further their studies at diploma and degree courses thus enabling them to gain wider employability access. The program currently conducts three pre-diploma courses, which are Pre-Commerce, Pre-Accountancy and Pre-Science Programmes at sixteen (16) UiTM branches nationwide. Students undertaking all these three pre-diploma courses also have to take the compulsory Pre-Diploma English Language Preparatory Course as English is viewed as an essential 21st century skill in today's globalised economies. The Pre-Diploma English Language (PDEL, hereafter) Course is a six-credit unit course that is designed to upgrade the proficiency level of pre-diploma students. The primary focus of the program is on reading and listening with appropriate consideration given to speaking and writing. It also incorporates lessons on grammar which is taught incidentally through listening, reading, speaking and writing tasks.

Though the PDEL Course has been implemented for close to five years now, there has been no holistic evaluation of the course. Interviews with the lecturers teaching the course revealed that through the years slight changes have been made to the PDEL course curriculum based mainly on lecturers' feedback with little or no feedback from students. Moreover, there has been scant empirical evidence of a holistic evaluation of the course especially where student voice is concerned. According to Keane and Labhrainn (2005), course evaluation is important as it helps to improve the quality of course delivery and to provide direct feedback to teaching staff. Moreover, it also allows one to make comparisons between courses delivered within and across departments. Even expert researchers such as Hattie (2008), who have conducted decades of research, revealed that getting feedback from all stakeholders especially students had "the most powerful influences on achievement" (p. 173).

We need to understand that current teaching pedagogy postulates a shift from teacher-centred to learner-centred education. According to Tudor (1996), learner-centered education is an approach where learners should play more active and participatory roles in their learning process. Consequently, students should no longer be viewed as passive recipients with teachers as the primary source of knowledge but rather as active learners who are capable of providing constructive feedback for sustainable, responsive and systematic approach to transform their own learning process. More importantly, encouraging student voice in a learner-centred approach is based on the

assumption that learners are actively involved in negotiating their learning process as they have unlimited potential for individual development. Liu, Qiao and Liu (2006) reiterate that the individual learner is the focus of teaching rather than the body of information whilst the instructor provides students with ample opportunities to learn independently and from one another. Engaging students to lend their voice in providing feedback gives students the opportunity to influence not only classroom activities but also curriculum and education policies (Harper, 2000).

Fletcher (2014) defines student voice as "any expression of any learner regarding anything related to education" (p2). Harper (2000) highlights, that student voice can be either the individual or the collective voice of students within the classroom learning context. It can also be viewed both as a metaphorical practice as well as a pragmatic concern. Fletcher (2014) a recognized expert on student voice stressed that "It is not enough to simply listen to student voice. Educators have an ethical imperative to do something with students, and that is why meaningful student involvement is vital to school improvement" (p.2). To this, Sidhu (2009) further reiterated that such a learning context calls for instructors to ensure students are coached with the appropriate skills so that they can manage (i.e. plan, organize, monitor and evaluate) their own learning. Such an approach will systematically help learners develop learner autonomy necessary 21st century life-long learning skill (Sidhu et. al, 2011).

This was also articulated by Scott-Webber (2012) who stressed that higher education today has been turned 'upside down' through the massive changes in ICT that are reshaping learner needs. Hence educators today need to adhere to this wake-up call to change and move towards a 21st century learning model where exploring student voice is as important as helping them make meaning of the learning process. Scott-Webber (2012) reemphasized that educators who see themselves as content experts and providers are redundant in today's learning spaces as students can locate content anywhere and at any time. What is perhaps more important is listening to student voices and helping them make sense of their learning.

Therefore, getting feedback from students and getting their voice heard is of utmost importance. Seldin (1997), highlighted that giving students a voice to provide feedback and appraisals of courses is invaluable when

the right questions are asked. Students can be asked to articulate what they have learnt in a course and also report on aspects such as a lecturer's ability to communicate at their level, the lecturer's professional and ethical behavior in the classroom, student-teacher relationships and lecturer's ability to stimulate interest in the subject matter. Such feedback can lead to improvement of teaching. Lodge (2008) further reiterated that involving students in dialogue about their own learning can actually help them become better learners and consequently help teachers to improve their pedagogy. More importantly she pointed that that though schools and other institutions of learning have long involved students in obtaining feedback, student voice to date has been rather tokenistic or limited. This means that student voice was only heard on issues such as hostel accommodation, lockers, meals and uniforms with less than 12% attention been given to issues on teaching and learning. This again is a testimony that we need to engage student voice to improve teaching and learning.

Therefore, the main purpose of this study was to explore student voice on the implementation of the PDEL Course. Nevertheless, this paper will only address a section of a holistic study that was conducted and will seek to address the following research questions:

What are the students' perceptions of the implementation of the Pre-Diploma English Language course?

Is there any significant difference in student voice on the implementation of the Pre Diploma English Language course with regards to gender, discipline, language proficiency and locality?

What are the students' main issues of concerns with regards to the implementation of the Pre-Diploma English Language course?

THE STUDY

This study was conducted in UiTM which is the largest public university in Malaysia. It has branch campuses in all the 14 states in Malaysia. In UiTM, English Language is the medium of instruction and a mandatory pass in English is a requirement for students to graduate. For this study, three UiTM branch campuses were randomly selected for the study – i.e. Melaka, Seremban and Kelantan. The final population sample comprised a

total of 341 Pre-Diploma students taking the PDEL course. The demographic profile of the respondents is provided in Table 1 below.

In this study, the respondents' English language proficiency was determined based on their results in the Secondary Five SPM (Sijil Peperiksaan Malaysia) English Language examination. Based on their results, students who obtained a distinction A were categorized as possessing high language proficiency, students with credits B, C and D (20.5%) as average language proficiency whilst the rest were categorized as having limited English language proficiency (75.8%).

The data for this study was collected using two instruments, namely a questionnaire and focus group interviews. The questionnaire was administered to all the 341 respondents and respondents were coded based on their locality – e.g. R2M referred to Respondent 2 from Melaka

Table 1: Demographic Profile of Respondents

Characteristics	Frequency	Percentage (%)
Gender		
Male	103	30.2
Female	238	69.8
Locality		
Melaka	147	43.1
Seremban	75	22.0
Kelantan	119	34.9
Disciplines		
Science	80	23.5
Non-Science	261	76.5

In each branch campus three focus group interviews were conducted. Each focus group was formed based on their language proficiency and they were randomly selected by their lecturers. The focus groups were labeled Group A (high proficiency), Group B (average proficiency) and Group C (limited proficiency). Each focus group comprised between eight to ten students and the students were coded based on their group – for instance RM-A3-Melaka referred to a Male (M) Respondent (R) number 3 from Group A (high proficiency). A total of nine focus groups comprising 85

students were interviewed from the three branch campuses. The quantitative data was analyzed using descriptive and inferential statistics whilst the qualitative data was analyzed using both deductive and inductive analyses.

RESULTS AND DISCUSSION

Given below are the main findings of the study. The findings are presented based on the research three questions posed in this study.

Student Voice on the Implementation of the PDEL Course

Research question 1 in this study explored student voice with regards to the implementation of the PDEL course. Findings obtained from the questionnaires (Table 2), show that respondents held rather positive views towards the implementation of the PDEL Course (M=4.20, SD=.545). They were pleased with lecturer preparation, language use and lesson presentation. They also felt that lecturers were able to maintain good classroom management which exhibited a warm and open classroom atmosphere.

Based on the dimensions displayed in Table 2, it can be seen that students agreed with most of the statements. Firstly, most of them acknowledged that their lecturers have clear lesson plans when it comes to the preparation of the lessons (M = 4.33, SD = .754) and lecturers provided them with interesting exercises and activities (M=4.39, SD .696). Moreover, lesson presentation was viewed favourably by students as lecturers used English language effectively in the course (M = 4.39, SD=.696) and frequently checked on students' understanding (M=4.32, SD=.745). Besides that lecturers gave their students ample opportunities to speak (M = 4.33, SD = .745) and provided them with constructive feedback (M = 4.33, SD = .745). With regards to classroom management, lecturers used small groups/ pair work effectively (M=4.28, SD=.692), and the seating arrangement facilitated the learning process. Lecturers encouraged students to speak English (M = 4.10, SD=.763) and they provided constructive feedback (M = 4.22, SD=.745). On the whole, the findings revealed that lecturers were able to maintain a positive, warm and open climate as student participation was active ((M = 4.03, SD = .777) and lecturers were sensitive to students' abilities and challenges (M = 4.20, SD = 0.847). Such positive behaviour shown by lecturers is often appreciated by students.

According to Samson and Collins (2012) including established routines, extending talk on a single topic, providing ample opportunities to converse and offering students with immediate and constructive feedback are all strategies to enhance student learning. They also added that teachers should speak slowly, using clear repetition and paraphrasing to support and check student learning frequently.

Table 2: Perceptions on the Implementation of the PDEL Course (n=341)

Items	Mean	Std. Deviation
Preparation		
Clear lesson plan	4.33	.754
Interesting exercises and activities	4.25	.756
Language Use		
The lecturer used English effectively	4.39	.696
Lesson Presentation		
Lesson was presented clearly	4.31	.671
Achieved the objectives of the course	4.16	.727
Time allocated for was appropriate	4.06	.799
Students were given opportunities to speak in English	4.10	.763
Lecturer gives frequent constructive feedback	4.22	.745
Lecturer asked different types of questions	4.17	.750
Lecturer checks for comprehension frequently	4.32	.745
Classroom Management		
Use of small groups/pair work was appropriate	4.28	.692
Seating arrangements facilitated learning	4.09	.748
Lecturer divided his/her attention appropriately	4.15	.781
Students were encouraged to use English	4.17	.791
The lecturer and students spoke in English	3.99	.815
Classroom Atmosphere		
Students' participation was active and lively	4.03	.777
Warm, open and pleasant atmosphere	4.12	.717
Sensitive to students' difficulties and abilities	4.20	.768
Promoted grammatical accuracy	4.25	.727
Appropriate teaching techniques	4.30	.705
Varied the tasks according to students' abilities	4.20	.740

Use of Technology		
Used appropriate technology	4.22	.847
Total	4.20	.545

Scale: 1=strongly disagree, 2=disagree, 3=almost agree, 4=agree, 5=strongly agree

Focus group interviews conducted also corroborated the above findings. Majority of the respondents spoke favourably regarding lecturers, their preparation, classroom management and ability to create a warm and open learning environment. For instance, student respondents from Seremban (RF-A2 and RM-B5) and Kelantan (RF-A1, RF-B3 & RF-C1) pointed out that their lecturers took time to attend to their needs and often coached them on a one-to-one basis. Respondent RF-A5-Seremban highlighted that, "My lecturer teaches us one-by-one. She focuses on every student in her class. So, she knows which students are weak and which one is good." Besides that students also pointed out their lecturers used interesting books and always motivated them. Respondent RF-B7- Melaka further reiterated, that, "my lecturer uses interesting books and she uses a clear approach when she teaches us. She also always motivates us. This makes our English language classes fun and interesting"

Respondents from all three branch campuses also stressed that their lecturers provided them with many interesting exercises and activities in the course. Evidence can be seen in the following excerpts:

> *'Lecturers see our fluency level in English and give marks through role play. We can write our own dialogue in that role play. Thus, we enjoy doing it.' (RF- B3- Melaka)*
> *'In listening, we listen to the audio and answer question. It is interesting activity when my lecturer read clearly and we write. She pronounce the words and we have to write the spelling correctly. (RF – B7-Kelantan)*
> *'For listening, sometimes we do dictation. Our exercise is to listen and write, we know the word but we can't spell it.' (RF-B3-Seremban)*
> *'We first listen to the story from the novel. Then, we do a role play based on the story, in group around 3 to 4 per group. We write our own scripts from the novel and change it a little bit.'- (RF-B9- Kelantan)*

Findings from the interviews conducted also revealed that a majority of the students used both English and Bahasa Malaysia (Malay Language) during their PDEL course. The use of code switching was considered a norm in almost all their classrooms. For instance, Respondent RM-B3- Melaka pointed out that:

> *'Students normally use mixed languages. But we often use Malay as we are more confident in*
> *using Malay language in expressing our opinion and delivering our message for others to*
> *understand. Although our lecturers use full English in class but we still respond using mixed*
> *languages. . .many of us do that I think it is ok'*

All the above articulation by student voice concurs with literature on effective instruction and reflects what Ellis (2008) as cited in Rahman and Alhaisoni, (2013) highlights that current English language teaching methodologies should focus on the significance of providing learners with ample opportunities to communicate and activities that engage and encourage student participation.

Student Voice based on Gender, Discipline, Locality and Language Proficiency

Research Question 2 in this study investigated if there was a significant difference in students' perception of the implementation of the English Language course based on the following variables; gender, disciplines, language proficiency and locality. To ascertain any significance different in the students' perceptions about the course based on their language proficiency, T- Tests and One Way Anova analyses were conducted to discover any correlations between these variables with their preferences

From the findings shown in Table 3, it can be seen that there were no significant differences in the students' perceptions of the implementation of the PDEL Course with regards to gender [t (339) =-1.364, p=.173] as well as their disciplines [t (170.745=-.428, p=.669]. However, there was a significant difference in the students' perceptions on the implementation

of the PDEL Course with regards to language proficiency (p=.695, p>.05) and their campus locality (p=.013, p<.05) at the 0.05 level.

With regards to gender, female students displayed a higher mean score (M=4.22, SD=.522) compared to male students (M=4.13, SD=.603). Though this may reveal a more favourable response to the implementation of the PDEL Course the difference was not significant. Likewise non-Science students displayed a higher mean score (M=4.20, SD=.578) compared to Science-based students (M=4.16, SD=.446). Though this may indicate that non-Science students held better perceptions of this course compared to their counterparts in the Science disciplines, the difference was again not significant.

Nevertheless there was a significant difference in student voice with regards to language proficiency. Students with high proficiency held better perceptions of the course (M=4.28, SD=.418) when compared to their peers with low (M=4.20, SD=.568) and medium (M=4.15, SD=.496) proficiency levels. This was also articulated by students during the focus group interviews. For instance respondent RM-A9- from Seremban pointed out that he was happy with the course because his lecturer taught all components and emphasized two-way communication. He added: 'I think the way lecturer conducts this course is really good. She teaches all components and indirectly includes grammar in her class. She also emphasizes two-way communication.'

Table 3: Correlation Tests on Students' Perceptions of the Implementation based on Variables (n=341)

T- Test						
Variable		**Levene's Test for Equality of Variances**		**t-test for Equality of Means**		
		F	**Sig.**	**T**	**df**	**Sig. (2-tailed)**
Gender	Equal variances assumed	.142	.706	-1.364	339	.173
Disciplines	Equal variances assumed	3.907	.049	-.428	170.745	.669

One Way ANOVA						
Variables		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Proficiency	Between Groups	.219	2	.110	.364	.695
	Within Groups	101.946	338	.302		
Campus	Between Groups	2.591	2	1.296	4.398	.013
	Within Groups	99.574	338	.295		

On the other hand, low proficiency students voiced out their concern about the pace of the course. Due to the fast-paced lesson, Respondent RM-C5- Melaka said he could not understand what have taught in the class and further reiterated that "*I can't cope with what my lecturer teaches me because her way of teaching is a bit too fast."*

A significant difference was also seen in terms of locality. Among the three branch campuses, respondents from Kelantan (M= 4.31, SD= .557), voiced the most favourable perceptions compared to respondents from Seremban (M=4.17, SD=.451) and Melaka (M=4.11, SD=.573). These findings were further supported by the data in the interviews. A majority of the students interviewed in Kelantan held good perceptions as to how the course was implemented. Respondent RF-A8 added that, "*My friends and I like learning English here we can practice and do many activities together. The English activities are fun and the lecturers are all very kind and understanding."*

Though some significant differences were seen between groups, researchers such as Norton (2000) caution that variables such as gender, and the level of academic performance is not the sole determiner on whether a student can develop positive feeling towards learning depending on how they learn or not as language teaching and learning is "a complex social practice that engages the identities of language learners." (p.132)

Student Voice on Issues of Concerns Regarding the PDEL Course

Focus group interviews which focused on listening to the students' voice on the implementation of the PDEL Course revealed that students had a number of concerns despite the rosy picture painted by the quantitative data collected via the questionnaire. In-depth interviews with the nine focus groups of students revealed that they had some issues regarding language proficiency, contact hours, the PDEL Course curriculum, assignments, teaching staff and learning within a homogenous group.

Firstly, the students voiced great concern regarding their limited English language proficiency. All students stressed that they were aware that learning English is important as it is a global and international language for knowledge business and commerce. More importantly, English is the medium of instruction in UiTM. As Dumaniga, David and Symaco (2012) posited, good communication skills especially in English language is expected by various stakeholders, and its acquisition signal better opportunities for job securement, both within the local as well as the global context. Student voice in this study unveiled that the greatest difficulty that they faced was understanding instructions and lectures conducted 100% in English. They felt that some lecturers spoke too fast whilst some used only English and refused to translate difficult words into Bahasa Malaysia. Yeh (2014) highlighted that comprehending lectures in a second language as a tremendous challenge for ESL students, which may negatively impact their learning of subject knowledge. Henceforth, the lecturers should take their time to not only clarify the students' understanding of what have been taught, but also allowing the students to process question and formulate proper responses in any discussion held (Wright et al., 2006).

Another issue of concern linked closely to student proficiency that was raised by a large majority of the students was the number of contact hours for the PDEL Couse. Students from all three campuses highlighted that they were aware of their limited English language proficiency and they felt that the contact hours for the teaching and learning of English for the PDEL Course should be increased from the current 6 hours to 12 hours per week. Some students such as Respondents RF-A3-Melaka, RF-B2-Seremban and RM-A10-Seremban suggested that an immersion course

component be included during the semester break so that they can get more exposure to learning English. This probably calls for understanding the learner and catering to their needs. Cheatham, Silva, Wodrich and Kasai (2014) proposed that when more information about a student's language proficiency is provided, teachers are better able to identify the problems that their students face in language learning better, thus allowing them to pursue the correct intervention to be applied.

Focus group interviews especially with the three groups of high proficiency students and some students with average proficiency revealed that the PDEL curriculum left much to be desired. Students such as Respondents RF-A8-Melaka, RF-A10-Melaka, RM-A1-Kelantan, RF-B2-Seremban and RF-A2-Seremban, were rather vocal when they said that they felt that they learnt very little under the PDEL course curriculum in comparison to the language curriculum offered to them during their upper secondary school days. Further probing revealed that what was given to them was a watered down version of what they did in lower secondary school. Respondent RF-A8-Melaka felt she had learnt 'nothing' under the PDEL course and further reiterated that "I think I learnt more English during my school days and what we learn here is rather simple and not challenging". These students felt that too much focus was given to the receptive skills of listening and reading with little help in improving their productive skills of speaking and writing. To this Respondent RF-A9-Seremban added that during her secondary school days she had to "write long essays of about 300 plus words" but under the PDEL course she was only required and taught to write "short paragraphs". Another respondent RF-B4-Melaka further stressed that she needed help in grammar and what she learnt did not help much to improve her language proficiency. This finding is very much in sync with research which exhibits that very often students at risk such as those under the current MDAB run the risk of receiving a watered-down curriculum that may only emphasize basic skills and not getting students engaged in interesting and challenging learning tasks (Scharberg, 2006). Respondent RM-A9-Melaka further added that student voice should be given heard and called for a more learner-driven curriculum that would address their needs in language learning and soft skills that ca help build upon their knowledge and skills so that they could become more holistic and confident tertiary students.

In line with the teaching and learning, respondents also voiced concern regarding the many assignments and 'little tests' that they had to do 'almost every week' during each semester. Respondents from all three proficiency groups (e.g. RF-A4-Melaka, RF-B5-Melaka, RF-A9-Seremban, RM-A1-Seremban) drew attention to the fact that since most of their classroom time was spent on working on assignments such as presentations and pop-quizzes, there was little or no time for effective learning and teacher instruction. This was succinctly put by RM-B10-Melaka when he said that:

> *"I think this course has too many assignments, pop-quizzes and tests . . .and I think the*
> *lecturers have no time to teach us . . .I felt I did not learn much because most of the time*
> *the lecturer is testing us and giving us work. . . .when do they really teach us?"*

Even though students spoke favourably about their lecturers, there was a small majority of students who highlighted that some of their lecturers left much to be desired. Respondents such as RF-B4-Kelantan, RM-A6-Melaka and RF-C3 felt that her lecturers were 'too young and lacked confidence' in both classroom management and teaching approaches. To this respondents such as RF-B9-Seremban and RM-C7-Melaka added that young lecturers were 'too lenient' and 'often the students took advantage' such as not submitting assignments and "deadlines' were not adhered to. Respondent RF-B3- Seremban felt rather disappointed as some lecturers were 'not serious in doing a good job of teaching'. Respondent RF-B3-Kelantan felt she liked "senior lecturers because students cannot play the fool with them." To this Respondent RM-B2-Melaka added that senior lecturers "are more concerned with teaching and if they are a little strict, we will learn more."

An issue that received a mixed response by students was regarding the homogeneous learning environment in UiTM. As most of the respondents are Malays and of the Muslim faith a majority highlighted that they were now more 'willing and confident' to speak in English." Nevertheless, there was a small majority who felt otherwise. Respondents such as RM-A1-Kelantan, RF-A4-Seremban and RF-B2-Seremban highlighted that though their peers had gained some confidence in speaking English, they were 'afraid to speak in English' once they were out of their 'UiTM comfort zone." RM-A1-

Kelantan highlighted that the homogeneous learning environment had in his opinion 'some minus factors' as his peers 'dared not speak and function in English when they have to deal with other people." He felt that their lecturers should provide them with more opportunities to use English in a variety of contexts and people. Gil (2009) suggested the probability of not allowing the students to have liberal opportunities to use English in real life situations and a lack of exposure to authentic English language material can impede their learning. To this, Naryanan (2009) adds that diversity should be the way forward in today's classrooms as everyone can profit from working in heterogeneous groups. Both students and teachers need to understand that diversity is not a drawback but has benefits for all.

CONCLUSION

The findings in this study revealed that students generally voiced positive and favourable opinions regarding the implementation of the PDEL course. They were pleased with lecturer preparation, language use and lesson presentation. More importantly, their lecturers were able to maintain a good learning environment with fun and interesting activities. This displayed a warm and open classroom atmosphere. Nonetheless, focus group interviews revealed that students voiced a number of issues and concerns regarding the PDEL course. They were aware of their limited language proficiency and sought to have more time allocated for the teaching and learning of English. Besides that some students felt that they PDEL course curriculum was a watered down version as they actually learnt less compared to their English language curriculum in secondary schools. They looked forward to more input for the acquisition of productive skills of speaking and writing. The concerns raised by students also revealed that there were too many assignments, leaving little time for effective teaching and learning to take place. Some students felt that the lecturers teaching them were rather young and inexperienced to maintain effective classroom management issues and hoped that more experienced and senior lecturers taught them. A few others highlighted their concern learning English in a homogeneous environment.

This study which explored student voice indicates that student feedback can provide rather valid and reliable information which can help enhance delivery of programmes offered in IHL. More importantly it can lead to

a learner driven curriculum which focuses on learner-centred education. Listening to student voice can help educators work collaboratively with students to decide what, how and in what time-frame effective learning can take place. This can also help lecturers decide on the types of activities, teaching approaches and techniques preferred by their students. When educators focus on the learner, their role changes from that of a 'sage on stage' to the 'guide by the side' to help student learning by utilising learner interests and needs. What we need to keep in mind in today's 21st century classroom is that student voice will direct a learner driven curriculum.

Therefore, educators should not lament that there is no time to listen to students as feedback from student voice can bring about change in learning and teacher growth. According to Wiggins (2012), in today's classroom there should be less teaching and more feedback as student voice is the key to achieving greater learning. This was also reiterated by Seldin (1997) who emphasised that teaching often falls short of a complete assessment but if teaching is to be improved, exploring student voice cannot be ignored. He put it succinctly when he said that "those who eat the dinner should be considered if we want to know how it tastes" (p.335).

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Identifying the Potential of Mobile Application for e-MUET: A Case Study

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ABSTRACT

This paper describes a study that has been carried out to examine the effect and use of the mobile application for Malaysian University English Test (MUET). The application is designed for mobile devices that include and mimics the real MUET with the aim to awaken interest and flexibility for the candidates to learn.Two of the main objectives of this study are to develop a mobile application (eMUET) for candidates to facilitate learning and to provide flexibility to learn. The second objective is to evaluate the effects of using eMuet in the learning process. The study uses the quasi experimental approach in order to gather data and obtain feedback from a sample of several groups of undergraduate students in a public Malaysian university. The instruments covered in this paper are disseminating pre and post questionnaires and using the application (eMuet). The study concludes that the use of mobile phones with suitable learning activities is favoured, and it helps improve the participants' learning experience.

Keyword: mobile application, language learning, mobile phones

INTRODUCTION

e-Muet is a mobile application for Malaysian University English Test (MUET). MUET is carried out to assess the English language proficiency of pre-university students for admission into universities and colleges. There are four components in the MUET exam: Listening, Speaking, Reading and Writing. Each component is assessed separately. E-Muet will cover two components: Reading and Listening. The purpose of e-Muet is to enhance the learning experience utilizing mobile technologies. The use of mobile device can help to reinforce the learning process, where it deliver learning in chunks or nugget sizes, on the move, at anytime and anywhere

Technology in education has a very long history that allows the user to change from time being. The beginning of the new era of technology even started from the early sixties century where people start to develop something new and useful for the community. From computer assisted learning, to open learning environments, technology advances have been used to reduce classrooms constraints during learning and somehow to adapt a new learning materials to increase the knowledge of the students. Mobile phone nowadays becomes more functional beyond phoning and text messaging. Using a mobile device in learning context allows the user to learn anywhere, and anytime.

The continuous development of mobile technologies has created a new platform for supporting communication in learning. There are five properties of mobile devices that produce unique educational affordances: portability, social interactivity, context sensitivity, connectivity and individuality (Naismith, Lonsdale, Vavoula & Sharples, 2004).

A study done by a Malaysian government agency, the Malaysian Communications and Multimedia Commission (2014) found out that in Quarter 4 of 2012, the penetration rate for mobile phone in Malaysia is 141.6 which is over 100%. The figure can be translated as 47% Malaysian own more than one mobile phone.

However, mobile learning in Malaysia is still in its infancy. In this respect, the study was designed to evaluate the feasibility of the application for MUET candidates. The objectives of the development of this MUET

application are to reduce cost and time to find any materials needed for MUET learning, and to provide extra learning content that can help to improve the student's skill in English especially for MUET. The main advantage is that they are not limited to in-class activities.

METHOD

The study was conducted with five groups with a total of 99 students from 4 different faculties in a public technical university in Malaysia where English is their second language. The population of this study consists of students from engineering and computer science faculties. This group of students are candidates for MUET, and they are required to sit for MUET examination prior to graduation. This sample is used to determine the feasibility of using a mobile application for MUET and to learn lessons for improving the design for the later stage. The students were asked to answer a set of questionnaire and download the application and use the application for a particular period.

RESULT AND ANALYSIS: PRE QUESTIONNAIRE

The questions asked about student's opinions and perception towards the mobile phone and learning. From the feedback given, the majority of the students feel that the mobile phone is a necessary item.

We also ask several questions regarding the MUET application. First we ask whether the use of the application enhanced or hindered their study experience. 80% of them agree that the use of this application can help to enhance their learning experience. Some of them said that the use of mobile phone is easy, faster to access and create more fun. While 10% of the students said, the learning experience is hindered because lots of entertainment applications are available and can easily distract the students' focus while using the MUET application.

Regarding the application itself, 80% of them believe the MUET application can be further improved by adding more functions and exercises. Another 10% would prefer to go the traditional method to learn. Followed

is a part of the question asked to the students. Refer to the following Figure 1A, 1B, 1C, 1D and 1E: The question asked is: Do you feel your mobile phone is necessary item? (e.g can't leave home without it). A majority of the students do agree mobile phone is necessary for their daily life.

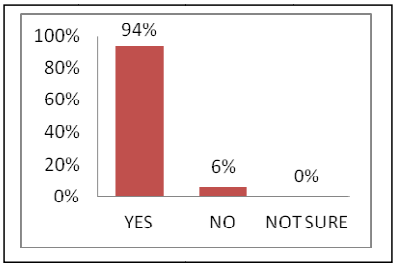


Figure 1A: Group 1

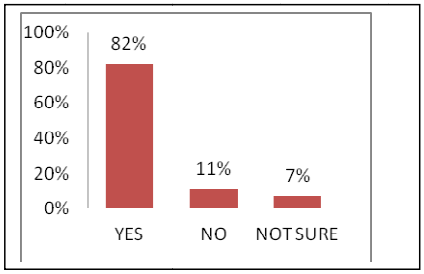


Figure 1B : Group 2

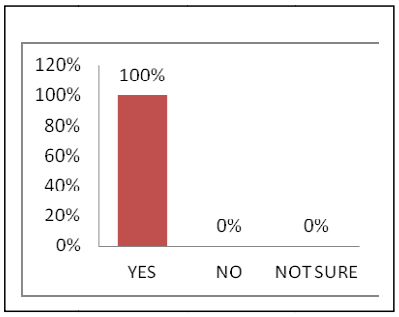


Figure 1C : Group 3

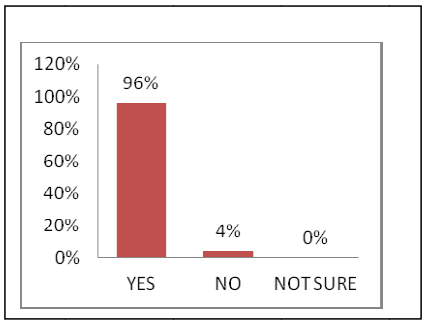


Figure 1D : Group 4

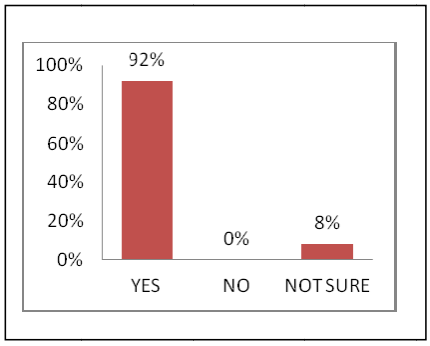
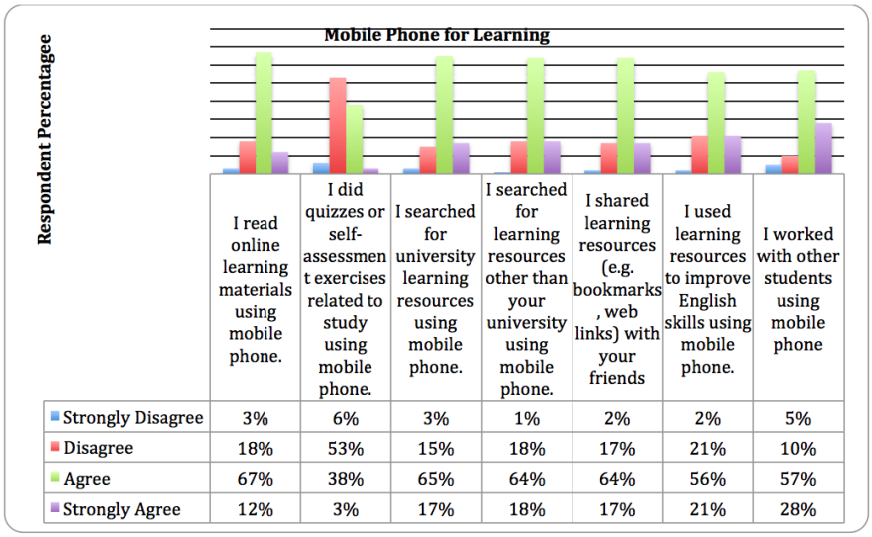


Figure 1E: Group 5



	I read online learning materials using mobile phone.	I did quizzes or self-assessment exercises related to study using mobile phone.	I searched for university learning resources using mobile phone.	I searched for learning resources other than your university using mobile phone.	I shared learning resources (e.g. bookmarks, web links) with your friends	I used learning resources to improve English skills using mobile phone.	I worked with other students using mobile phone
Strongly Disagree	3%	6%	3%	1%	2%	2%	5%
Disagree	18%	53%	15%	18%	17%	21%	10%
Agree	67%	38%	65%	64%	64%	56%	57%
Strongly Agree	12%	3%	17%	18%	17%	21%	28%

Figure 2: Mobile Phone for Learning

We also want to know student's perception and how they use mobile phone for learning. Several questions were asked as depicted on the figures above (refer Figure 2). 67% students agree that they read learning materials using a mobile phone. A majority of them also use the mobile phone to search for learning resources and share resources among their friends. Quite a number of students use the mobile phone to improve English skills.

After answering the pre questionnaire, students are encouraged to download e-MUET from a given URL. They need to install the apps on their mobile phone and use the apps for several weeks. The statistics show that around 83 users has access and download the apps.

Several weeks after the experiment, similar questionnaires were handed out to the same students. For questions: Do you feel your mobile phone is necessary item? (e.g can't leave home without it) refer results in Figure 3a and Figure 3b.

Compared to similar questions before and after the experiment, we identify an increasing number of agreement that the mobile phone is a necessary item for the students.

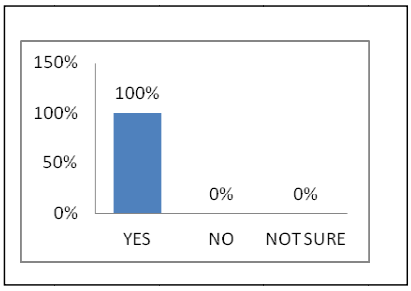


Figure 3a: Group 1, 3, 4 and 5

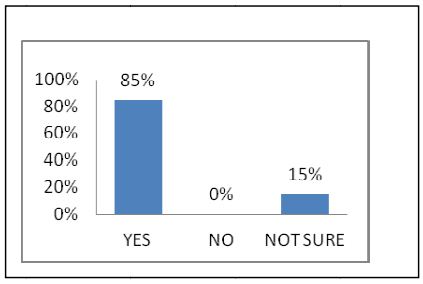
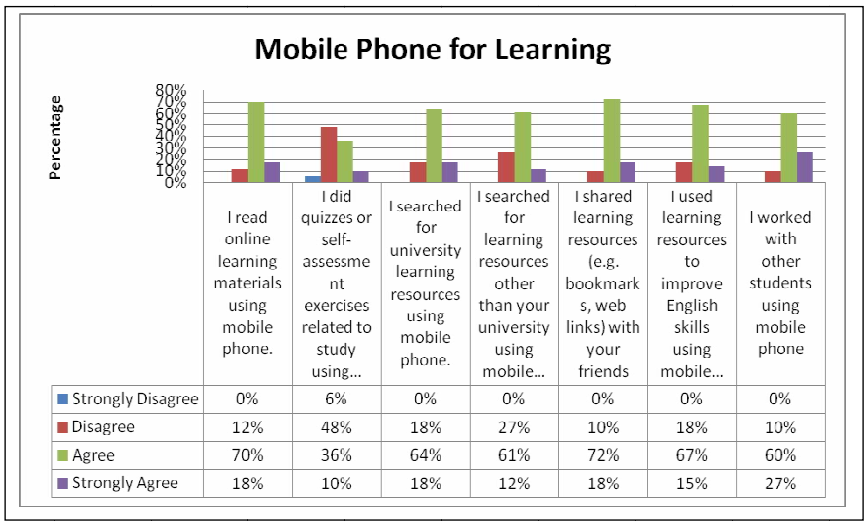


Figure 3b: Group 2

Whereby for perception and usage of the mobile phone for learning. Some of the questions improved positively (refer Figure 4). Percentage developed for share learning resources, use the mobile device to learn and worked with other students using the mobile phone.

This study has several findings. Firstly, the use of mobile phone among the university students is very handy since they use the device to communicate with others. Secondly, the development of e-Muet application interestingly manage to spark the interest for students to use and learn. The overall findings from the study suggested that students have a positive view of using the mobile application to learn MUET.



	I read online learning materials using mobile phone.	I did quizzes or self-assessment exercises related to study using...	I searched for university learning resources using mobile phone.	I searched for learning resources other than your university using mobile...	I shared learning resources (e.g. bookmarks, web links) with your friends	I used learning resources to improve English skills using mobile...	I worked with other students using mobile phone
Strongly Disagree	0%	6%	0%	0%	0%	0%	0%
Disagree	12%	48%	18%	27%	10%	18%	10%
Agree	70%	36%	64%	61%	72%	67%	60%
Strongly Agree	18%	10%	18%	12%	18%	15%	27%

Figure 4: Mobile Phone for Learning

CONCLUSION AND LIMITATION

The findings of this study could have important implications for MUET application. The range of research and projects in the use of mobile phones for language learning has been positive in European countries (Malliou, Miliarakis, Stavros, Sotiriou, Startakis & Tsolakidis, 2002; Kadyte, 2003; Tan & Liu, 2004; Pincas, 2005; Zurita & Nussbaum, 2004).

There are several limitations identified. Firstly, we do not know precisely whether the student has any experience in using mobile phone for learning language learning especially. This could be asked in depth in the questionnaires and interviews. The pre and post questionnaire should be better matched them to measure more accurate findings. The study can be further expanded implemented with bigger samples for the whole semester to get better results and in-depth pattern or analysis.

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Virtual versus Face-to-Face Teaching: An Approach in Implementing Blended Learning among First Year BDS Students in UiTM

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ABSTRACT

Nowadays, any students are well-exposed to digital technology. Since blended learning incorporates digital elements into teaching, this method is thought to be suitable for this todays' generation. The virtual teaching was therefore introduced alongside the face to face teaching to increase students experience and understanding in learning process. This study was designed to compare the effectiveness between virtual and face to face teaching of first year dental (BDS) student on their understanding of Physiology. All 70 BDS students took part in this study. Two modules from their syllabus with five lectures each were selected. In the first module, the five lectures were delivered face to face. In another module, the five lectures were delivered virtually using E-Learning softwares that were displayed in the classroom during lecture times. At completion of all lectures in each module, all students are subjected to answer a quiz containing 100 true/false questions. The data collected were then analysed using SPSS version 22. A short survey was then conducted to gather feedbacks on student acceptance and preference. The mean marks of face to face and virtual teachings were 70.57± 4.80 and 71.69±5.61 respectively. The difference between the two however was not significant. From the survey, the students generally accepted the virtual teaching but preferred the face to face teaching. Therefore the virtual teaching method can be implemented as early as in the first year without worry on jeopardizing their grades. In conclusion, with some betterment on the virtual teaching method such as inclusion of two-way interactions would improve their understanding in learning Physiology thus may help the students in getting better grades.

Keywords: Blended learning, virtual teaching, face-to-face teaching, dental student, physiology

INTRODUCTION

Blended learning is a 'hybrid' of several learning methods including face-to-face (f2f) and virtual learnings. Although pros and cons of these two learning methods have been well discussed (Schreiber et al., 2010), the effectiveness in the implementation of these type of learnings are varied in accordance to several factors (Moazami et al., 2014). McCutcheon et al. (2015) suggested that online learning for teaching clinical skills in nurse education is no less effective than the traditional methods. This could be due to the fact that clinical skills require hands-on and practice rather than learning through watching. On the other hand, Shambavi and Babu (2015) found that blended learning has successfully provides efficient and effective learning experiences in engineering education.

In the syllabus of Bachelor of Dental Surgery (BDS), the first year students are required to pass preclinical science course for them to venture into the clinical year. The preclinical science course is always considered to be challenging as it comprises of various medical science disciplines including physiology and is one of the earliest course taught to the first year students. In the learning process of the course, the understanding and memorizing tones of facts from different disciplines of medical science could be a stressful and tend to be boring if without the intervention of virtual learning in this era of digital technology (Maggio et al. 2012). Thus, incorporating learning and the digital technology is a suitable approach in implementing blended learning to ensure the learning objective is accomplished.

Although blended learning may benefit the students, there is fear that direct implementation of blended learning may jeopardize the students' performance. This worry is particularly addressed to the majority of the student in the first year BDS who are quite young, coming into the programme direct from the matriculation. These students are good in their technology skills, however, it is their ability for self-directed learning for what virtual teaching is required for is a matter of concern (Emily &

Gwendoline, 2014). In addition, the student are so used to the f2f teaching method since early school days up to their matriculation. Making a new teaching method other than f2f to be thought as a big change in their study life. The introduction of virtual teaching in the implementation of blended learning may be considered as a disturbance to their comfort zone in studying (Abbas 2015). Therefore, this study was designed to compare the effectiveness between virtual and f2f teachings of the first year BDS student on their understanding of Physiology and to evaluate their perception towards the implementation of blended learning. The results and conclusions from this study perhaps will give cluess on the key concepts towards improving the quality of teaching and learning in higher education.

METHOD

We introduced virtual teaching method in the implementation of blended learning to all first year BDS students at Universiti Teknologi MARA (UiTM) cohort 2014/2015. To begin with, two modules from the BDS curriculum that contains five lecture each were selected namely the Cardiovascular and Respiratory Modules. The Cardiovascular Module was conducted using f2f teaching while the Respiratory Module was conducted virtually. For the virtual teaching, all five lectures were recorded using web-based learning software and later played in the classroom. Both f2f and virtual lectures were limited to 1 hour per session each and the materials were available to be downloaded from i-Learn website. At the end of each lecture series, the students were subjected to answer 100 true/false questions in a quiz. The marks obtained in the quizzes were compared and later the students were asked to provide feedback on both teaching methods. The data collected were then analysed using SPSS.

RESULTS AND DISCUSSION

The results obtained from this study was divided into two sections; the student performance and student perception on f2f and virtual teachings.

Student Performance

The marks obtained from the quizes following the f2f and virtual teachings were compared. The students scored 70.57$\pm$ 4.80 and 71.69$\pm$5.61 in f2f and virtual teachings respectively. Although it was appeared that the students performed slightly better from virtual compared to the f2f teachings, the difference however was not statistically significant. The difference seen can be contributed by several factor including the learning material itself. According to Schreiber et al (2010), learning process is enhanced when both visual and auditory were stimulated. This principle is applied on both teaching methods. However, the virtual teaching has an upper hand as it offers option to the student to repeat any part of the lecture at any time whenever needed. This may help the student for better understanding. Besides, during f2f session, the capacity of learning in working memory is limited (Schreiber et al, 2010) and this contribute to the downside of this method. The student may not able to capture the important input during the lecture and yet, the lecturer must carry on the lecture to finish the lesson in time.

In addition, a different type of learner may suited differently to another type of learner. Direct interaction with the learning material in virtual teaching benefited the tactile learners in which the students were able to control the learning material such as by pushed it forward, rewind and repeat the recorded lectures. This fact is in agreeable to Rossing et al. (2012) who concluded that the tactile learners gained extra benefits from virtual teaching method.

The disadvantage of this method however, is the limited communication between lecturer and students (Smyth et al., 2012). The communication gap in virtual teaching made the student not to have a ravenue to ask question regarding their doubt and as a consequence demotivated them in studying (Vaughan 2007) and made understanding the subject matter becoming more difficult. Bath and Bourke, (2010) have pointed out that effective communication between staff-student and student-student is crucial for the success in learning. Perhaps with the introduction of live forum discussion in the future may solve the issue and contribute to better student's understanding and help them to improve their performance.

Student Acceptance & Preference

The students have provided feedbacks through a survey on the implementation of blended learning, the f2f and virtual teachings and their preferences. The gathered data from the survey suggested that although the students accepted the virtual teaching, majority of them (83.89%) still preferred the f2f teaching. This is in particular for the introduction of new topics. The main reason for f2f teaching preference was the direct communication with the lecturers during the lecture session which is in agreeable with Smyth et al. (2012). The direct communication enabled the students to be more focused. They were more alert too in case he/she was called to answer any impromptu questions by the lecturer. It was concerned that some students felt lost with the absence of supervision during virtual teaching session causing them to lose their interest on the subject matter and became demotivated. The similar observations were concluded earlier by Vaughan (2007). Another study on implementation of blended learning which was conducted by the Stanford University revealed that over implementation resulted in only highly motivated students would complete the program. Such condition was later diagnosed as a mismatched between the student's desired learning styles (interactive, social, mentored learning) with the delivery technology (Singh, 2003).

In the context of blended learning, the student perception towards the method of teaching is an important factor (Poon, 2013). Based on this recent study, the students expected that the virtual teaching was supplemented on top of the f2f teaching. They preferred to have the virtual teaching material to be provided for revision purposes rather than as a first hand lecture. This scenario may be due to the experience of purely f2f teachings during the past, prior to the BDS program. In implementing blended learning, the f2f and virtual teachings are complements to each other. In fact, Hockly (2011) has explained that the effectiveness of technology usage in learning was not determined or favoured by age. It is time that is needed, for any change to be accepted thoroughly. In the beginning of implementing blended learning in teaching the preclinical science course, perhaps, selection of only certain topics to be covered virtually is hoped will provide some times for the system; the lecturers and students especially to adapt and thus allowed a smooth gradual transition. In order to supplement the teachings, there are also tutorial slots allocated in the curriculum for discussion in which the students are free to express their concern or to clear their doubts.

CONCLUSION

The success of blended learning is influenced by many factors. The combination of f2f and virtual teachings exposed the students to new learning material and increased their learning experience. The introduction of virtual teaching did not jeopardized their academic performance instead, may be a helpful element for a better one. Although the students preferred f2f teaching, the virtual teaching can be an alternative whenever needed. Besides, a good quality learning materials from virtual teaching may change a students' perception towards blended learning and later contributed to the betterment in their academic performance.

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