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Investigating a Student Focused e-Learning System in Higher Education: A Case Study of Diploma Students

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ABSTRACT

Universiti Teknologi MARA (UiTM) has incorporated a Learning Management System (LMS), known as i-Learn, with cloud computing facilities for distribution of course contents, communication, collaboration, content management and assessments. Some studies have found that some learning management systems have followed a static and predefined representation of knowledge with the view to getting the right information to the right person. As a result, these e-learning systems are not being fully utilized. Many studies have suggested the failure of e-learning can be prevented if an e-learning system can accommodate student expectations of e-learning. In this study, a survey was conducted to investigate diploma level students' usage of e-learning technologies and also to determine web services used by the students in their various learning activities. Based on the questionnaires distributed to 112 diploma students at three campuses of a public university, it was found that students did use technologies extensively and they also utilized the i-learn portal and various web services in completing their learning activities. Based on the findings, researchers have proposed a student focused e-learning system that provides a Personal Learning Environment (PLE) that supports e-learning. It is suggested that a personalized e-learning environment should blend the web services that support e-learning in a hybrid cloud computing environment due to components and resources that can be freely accessed through cloud computing apps with the highest personalization. With the implementation of a hybrid cloud, the administrator would be able to control and maintain the infrastructure of the LMS.

Keywords: e-Learning, hybrid cloud, personalization, web services

INTRODUCTION

Many higher education institutions have set up e-learning systems which provide students with online access and learning content. The rapid development of cloud computing has enabled certain e-learning systems to incorporate cloud computing facilities. This integration of cloud computing and e-learning has enabled convenient usage of the e-learning system. Universiti Teknologi Mara (UiTM) has adopted the same practice where students are able to experience new technologies through the use of the web based learning management system called *i-learn* which is a comprehensive system allowing for access to course contents, communication, collaboration, content management and assessments.

One drawback of some current learning management systems (LMSs) is that the approaches have followed a static and predefined representation of knowledge with the view to getting the right information to the right person at the right time (Chatti et al., 2007; Sclater, 2008). Within those systems, experts create and identify what is most valuable and continually renew, validate and revamp the content offered in the system. As a result of the static implementation of LMSs, e-learning systems are not being fully utilized by students. Many studies (Leem & Lim, 2007; Liu, 2010) have suggested that the failure of e-learning can be prevented if e-learning designers carefully determine what students expect from e-learning. E-learning designers should be aware that learning should focus on the user, not the institution or the course (Attwell, 2007; Selviandro & Hasibuan, 2013) and design the content accordingly.

The purpose of this study is to investigate a student focused e-learning system for diploma students. Firstly, this report will determine the student usage of digital technologies during their studies at the diploma level. A survey was conducted to investigate students' level of usage of e-learning technologies at diploma level. The survey was also used to determine web services used by the students which include both *i-learn* and open access Internet services. Based on the above findings, researchers aimed to propose a student focused e-learning system that provides a personalized learning environment for the students.

LITERATURE REVIEW

Ferrer and Alfonso (2011) have defined e-learning as the use of the Internet to access learning resources and contents, as well as interact with instructors and other learners in order to obtain support during the learning process, with the aim of acquiring knowledge, constructing personal meaning and growing from the learning experience. Many existing LMSs have limited capabilities because they lack reusability, portability and interoperability (Kalagiakos & Karampelas, 2011). Integration of e-learning and cloud computing is one solution which can provide a platform to encourage lifelong learning for students. Cloud computing has many benefits for e-learning in particular and education in general by providing the platform for virtualization, centralized data storage and educational services (Ghazizadeh, 2012; Kalagiakos & Karampelas, 2011; Mokhtar et al., 2013). Cloud computing refers to both applications delivered as a service over the Internet as well as hardware and system software in the data centers that provide those services (Armbrust et al., 2010). Some benefits of cloud computing in e-learning are flexible and scalable infrastructure, increased mobility in the global workforce and reducing implementation concerns (Ghazizadeh, 2012).

Most LMSs provide users with content distribution and communication facilities to interact with instructors and other learners. Cloud computing is a consolidation of multiple relatively low cost calculation entities which are integrated into a strong web system of powerful computing capability (Wang & Xing, 2011). The *i-learn* system at UiTM can be considered a private cloud computing, built by one client and which provides data security and quality of service (Aljenaa et al., 2011; Ghazizadeh, 2012). There are many services available through *i-learn* such as accessing learning content (ie. downloading and reviewing course material), communication between students and lecturers (ie. public announcements and forums), data management (ie. storage through *mydrawer*), assessment (ie. online quizzes and tests) and evaluation (ie. student evaluation as well as entrance and exit surveys). With the development of online services that support e-learning, it is important to not only use web services from a private LMS but to include components and resources that can be freely accessed through most cloud computing apps with some degree of personalization. Some of the significant milestones in public cloud computing applications that could benefit e-learning are search engines (1993), e-mail services (1996), online

messaging services (1995), social networks (2007) and online software (2006) (Mokhtar et al., 2013).

An LMS has become an essential platform to monitor the progress and data management of users and, at the same time, support the learning process within an organization. Aljenaa et al. (2011) suggested that the learning sector should adopt a private cloud for monitoring which should also be able to host e-learning programs/apps of public cloud implementation within its system to motivate e-learning. Within a private cloud computing environment, services provided to users are constrained by the control of the administrator. With the current development of web technologies that support e-learning, a public cloud environment is another component needed to support e-learning within an organization (Selviandro & Hasibuan, 2013). The combination of private and public cloud computing produces a hybrid cloud. Within a hybrid cloud, the availability of a modern and responsive e-learning system could support a personalized learning environment for students.

Personal Learning Environment (PLE) supports independent learning that incorporates the largest collections of tools under the control of an individual (Leem & Lim, 2007; Wilson, 2008). As stated by Wilson (2008), PLE employs a variety of tools and web services such as chat messaging, groupware, calendaring, scheduling, blogging, social software and collaborative tools. A PLE can maintain student individualities and differences according to personal preferences selected from a variety of tools and web services (Mavromoustakos & Papanikolaou, 2010). Conde et al. (2013) have stated that the future of e-learning is dependent on the implementation of PLE with tools or web services that support customization. Some of the learning activities within a PLE, as suggested by Hamid et al. (2015) and Mavromoustakos and Papanikolaou (2010) are communication between friends and with lecturers, as well as obtaining and sharing information and collaborating on tasks. Ritter and Lemke (2000) have suggested that a learning principle that requires prompt feedback for Internet-enhanced education is vital for students to do evaluation or exercises online.

METHODOLOGY

This quantitative study involved 112 diploma students from Seremban, Kuala Pilah and Jasin Campuses of UiTM, a Malaysian public university. The students were given a set of questionnaire to determine the level of usage of technologies and identify the technologies used for learning activities such as communication with friends, communication with lecturers, obtaining information, doing collaborative tasks (with friends) and doing exercises or evaluation. To determine the level of usage of technologies for the learning activities, students were asked to rate items indicating the level of usage according to the following scale: 0 – never, 1 – a little, 2 – moderately and 3 – a lot. To determine the technologies used by students for the stated learning activities, students were given a list of different web services that support the stated learning activities where they could select more than one service used or add other services if applicable. Table 1 shows the twenty different types of web services used by students based on the stated learning activities.

Table 1: **List of Web Services Used by Students for Different Learning Activities**

Table 1. List of web sevices used by students for different type of learning activities

No.	Web Services or Apps	Learning Activities				
		Comm. with friends	Comm. with lecturers	Obtaining information	Doing collaborative tasks (with friends)	Doing exercises or evaluations
1.	*i-learn*	X	X	X	X	X
2.	Facebook	X	X		X	
3.	Whatsapp	X	X		X	
4.	gmail	X	X			
5.	Yahoo mail	X	X			
6.	twitter	X	X	X	X	
7.	Instagram	X	X	X		
8.	Blog	X	X	X		X
9.	sms	X	X			
10.	wechat	X				
11.	Blendspace		X		X	X
12.	Wikipedia			X	X	
13.	youtube			X		
14	Google search			X		
15.	Yahoo search			X		
16.	Slideshare			X		
17.	Google drive				X	
18	Dropbox				X	
19.	Online forum				X	
20.	Google forms					X

DATA ANALYSIS

Based on the set of items to determine the level of usage of technologies for their studies, it was found that students did use technologies for the five stated learning activities. On the average, students used technologies at a moderate level. Figure 1 shows the comparison of level of usage for the different learning activities, where it can be seen that students mostly used technologies for *gathering information* with a scale value of 2.61 and *communicating with students (their friends)* with a scale value of 2.53.

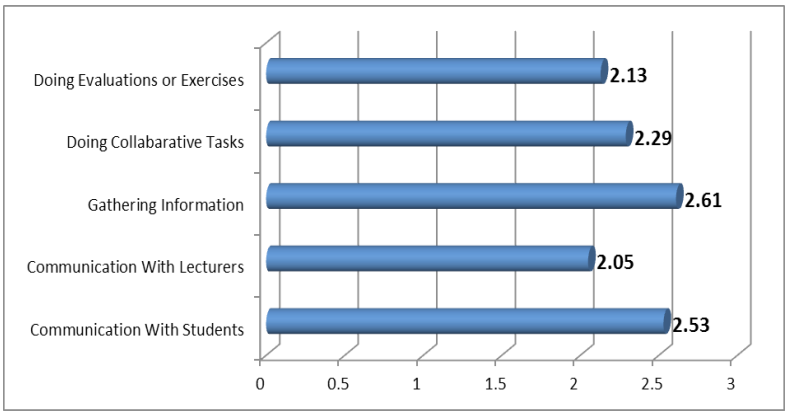

Figure 1: Level of Usage of Learning Activities

Table 1 above shows 10 different web services that support learning activities for communication with friends. The five web services most often used by the students are shown in Figure 2. 106 (out of 112) students used *Whatsapp* to communicate with their friends, whereas only 49 students used the *i-learn* system to communicate with their friends. The other web service frequently used by students is *Facebook*. The comparison of the number of students for the five different web services most often used by students to communicate with their friends is shown in Figure 2.

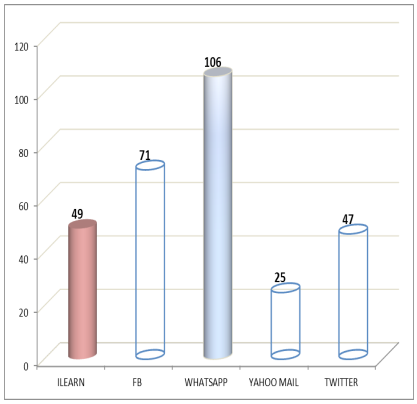

Figure 2: The Five Web Services Mostly Used for Communication With Friends

Table 1 shows that students used various web services to communicate with lecturers. It was found that students mostly used *Whatsapp* to communicate with lecturers. At the same time, students also used *i-learn*, *Faceboook*, *Yahoo mail* and *gmail* to communicate with lecturers. The comparison of the number of students using different services to communicate with lecturers is shown in Figure 3 which highlights that out of 112 students, 94 used *Whatsapp* and 83 used *i-learn* to communicate with lecturers.

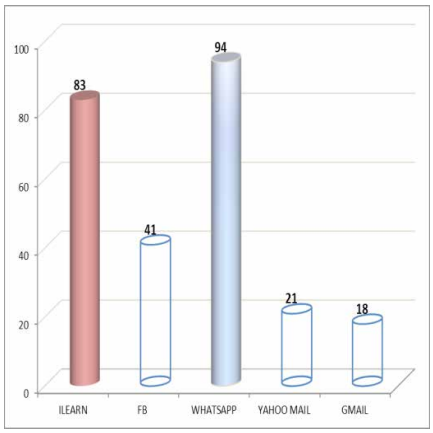

Figure 3: The Five Web Services Mostly Used for Communication With Lecturers

For *obtaining information*, it was found that students used a variety of web services. Some web services mostly used by students are *i-learn*, *Wikipedia*, *YouTube*, *Google search* and *Slideshare*. More than 50% (>56 students) of students used the stated web services to obtain information during their learning activity as shown in Figure 4 below.

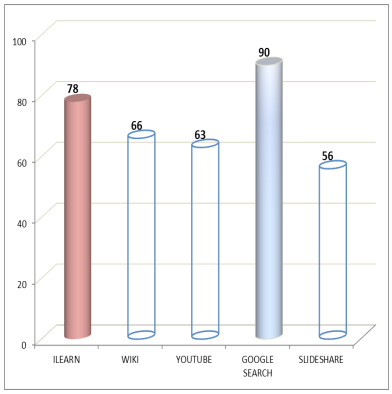

Figure 4: Five Web Services Mostly Used for Obtaining Information

For *doing collaborative tasks* with friends, the comparison of the five web services revealed that *i-learn* was the most frequently used service for this learning activity while *Facebook* was the second most often used. The breakdown of other web services used by number of students is shown in Figure 5.

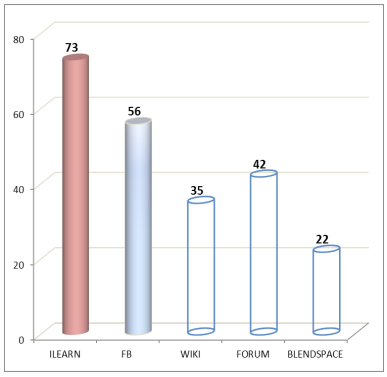

Figure 5: The Five Web Services Mostly Used for Doing Collaborative Tasks (With Friends)

Out of 112 students, 100 used *i-learn* to do exercises or evaluations. The other selected web services used by students for this learning activity were the *Google forms*, *Blendspace* and *Blog*. The breakdown of the number of students for each web service is shown in Figure 6.

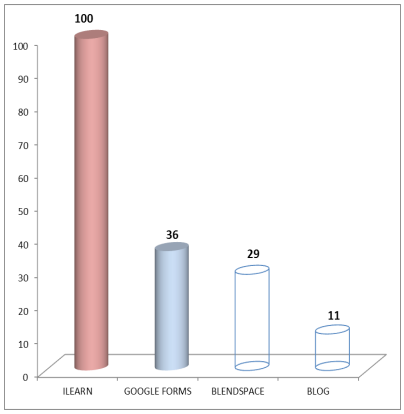

Figure 6: The Four Web Services Mostly Used for Doing Exercises or Evaluations

FINDINGS AND RESULTS

It can be concluded that students in this study used a variety of web services to complete different types of learning activities such as communicating with friends, communicating with lecturers, obtaining information, doing collaborative tasks (with friends) and doing exercises or evaluations. The preferred web services varied according to the necessity of different learning activities. The summarized data for the top three ranking of web services and its corresponding number of students for each learning activity are shown in Table 2 below.

Table 2: Ranking of the Three Most Often Used Services and the Corresponding Number of Students for Different Learning Activities

No.	Learning activities	Ranking of web services and its number of students		
		No. 1	No. 2	No. 3
1.	Comm. with friends	Whatsapp (106)	Facebook (71)	*i-learn* (49)
2.	Comm. with lecturers	Whatsapp (94)	*i-learn* (83)	Facebook (41)
3.	Obtaining information	Google search (90)	*i-learn* (78)	Wikipedia (66)
4.	Doing collaborative tasks (with friends)	*i-learn* (73)	Facebook (56)	Online forum (42)
5.	Doing exercises or evaluations	*i-learn* (100)	Google forms (36)	Blendspace (29)

The *i-learn* portal which is the official LMS for e-learning in UiTM remains an important component for e-learning of diploma level students. The *i-learn* is considered a private cloud computing which allows for distributing of course content, communication, collaboration, content management and assessment. But, at the same time, web services provided through the Internet are also important components of the students' e-learning. The web services such as the *Whatsapp*, *Facebook*, *Google search*, *Google forms* and *Blendspace* are some of services provided through a public cloud computing environment. It can be concluded that a hybrid cloud computing should be one of the methods to support a Personal Learning Environment (PLE) for diploma students. Within a hybrid cloud computing, students are able to use a variety of web services which cater for personalized preferences of services for e-learning.

RECOMMENDATIONS

Hybrid cloud is a mix of two or more types of cloud computing (Armbrust et al., 2010; Ghazizadeh, 2012). Based on the findings of this study, it is recommended that *i-learn* should be implemented as a hybrid cloud computing which combines web services from both private and public clouds. Organizations adopt hybrid cloud computing when the capacity of the organizational infrastructure is inadequate and needs to expand to meet its business requirements (Aljenaa et al., 2011; Mokhtar et al., 2013). This study reveals that a hybrid cloud computing is needed since most students were found to be using the web services available from the Internet, while at the same time, using the services provided by the *i-learn* system. By creating a hybrid cloud computing platform, students are able to select and use multiple web services based on their own preferences. This situation

is best described as a Personal Learning Environment (PLE) since each student would have their own preferences of web services to complete different learning activities.

As stated by Mohd and Shahbodin (2013), a PLE would facilitate students to take charge of their learning processes via a selection of tools and resources which, in turn, will help students learn better. The PLE would also facilitate individual learning time and space where students are able to develop and share the ideas which link distant resources and contexts. (Attwell, 2007; Ghazizadeh, 2012;Jafari Navimipour &Zareie, 2015). A hybrid cloud computing for e-learning can benefit students because students still need some guidance to become effective self-regulated learners (Dabbagh & Kitsantas, 2012). The LMS administrator would be able to implement and control its content by hosting external web services where the features of the external web service could be customized for security levels, content, searches, and access (Ghazizadeh, 2012).

CONCLUSION

Learning is a social activity involving communication, communication formation, information exchange and resource sharing between teachers and students (Mavromoustakos & Papanikolaou, 2010). This study is aimed at recommending a student focused e-learning system for diploma students which is based on the creation of a personal learning environment (PLE) within a hybrid cloud computing environment. This system is able to support e-learning for students which would enable them to access web services both from *i-learn* and the Internet platform. One advantage of implementation of PLE within a hybrid cloud computing is that the administrator of the LMS is able to control and maintain the infrastructure of the existing LMS. In the future, this method can also support any new policy regulation of e-learning within the organization. LMS with hybrid cloud implementation is the way forward to promote self-learning for students and self-administering for the *i-learn* system.

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The Development of Differentiation Intelligent Tutoring System (DifITS): Example-tracing Tutor Approach

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ABSTRACT

Calculus is an important branch of Mathematics for post-secondary education in various disciplines. Students are introduced to Calculus through the topic of Differentiation when they are in secondary school. However, the analyses of the Additional Mathematics' answer scripts of the Sijil Pelajaran Malaysia (SPM) (Malaysian Certificate of Education equivalent to GCE O' Level) examination, has shown that students are not doing well in this topic. Past empirical studies done locally and overseas have also shown that many undergraduates face difficulties in learning Calculus, thus hindering their undergraduate studies. Therefore, there is a need to address this learning deficit, and with increasing class sizes in school and tertiary institutions, a technology-enabled solution with minimal human intervention, the Differentiation Intelligent Tutoring System (DifITS), as proposed by this study, could be a viable approach to assist students' learning for this subject. DifITS is promoted as a web-based tutor, using the Example-tracing tutor approach to provide one-to-one tutoring and self-paced learning for the students. The Example-tracing tutor will be applied using Cognitive Tutor Authoring Tools (CTAT). A behavioral graph will be created to track students' answers in order to provide hints and feedback. In addition to enhanced learning, it is anticipated that DifITS will motivate students as the tutoring mechanism involves animation to enable students to visualize the procedural process of Differentiation. In addition, DifITS will also focus on conceptual understanding through graphs to show the rate of change and motion for the respective differentiation procedures.

Keywords: calculus, differentiation, Example-tracing tutor, intelligent tutoring tutor

INTRODUCTION

For a number of science-related disciplines, one of the important and fundamental courses during tertiary learning is Calculus (Mohd Ayub, Tengku Sembok, & Wong, 2008). For instance, it is a major component for tertiary programs such as engineering, science and business (Kadry & Shalkamy, 2012) as it is widely used to understand the concept of rate of change and motion (Mokhtar, Ahmad Tarmizi, Mohd Ayub & Ahmad Tarmizi, 2010). However, the subject is seen as both complex and abstract, and students often find it difficult to master it (Mokhtar et al., 2010; Gordon, 2004 as cited in Ng, Tan, & Ng, 2009). This has impacted on the passing rate of these Calculus related courses (Tang, Julaihi & Voon, 2013). An important component of Calculus is differentiation (Idris, 2009; Mohd Nasir, Yusof, Ahmad Zabidi, Jusoh & Mohd Zaihidee, 2012) and students face difficulty understanding the concept of differentiation and performing the differentiation procedures (Idris, 2009). Malaysian students are first introduced to differentiation when they are in Form 4 (16 years old) through Additional Mathematics. Students sit for the Sijil Pelajaran Malaysia (SPM) (Malaysian Certificate of Education), a public examination equivalent to the GCE O' level examination, a year later. Analyses of the students' answer scripts for Additional Mathematics in SPM by the Malaysian Examination Board has shown that students have difficulties in learning differentiation. These include confusion in choosing the right method or formula for differentiation and weaknesses in applying the product rule, quotient rule and chain rule (Chuo, Mazlan & Hong, 2015). In addition, students could not retain differentiation skills for higher education requirements.

Thus, this study proposes a prototype of an Intelligent Tutoring System (ITS) to be known as Differentiation Intelligent Tutoring System (DifITS) using the *example-tracing tutor* approach to assist students' learning of differentiation in Additional Mathematics. The aim of this paper is to describe DifITS and the developmental process of the *example-tracing tutors*. According to Chronopoulos, Hatzilygeroudis, Perikos and Kovas (2010), *Example-tracing* tutors are problem-specific tutors that provide guidance to the students during problem solving practice by comparing their solution steps to the proper solution process of an example that has been recorded in the tutor. The *example-tracing tutors* provide hints and error feedback messages, and are flexible enough to handle multiple solution strategies and paths.

The discussions in the next section focus on ITS and is followed by descriptions of two examples of ITS. Then, the discussions move to the development of the proposed prototype of DifITS.

INTELLIGENT TUTORING SYSTEM

Advantages of using computer technologies in teaching and learning include making the teaching and learning process more interesting for both parties, increasing students' motivation in learning, improving work quality, reducing the time required in the learning process and enhancing learning performance (Adekunle, Adepoju & Abdullahi, 2015). While most studies have shown that computer technologies have improved learning performance, some studies have reported otherwise (Beal, Arroyo, Cohen & Woolf, 2010). However, most researchers agree that the focus should not be on whether to use computer technologies for teaching and learning but rather on how to use computer technologies effectively. Thus, more studies are encouraged on how to effectively use computer technologies to enhance teaching and learning (Pilli & Aksu, 2013).

With the advancement of computer technologies, increased capacity and faster internet connection, new approaches in using computer technologies for teaching and learning have emerged. One such technology is the Intelligent Tutoring System (ITS). ITS is a computer based program which attempts to mimic a personal human tutor by providing personalized instructions based on students' progress (Ahuja & Sille, 2013). It is also a computer software that is able to track students' progress and, at the same time, provide feedback and hints. Furthermore, the software is able to diagnose students' performance and suggest additional work where applicable (Mitchell & Howlin, 2009).

As one-to-one human tutoring is often not feasible due to human and economic limitations, ITS may be a viable option for providing one-to-one tutoring. Students would have unlimited access to affordable and effective personal tutoring anytime, anywhere through the use of ITS (Md Noh, Ahmad, Ab Halim & Mohd Ali, 2012). Similar to the normal classroom, ITS would provide primarily notes, examples and exercises. Additionally, ITS would also include hints, guides and feedback when necessary. ITS has

been successfully implemented in many areas of teaching and learning and also at the primary (Md Noh et al., 2012) and secondary school levels (Tsai, Md. Yunus, Wan Ali & Bakar, 2008a, 2008b). Some existing examples of ITS include AnimalWatch and Andes.

EXAMPLES OF ITS

AnimalWatch

AnimalWatch is a web-based ITS developed for the learning of algebra which includes arithmetic, fractions skills and word problems. It is based on the California Mathematics Content Standards for Grade 6. However, students from Grades 4 through 7, including high school students who need to review basic arithmetic and fractions have found AnimalWatch useful. It is available online at http://animalwatch.arizona.edu/. It links mathematics learning with the real world situation, focusing on endangered species and environmental sciences. It allows students to progress at their own pace by providing help through worked examples and interactive and video lessons for each of the word problems. AnimalWatch is free for use and is supported by research grants from the National Science Foundation and the U.S. Department of Education. Studies have shown that AnimalWatch has been effective in enhancing students' learning process in much the same way as an experienced human tutor for a small group of students (Beal et al., 2010).

Andes

The focus of Andes is on helping students with their physics homework. Students can solve physics problems by drawing diagrams, entering equations and defining variables on the interface just as if they are solving the problems with pencil and paper. Andes provides instant feedback by coloring the entry in red or green to indicate whether it is right or wrong. Andes also provides principle based hints when prompted. Andes is targeted for introductory college physics, high school physics or distance learning courses. It contains over 500 problems involving the trigonometry-based physics topic. Similar to AnimalWatch, Andes is free and is funded by the National Science Foundation. Studies have shown that students who did their homework using Andes learned significantly more than students using

the traditional method of attending lectures, labs and recitations (VanLehn et al., 2005). Andes is available at http://www.andestutor.org.

DIFFERENTIATION INTELLIGENT TUTORING SYSTEM (DIFITS)

The following sections describe and discuss the various features of the proposed DifITS.

Progress Report

Part of the DifITS was developed based on the *example-tracing tutor* approach. The *example-tracing tutor* approach is used in the exercise section of the system. The overview of the whole prototype is presented in Chuo et al. (2015). Students need to register before using the system to enable the system to track the students' learning progress. After the students login in, their progress report page is displayed as shown in Figure 1.

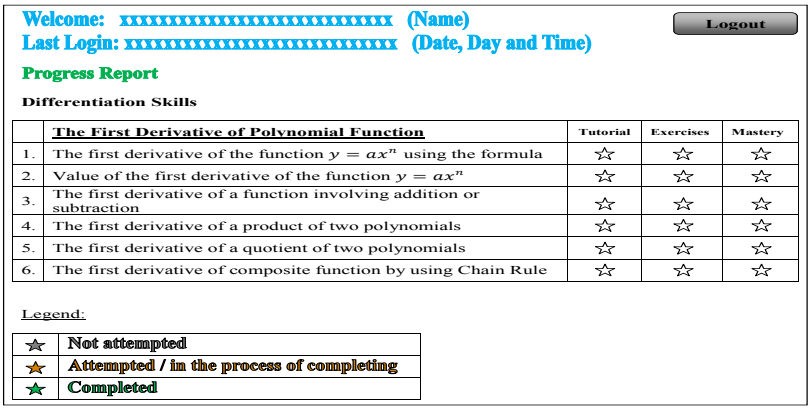

Figure 1: The Screenshot of the Progress Report Page

The progress report page displays the list of differentiation skills to be learned using the system. The page also shows students' progress using colored icons. From this progress report page, students can proceed to learning the skills by clicking on the respective stars. However, for certain skills, students would need to have completed the pre-requisite skills such

as skills 1, 2 and 3 before they can proceed to learn either skills 4 or 5. In order to start learning skill 6, students must have completed all the required prior skills. Thus, except for the stated limitations, students can decide what they want to learn and therefore, self-paced learning is applied through the progress report page.

General Layout

Figure 2 shows the general layout of the work area of DiffITS. The username is displayed at the top of the page with two other buttons, namely the button to return to the report page and the logout button. The list of the skills to be learned is displayed on the left panel. The 'green' color code is used to remind the students of the current skill they are learning. The middle panel is where the interaction between the students and the system appears. The right panel displays hints, feedback, graphs and an online derivative calculator. The sizes of the three panels are dynamic, such that the panel can be enlarged or minimized as required. This is useful when students require more workspace when using smaller screens such as tablets or netbooks.

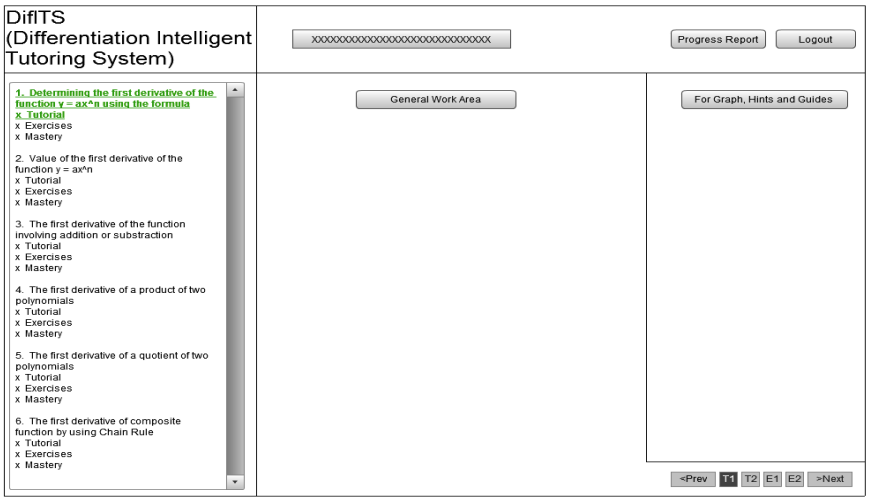

Figure 2: The Screenshot of the General Layout of the System

For the rest of the discussion, the screenshots will only focus on the middle panel and the right panel as the left panel only displays the list of skills to be learned.

Tutorial Section (Animation)

In the tutorial section of the system, the students are given explanations and examples for each of the learning skills. Some of the differentiation processes are explained through animation. An example in the tutorial section is shown in Figure 3.

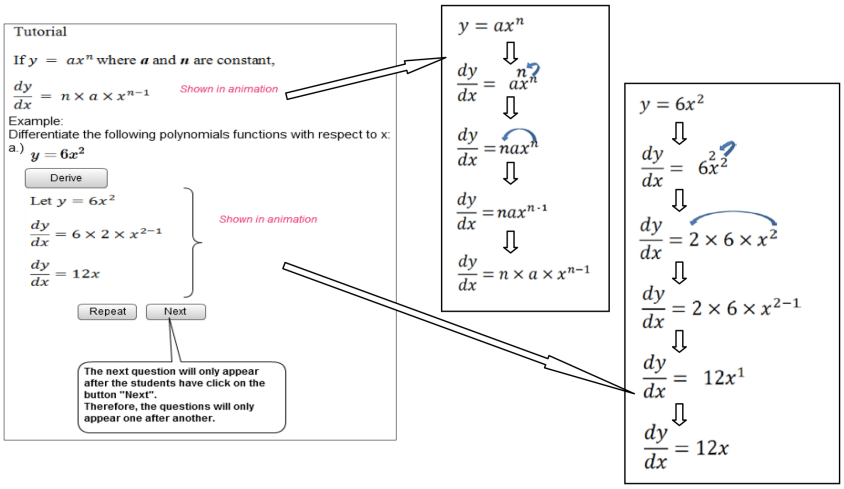

Figure 3: The Screenshot of the Tutorial Section with the Animation Sequence

The animation shows the process of the movement of the index of the variable ***x***; namely ***n*** from the top of variable ***x*** to the front of the coefficient ***a***. Then, the animation will show the process of value of the index being reduced by one unit; ***n – 1***. The process of using the differentiation formula will be clearly shown using the animation. In the example of using the formula, the animation will show the movement of the index of the variable ***x***; namely ***2***, from the top of variable ***x*** to the front of the coefficient; ***6***. It then shows that the index ***2*** is reduced by ***1*** through the process of ***2 – 1***. This will be followed by the calculation to obtain ***12***. Thus, after the derivative process, the animation will show the final answer of ***12x***.

Using animation helps students to visualize the differentiation process as some procedures involve complex formulas and many steps. Students may become confused and lost in the process of doing differentiation. In

addition, students can repeat the animation till they understand the process.

At the same time, on the right panel, a graph appears to provide the conceptual meaning of differentiation. The graph will show that differentiation is about the rate of change of the function given at a particular point on the graph of the function given. Students can see that the slope which represents the rate of change will be different for different points. This will facilitate students' understanding of the concept of differentiation. Therefore, DifITS is focused on enabling students' understanding of the procedural skills of doing differentiation and also the conceptual understanding of differentiation.

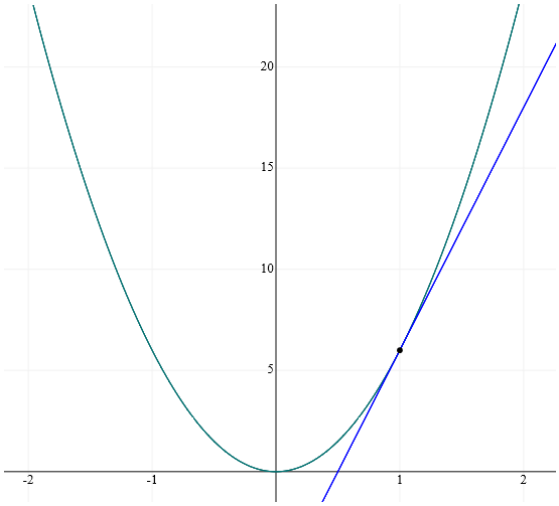

Figure 4: The Slope of the Tangent representing the Rate of Change for the Function

Exercise Section (*Example-tracing tutor* approach)

After the students have gone through the tutorial section, they proceed to the exercises to practice what they have learned. DifITS employs the concept of "What You See Is What You Get" (WYSIWYG) in the learning process. This is to ensure that what the students have accomplished using the system can be transferred to pencil and paper scenario with ease.

For the exercise section, the system uses the *example-tracing tutor* approach. *Example-tracing tutor* approach is applied through the use of Cognitive Tutor Authoring Tools (CTAT). The current version is CTAT 3.4.0 released on 6 February 2015. CTAT software is free for research purposes. CTAT website provides the tutorial on how to create an *example-tracing tutor* (http://ctat.pact.cs.cmu.edu/tutorials/).

Developing an *example-tracing tutor* through CTAT has two advantages (Aleven, McLaren, & Sewall, 2009). Firstly, using CTAT, building *example-tracing tutor* ITS would be easier and more economical as it can be built easily by nonprogrammers. Thus, the development time can be reduced. Secondly, CTAT would enable ITS to be delivered through a web-based platform.

Aleven, Mclaren, Sewall and Koedinger (2009) shared seven steps in developing an example-tracing tutor. On the other hand, Aleven et al.(2009) described five developmental steps. This paper focuses on step 4 in Aleven et al.(2009) also known as the "Design and develop tutor" step.

Designing and Creating the Interface

The first step in designing the interfaces is shown in Figure 5. The interfaces were created using Eclipse, an integrated development environment (IDE) based on Java. Eclipse provides drag-and-drop techniques, making the process of creating the interface user friendly. CTAT also supports the use of Flash in creating the interface. However, Eclipse was selected as it is free to use, whereas Flash requires licensing. In the process of designing the interface, the authors took into account how to apply WYSIWYG in presenting the questions and getting the responses from the students. It was a challenge to determine the best approach to present the questions and get the responses from the students using WYSIWYG. In creating the interfaces, the type of responses that the students would provide during the working steps were also taken into account.

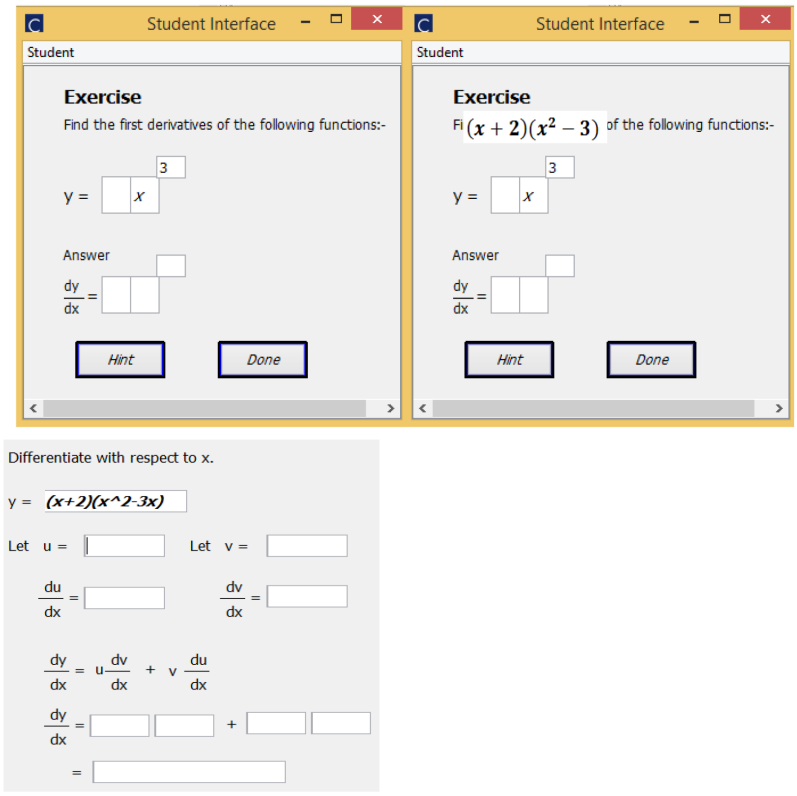

Figure 5: Screenshots of Two Examples in the Exercise Section

Creating A Behavior Graph (Demonstrating Correct and Incorrect Behavior)

After creating the interface, a behavior graph was created to demonstrate the correct responses to the question. All the possible working steps were demonstrated in the behavior graph using the interface as guided by the tutorial. The possible mistakes that the students might make in the process were also recorded in the behavior graph. Figure 6 shows the behavior graph for the question.

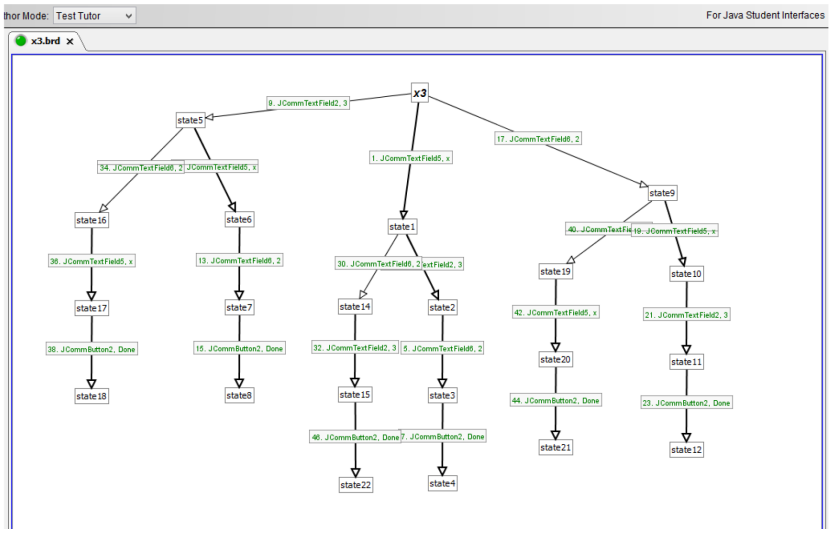

Figure 6: The Behavior Graph for a Question

Testing the Tutor

The development of the tutor was considered complete from the *example-tracing tutor* approach after going through the two steps; namely designing and creating the interface, and creating the behavior graph. The tutor for the exercises was then tested for its functionality. Figure 7 shows examples of the feedback that the DifITS provides.

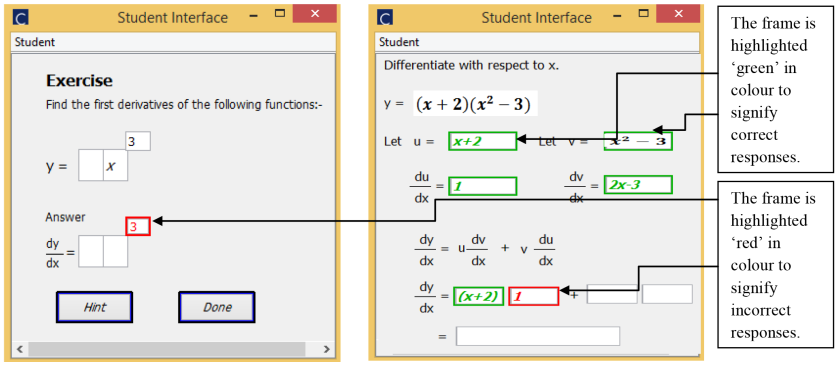

Figure 7: Screenshots of the Feedback in the Exercises

In the exercises shown in Figure 7, when the students provide the responses, the system compares the students' responses with answers in the behavior graph. When the response matches one of the possible answers, the system gives a positive feedback by highlighting the textbox green. This positive feedback is to give students encouragement and motivation to move on. However, when the response does not match any of the possible answers, the text box is highlighted red. Students will not be able to proceed until they have provided the right answers. Therefore, students must learn to get the right answers before they are allowed to proceed. To encourage the students to proceed, the system prompts the students with hints to help them to get the right responses. Students could also request for guidance by using the hint button. All these hints and guides are provided to support and encourage students when they face difficulties in the learning process. Through the feedback, hints and guides using *example-tracing tutor* approach, DifITS is able to provide one-to-one tutoring that students need in the learning process. With DifITS, students can proceed with their own learning without much difficulty as they do not need to wait for teachers to guide them. With DifITS, the developers hope that students will be motivated in the learning process of this particular topic that is crucial for their success in the related disciplines in higher education.

CONCLUSION

This paper discusses the development of a prototype of DifITS to enhance the teaching and learning of differentiation using the *example-tracing tutor* approach. The *example-tracing tutor* is able to provide one-to-one tutoring needed in the learning process. The challenging part in the development of a prototype of DifITS was to determine the design of the interface and create the comprehensive behavior graphs. For further research in this area, the authors will focus on completing the development of the proposed prototype and include a mastery section to ensure students have mastered each of the respective skills before proceeding to the next step in the learning process.

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Learning Styles of *Orang Asli* Students

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ABSTRACT

Learning style is an important aspect that should be taken into account while designing teaching and learning modules. The implementation of learning modules that addresses students' learning styles can help them to achieve meaningful learning. This study aims to explore the learning styles of indigenous (known as Orang Asli in the Malay language, and henceforth) students. The respondents of this study are Orang Asli students from a southern region in Malaysia who were involved in an ICT Literacy Program. Data was generated through observations and interviews which were conducted during and after the implementation of the ICT Literacy program. Data analysis was performed using ATLAS.ti software. The findings showed the emergence of seven learning styles of Orang Asli students. The learning styles preferred by the Orang Asli learners are (i) group, (ii) individual, (iii) movement, (iv) hold and touch, (v) visual, (vi) auditory, and (vii) phrase level. This paper provides a detailed discussion of learning styles among Orang Asli students and thus, provides implications for the future developmental processes of online teaching and learning modules particularly for this particular group of students towards achieving meaningful learning.

Keywords: ICT literacy, learning styles, meaningful learning, *Orang Asli*

INTRODUCTION

Lifelong Learning (LLL) is a process of democratization of education which includes the acquisition of skills, knowledge and competence, formally or informally, based on experience and training. LLL is essential in increasing added value to the community and it is the biggest contributor to national productivity and development (Alicia & Ruth, 2011). This dream is achievable with active involvement of youth who are going to lead the nation through educational programs integrated with technology (Rosseni et al. 2011). However, the educational process for *Orang Asli* students is not integrated with technology causing them to remain isolated from the mainstream of national development. Therefore, continuous research should be conducted to identify the needs and problems faced by *Orang Asli* in education to ensure that they are not left behind. Thus, in producing excellent, knowledgeable, skillful and well-rounded *Orang Asli* human resources, the government, through the Ministry of Education (MOE), has introduced the *Orang Asli* Education Transformation Plan. This plan is designed to ensure that there is no one left behind, including the children of the *Orang Asli* community in mainstream education. In the 10th Malaysia Plan, the effort to strengthen the national education system from childhood to higher education took account of the needs of all communities including *Orang Asli* communities in rural areas. However, one problem remains unsolved, which is low motivational level of the *Orang Asli* students to learn. Therefore, it is essential to conduct programs that can increase the motivation of these students to raise their educational level so that they can improve their quality of life and be competitive with other communities (Mohamad Johdi et al., 2009).

PROBLEM STATEMENT

A reputable Turkish thinker and the author of *Risale-i Nur,* stated that the main enemy of man consists of three things, one of which is ignorance, which can be overcome through education. This shows that education is an important element in the process of removing individuals from the cocoon of ignorance especially pertinent for the *Orang Asli* community in Malaysia (Bemen & Christopher, 2012). Low motivation to learn among *Orang Asli* students is one the contributing factors that causes ignorance

(Hou & Huang, 2012; Ruth, 2010; Doug, 2001). The consequence of this is illiteracy, inability to master the 3Rs (reading, writing, arithmetic), and a low academic performance (Mohamad Johdi et al., 2009; Bemen & Christopher, 2012). Therefore, in order to ensure that the nation will not lose a part of its human resources, this problem has to be addressed by identifying the factor/s that affect motivation level among *Orang Asli* students and utilizing that knowledge to improve the educational outcomes for this group of students.

Various issues may contribute towards the low motivation level among *Orang Asli* students. This study focuses on teaching and learning (T&L) methods which are unsuited to the learning styles of *Orang Asli* students. When the T&L methods implemented do not suit the learning styles of *Orang Asli* students, their learning will be impeded causing them to lose interest and enthusiasm to attend school (Nicholas, 2010; Linda, 2005; Mohamad Johdi et al., 2009; Bemen & Christopher, 2012). Technology plays an important role in creating meaningful learning based on the learning styles of students (Shutterstock, 2011; Rosseni Din et al., 2011). Several studies on the learning styles of indigenous students have been conducted overseas, but in Malaysia, this area is still insufficiently studied (Kamarulzaman & Osman, 2008). A meta analysis of the studies conducted in Malaysia in this area reveal that these studies do not include precise and adequate elaboration as well as description about the learning styles of *Orang Asli* students. Therefore, this study aims to fill the gap in order to identify the specific learning styles of *Orang Asli* students through ICT literacy program.

METHODOLOGY

This study uses a qualitative research design by using the case study approach. This approach was used to explore a phenomenon through variety of lenses and enable the researchers to better understand the respondents' actions. The respondents involved are 5 *Orang Asli* students from an *Orang Asli* settlement in Southern Malaysia. Data was collected in two ways; through interviews and observations. Individual interviews were conducted to obtain more detailed information as well as to build a strong rapport between the respondents and the researchers. Open-ended questions were used in this study to allow the respondents to create options. Interviews were conducted once the students had gone through the ICT literacy

program. Observations were made without any specific structure in order to obtain authentic data and to avoid deliberate acting during the observation. Observations were made in every session of the lesson conducted. In order to ensure that the observations were conducted effectively, tools such as video recorder and iPad were used to record the situations that took place throughout the program.

The data collection process was conducted based on the protocols prepared before the implementation of this study to ensure that the data collected is relevant to the research questions. The data obtained was then analyzed. The data was transcribed to ease the analysis process. Transcription is the early stage in the data analysis process, which becomes a reference for audio documents. Transcribing is essential in the research validity process (Seale, 2002). After that, open coding is conducted as an initial stage in the data transcription process. Open coding is the process of identifying codes contained in the transcribed data (Seaman, 2013). These codes will then be classified into several categories of information. Each category is then analyzed based on the research questions. Using open coding can create various temporary codes that can help in the axial coding process which is the following stage of data analysis. Axial coding process is a set of procedures that involve data combination in a new form after open coding process by creating associations among the categories created. Axial coding methods are conducted by extracting the codes produced in open coding process which are then combined based on suitable or relevant associations. Axial coding is used in the analysis process of this study to create new associations between two different concepts which will be organized based on the phenomena studied on the existing association. Finally, several themes will be produced based on the axial coding.

FINDINGS

This section will elaborate on the findings obtained regarding learning styles of *Orang Asli* students based on observations and interviews conducted. Observations were made during practice sessions in computer labs, while the interviews were conducted after the respondents had gone through the personalized learning conducted. Based on the analysis, seven themes were found to be associated with the learning styles of the *Orang Asli* students.

Group

The students were found to be more enthusiastic while completing their tasks in groups. This is because they are able to discuss and complete the task together, exchanging ideas among themselves and at the same time encouraging each other to learn. Following are the explanation given by the students related to the learning style related to group work.

> *"Because learning computer, with friends I can learn how to type, I don't get this in school."*(Fat)

> *"A lot of friends."*(Aca)

Individual

The students were more focused while completing their task individually. It was observed that some of them refused to share the computer unit that they were using while completing the task. The students were asked to complete their task by using the computers provided, yet some of them moved to another place without completing the task when other students came to use the computer that they were using. Following are the statements given to illustrate the description above.

> *"Teacher, s/he is bothering me. I don't like it when other people are bothering me while I am doing my work, or I will not be able to complete it."*(Su)

> *"Teacher, s/he is using my computer, how can I do my work?"*(Mah)

> *"Can you please do your work faster; I want to use my computer to do this. Teacher, s/he is doing things slowly, I want to do my work."*(Aca)

Movement

Movement learning style appears to be the main attribute among the *Orang Asli* students. Moving around during the T&L process contributed in reducing the students' boredom and focusing them on the T&L. This attribute is also influenced by the environment of the students. For example,

the students were given 10 minutes break after each T&L session during which time they ran outside the classroom to climb the guava and mango trees nearby. Then, they took the fruits inside and ate them while continuing with the task given. Listed below are the statements made by the students to support the observation above.

> *"I cannot sit still, teacher. I cannot do my work if I have to sit all the time. I need to move around."*(Su)

> *"There were students moving from one computer to another with their wheeled chair to look on the task done by their friends and then they returned to their original place to complete their task."* (Observation2)

Hold and Touch (Tactile)

Holding and touching denotes different meanings. Holding refers to the students' action in grabbing on to something such as the computer mouse while completing their task (*Kamus Dewan,* 2005). Meanwhile, touching refers to their action in holding or putting their hands on the surface of an object. This can be further explained in this observation: *"the students touched the computer screen using their index finger to show the teacher the part that they are stuck with"*. Following is the input of one of the students related to this attribute as their learning style.

> *"Do you have to hold it to understand?" [Nod]*
> *"So, you have to hold it?" "Yes"*(Su)

Visual

The students were more focused when the learning module contained easily comprehensible pictures such as those in the PowerPoint module. The task given in this module was to prepare a poster related to tourism and the forest products available in their village. They were able to complete the task easily and rapidly because they were asked to insert pictures in their PowerPoint slides. The feedback given stated that they enjoy visual learning. The statements below are the feedback given by the students related to their learning process based on visual learning.

"Do I have to include more pictures, not more words? "More pictures."(Mah)

"Put pictures in PowerPoint"(Wan)

Auditory

Auditory is one of the learning styles preferred by the *Orang Asli* students in this study. The students were more motivated when the T&L process was conducted by integrating sound. Sound in this research refers to music, animations, videos and any other sound element that can be integrated in the T&L process. The environmental factor of living in a jungle where they are surrounded with the sound of waterfalls, birds, insects, and the sound of the trees moving to the wind has influenced the learning styles of *Orang Asli* students (Mohamad Johdi et al., 2009). Feedback and observations below further support the auditory attribute in the learning styles:

"Teacher, look. There is sound… (while smiling and focusing at the computer screen)."(Wan)

"But, one computer will be shared by two people?"

[Nod] … there are computers with speakers." "Aha…so use?"
"Aah."
"Used for?"
"To listen to… what is it… radio"(Aca)

"The students inserted music CD from the classroom into the CD player on the computer."
(Observation1)

Phrase level

The students were observed to enjoy modules with limited phrases in terms of language use. Based on the observations made throughout the class session, if the lesson displayed on Microsoft PowerPoint contained more than three phrases, the student would only read up to two or three phrases, then would stop and look at the teacher. Based on the feedback given,

when less phrases are used, their learning motivation increases. They can focus more as well as hasten their learning process. This also refers to the answers given by the students when questions were asked. They tended to give at least two phrases or words and then they would stop. Below are the observations and feedback given by the students related to this learning style.

> "*There's smoke, teacher". Student giving feedback* (Observation1)
>
> *The teacher asked, 'Which TV program do you normally watch?'... student replied... "Cartoon, watching motors"* (Observation3)
>
> *"I like less words when I am studying, teacher."*(Su)

Orang Asli Students' Learning Style Framework

Figure 1 indicates the framework for the learning styles of the *Orang Asli* students which consists of seven attributes. The attributes include group, individual, movement, hold and touch, visual, auditory, and phrase level. This framework was created using ATLAS.ti version 1.0.15(81).

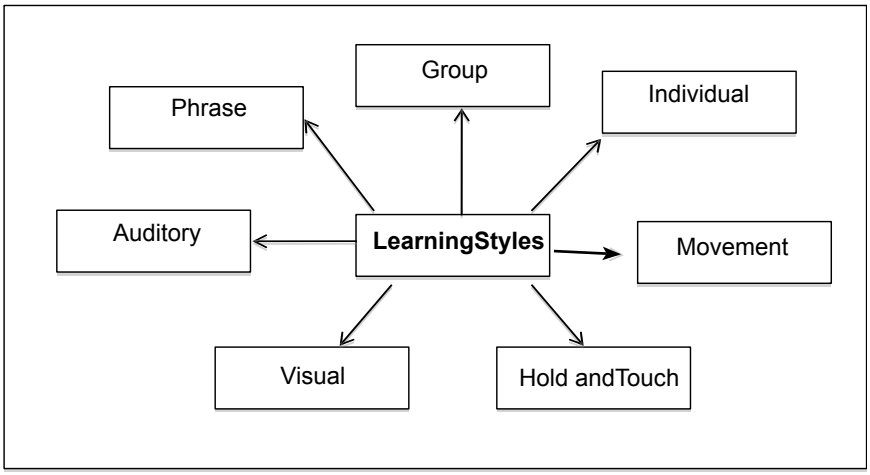

Figure 1: *Orang Asli* Students' Learning Style Framework

DISCUSSION

This study has attempted to contribute towards the discovery of the learning styles of *Orang Asli* students in Malaysia which have as yet not been thoroughly explored as compared with other studies abroad especially in Australia. The findings also show that the learning style of *Orang Asli* students in Malaysia is different from the indigenous people of other countries (Paul & Arthur, 1997). Learning styles such as hold and touch, sound (auditory) and phrase level are new attributes discovered in this study, and there are limited studies, both local and international, on these three attributes. The emergence of these attributes have contributed towards the identification of learning styles among *Orang Asli* students in Malaysia. Besides that, this discovery can also help researchers in the development of teaching and learning modules for *Orang Asli* students, ensuring that they acquire meaningful learning. It is essential to ensure that this group of students are motivated to learn and broaden their horizons to prepare them for the future.

CONCLUSION

The findings of this study reveal the emergence of seven learning styles of *Orang Asli* students based on the implementation of ICT literacy program in their T&L process. This outcome will contribute to the T&L planning process that can create meaningful learning for this particular group of children. Hopefully, this will increase students' comprehension and acceptance levels of the T&L conducted and increase their motivation to learn. By integrating students' learning styles in the T & L process, they will be more enthusiastic to prepare themselves to face the future.

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Learners' Attitudes towards Engaging in Online Communication Activities

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ABSTRACT

Blended learning has been implemented in Universiti Teknologi MARA (UiTM) since 2009. However, there is still no known study on the attitudes of learners who engage in online communication activities in the study of Mandarin. Thus, this study was carried out to investigate the attitudes of learners who engage in online communication activities while studying Mandarin. The sample for this study comprised 201 students from eight classes of seven faculties at UiTM, Shah Alam. The data were collected via observations of the sample's online communication activities in the i-Learn portal for one semester. Throughout the semester, the researchers monitored the sample's activities and the results revealed that most of the sample showed a positive attitude towards online communication activities despite certain challenges faced by lecturers in online communication activities. The findings of this research will serve as a helpful reference to guide the teaching and learning of Mandarin among non-native or third language learners to actively engage them in online communication activities that create flexible, flipped and active learning of Mandarin as a foreign language.

Keywords: blended learning, learners' attitudes, online communication activities, teaching and learning of Mandarin

INTRODUCTION

Learning a third or a foreign language has become immensely popular at Malaysian universities since students are increasingly aware that knowledge of foreign languages facilitates travel and enhances career opportunities (Morris, 2005). One of the most popular foreign languages taught in Malaysian schools and universities is Mandarin, which is also one of the United Nation's official languages. In a multiracial country like Malaysia, mastering a third language certainly opens up more opportunities for jobs and career advancement. More importantly, China's rapid economic growth has encouraged many who are interested in doing business with the Chinese and exploiting economic opportunities in China to take up Mandarin.

At Universiti Teknologi MARA (UiTM), Malaysia's largest university in terms of enrollment, Mandarin is one of the most popular foreign or third language options for students. Mandarin is an elective taken by several thousand students each semester at the main and satellite campuses in Malaysia. Blended learning (BL) has been implemented in UiTM since 2009. Since its inception, a lecturer can teach with a well-structured lesson in the classroom, and then follow up with online forum/online communication course via the university's Learning Management System known as *i-Learn*. A lecturer is able to conduct a variety of learning activities with the use of technology to facilitate and enhance lecturer and peer interaction. The role of students is to join the online forum/online communication to enhance their learning experience. The rationale for having an online academic discussion is to provide a channel for students to continue learning after classes. However, there does not seem to be any significant study on attitudes of learners who engage in Mandarin online communication activities. Thus, this study was carried out to investigate the attitudes of learners who engage in online communication activities. To enable investigation, several activities were designed for students based on learning approaches such as collaborative learning, cooperative learning, flipped learning, and active learning.

PROBLEM STATEMENT

It needs to be pointed out that foreign language courses offered at the undergraduate level are very basic, catering to students with no prior knowledge of the foreign language taken. In UiTM, these foreign language courses focus on basic skills in listening, speaking, writing and reading with two contact hours a week. It is common knowledge that limited contact hours can impede learning. Instructors facing time constraints may neglect listening and speaking exercises in the classroom in order to complete the syllabus.

A survey carried out by Naimah (2005) found that although the majority of UiTM undergraduates obtained outstanding results in examinations, they were unable to speak and understand foreign languages outside the classroom. As such, it was felt that a fundamental change is needed to equip undergraduates with practical real life communication skills – in other words, language skills which they can confidently use to interact with native/speakers of the language learned. To achieve this objective, language teachers would need to adopt new methods of teaching foreign languages, for example, integrating traditional ways of teaching foreign languages with technology such as via BL.

OBJECTIVE OF THE STUDY

The advent of technology has made it possible for lessons to be conducted via the Internet and other digital media. Thus, the foreign language teacher can transform teaching materials or contents into a different format for use on a variety of portable devices as well as diversify their teaching methods such as conducting online communication activities after classroom teaching. In an effort to implement BL, UiTM students were also exposed to online communication activities for the Mandarin course. Thus, this study intends to look into the attitudes of students who engaged in online communication activities during their study of Mandarin.

METHODOLOGY

The research design for this study was based on the qualitative approach, in which the data were collected via observations of online communication activities through *i-Learn* portal of the sample for one semester. The sample comprised 201 students in eight classes in seven faculties at UiTM, Shah Alam, i.e., Architecture, Planning & Surveying (AP), Business Management (BM), Computer Science & Mathematical Sciences (CS), Health Sciences (HS), Information Management (IM), Office Management Technology (OM) and Pharmacy (PH). This selection was made in order to provide an extensive representation of the participants of this study. One Mandarin class was selected from each faculty, except for two classes from the Health Sciences (HS) faculty. Students attended their Mandarin classes at the TEC (Technology Enabled Classroom) at the respective faculty. Outside the classroom, the sample accessed *i-Learn* to participate in online communication activities via "i-Discuss". Throughout the entire semester, the researchers monitored the students' activities with the aim of investigating the sample's attitudes to online communication activities.

Table 1: Online Communication Activities Setting

a) **Announcement**	The lecturer posted any important announcement here.
b) i-Discuss	This consisted of two main folders, namely : **General**&**Academic**
i) General folder consisted of topics	
General	Students could post any question about Mandarin 1.
Welcome	Lecturers wrote welcome messages to students.
Chatting	Students chatted with their peers or with their lecturers.
ii) Academic folder consisted of topics	
Hanyu pinyin	Hanyu Pinyin and Questions & Answers (Q&A).

Mandarin 1 Note/Nota	Students printed out this study material via the subfolder *Mandarin 1 nota* to enhance their knowledge of vocabulary and grammar. Additionally, students submitted their exercises here.
Podcast/Listening	Students downloaded materials into their digital devices such as mp3, mp4, i-phone, smart phone, etc.
Chapter 1 to Chapter 8: Each chapter had three subfolders, namely:	
Internet resources link:	Students posted links to Internet resources related to Chapter 1 to Chapter 8. For example, some *YouTube* links related to learning Mandarin, etc.
Questions & Answers (Q&A)	Students asked questions pertaining to Chapters 1 to 8. The group in charge of a particular chapter answered the questions posted by other classmates. Students referred the questions to their lecturer.
Exercises	The group members posted exercises here. The exercises included rearranging sentences, constructing sentences, translating, and carrying out dialogues in Q&A format.

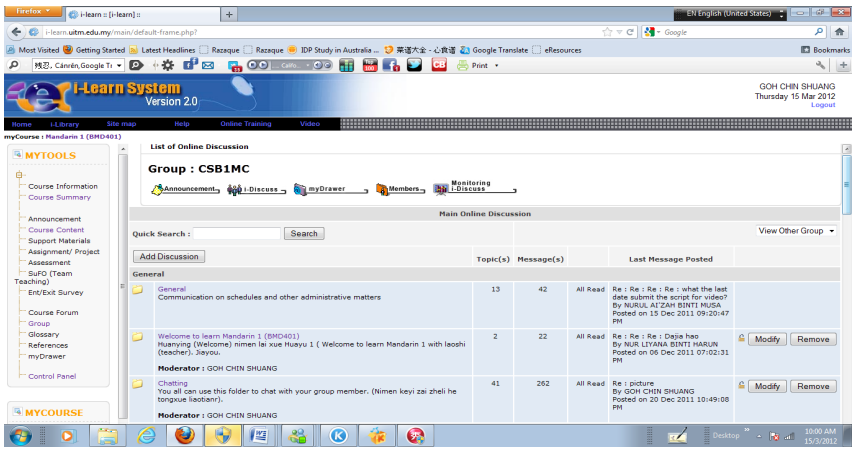

Figure 1: Online Communication Activities Setting

RESULTS AND DISCUSSION

Online communication activities for one semester were monitored by investigating the attitudes of students who participated in these activities. From the data gathered, all the students in this study had no prior experience of participating in online communication activities for the study of Mandarin. All activities in the online forum were based on the learner centered approach and collaborative learning. Since the online communication activities were divided into two main categories - general discussion and academic discussion, the data analysis was done according to these two categories.

Students' Attitudes to Using Online Communication for General Discussion

In the general discussion section, students were provided with three folders to use to discuss general topics in the Mandarin syllabus. The three folders were named *General*, *Welcome* and *Chatting*. In the *General* folder, students could post any general question on Mandarin. However, an analysis of this folder found that some students posted academic questions instead, and these questions were also posted in the *Welcome* folder. This provided evidence for the researchers to conclude that some students had not read or referred to the manual provided. The *Chatting* folder, on the other hand, was set up to allow students to converse with their peers on any topic regarding their learning experiences, including sharing of information, with the condition that they had to use the Mandarin they had learned in their interactions with peers and lecturers. It was observed that students from different faculties posted different kinds of questions in this folder. A similar occurrence is that there were still several students from certain faculties who posted academic questions in the *Chatting* folder. On the other hand, students from the Faculty of Health Sciences (HS), Computer and Mathematical Sciences (CS), Office Management (OM) and Pharmacy (PH) posted questions on general topics in the *Chatting* folder. They posted the questions they had learned in conversation format and their peers/classmates responded to their questions. Some students also shared information obtained from websites. For instance, some students posted some Internet links in the *Chatting* folder, or posted some information regarding the learning of Mandarin 1. One student also shared her experience of watching Chinese movies with others. Overall, most of the students used sentences

they had previously learned when chatting with other students. Apart from that, the researchers also posted two questions for the students, to ask them why they learned Mandarin and what problems they encountered when learning Mandarin. However, not many responded to these questions. Those who did respond explained that they learned Mandarin to communicate with Chinese friends and for their future career, since the ability to speak Mandarin is an asset. Some students drew attention to the difficulty of identifying and using the correct tones and pronouncing words correctly. Generally, the pattern of online communication was clear. Students asked their classmates and lecturers some questions, which were then answered by their classmates and lecturers.

Students' Attitudes in Using Online Communication for Academic Discussions

The rationale for having an online academic discussion is to provide a channel for students to continue learning after classes. To enable continuity of learning, the researchers had designed some activities for students based on learning approaches such as collaborative learning, cooperative learning, flipped learning and active learning.

The Academic Folder comprised four topics - *Hanyu pinyin; Mandarin 1 Note/Nota; Podcast/Listening; and Chapter 1- Chapter 8.*

For the *Hanyu pinyin* folder, students could post all information relevant to *Hanyu pinyin* via this folder. Surprisingly, some students posted other questions or information here. It was clear that certain students did not pay any attention to the instruction given by the researchers or refer to the manual for online communication activities.

For the *Mandarin 1 Note/Nota* folder, not many students submitted their exercises and posted them here. Most probably, lecturers had already discussed answers to exercises in the classroom.

For the *Podcast/Listening* folder, the lecturers did not receive many questions from the students regarding this topic. Most of the students merely downloaded and studied these materials by themselves. They preferred to study on their own, and not engage in any discussion via "i-Discuss".

Meanwhile, for the folder *Chapter 1 - Chapter 8*, most students posted exercises into different sub-folders and let other students do the exercises. In this part of the academic discussion, students were assigned to groups of two to five students. Each group was responsible for a specific chapter. Cooperative learning, collaborative learning and flipped learning approaches were adopted to encourage students to engage actively in online communication activities. It is believed that these learning approaches would help students to become proficient in Mandarin. Besides, they would also acquire teamwork skills such as collaborating and brainstorming with peers and lecturers.

The researchers' monitoring of the students' activities showed that each group did post several exercises and other students posted their answers. The exercises ranged from gap filling, translation activity, dialogue completion, dialogue writing, sentence reformulation, sentence construction to question and answer types of exercises. If the correct answer was posted, encouraging comments were given. Examples of the comments included *"*CONGRATS, friends. all your answers are correct :) WELL DONE", or "Jiāyóu". Some students replied to these comments with "xièxie" (thank you). When lecturers monitored the online communication activities, they identified and corrected the mistakes for the students. As a result, other students could also learn from the mistakes when they viewed the post. If students put in a great effort to give correct answers, the lecturer praised the students by commenting "Nĕmen zhēn cōngming. Jiāyóu.  ", (You are /All of you are so clever. Work harder). The student responded to the lecturer by commenting "xièxie laoshi. wŏmen zhēn cōngming" (Thank you, Teacher, we are really clever). Some groups posted some Internet resources links, but most groups did not post this information in the subfolder labeled *Internet resources links*.

Challenges of Participating in Online Communication Activities

All in all, most participants in this study seemed to be very interested in online communication activities. The online communication activities created a learner centered learning environment and the lecturer became a facilitator, allowing students to take charge of their learning and interrupting their discussion only when necessary. Students also practiced what they

learned from Multimedia e-Learning Materials (MELMs) with their peers and lecturer via *i-Discuss*. However, the researchers also found that certain students were not actively participating in the online communication activities even after the lecturer identified them in class as well as in the *Announcement* folder via *i-Learn*. Consequently, the lecturers had to compel the students to participate in online communication activities. After listing the names of inactive students in the announcement folder, the number of students participating in the online communication activities increased considerably; there were even complaints from the students that they were unable to download or upload their materials or exercises due to technology glitches, and there were students who requested their lecturers to provide feedback promptly to them. This occasionally occurred as lecturers were unable to respond or answer the students' questions promptly or immediately as a result of a demanding teaching workload.

Suggestions for Student Engagement in Online Communication Activities

The present study has identified some challenges in online communication activities namely, a) a small group of the students who never posted questions and answers; b) technology glitches issues; and c) inability of lecturers to give prompt or immediate feedback to students.

In response to students who are inactive in online communication activities, the researchers suggest certain strategies to prompt students to participate in these activities. The lecturer can reward active students with small gifts, provide more exercises and assignments that are related to their Mandarin syllabus and their assessments, as well as make it compulsory for students to submit assignments via *i-Learn* to get marks, thus promoting collaborative learning among students (Anbalagan, Kumar & Biljlani, 2015), and overall, encouraging students to participate in online communication activities. As suggested by Salter and Conneely (2015), online communication activities should provide structured discussion forums whereby lecturers can post "starter" questions to students, hence creating an enjoyable and interesting way for them to engage in online discussion forums.

Regarding technology glitches, the *i-Learn* system should be upgraded with state-of-the-art capacity to avoid problems that are technical in nature. Besides that, *i-Learn* should provide more multimedia functions such as audio and video chats (voice communication) and more image features with the aim of making online communication more interactive (Osipov, Prasikova & Volinsky, 2015).

Immediate or prompt feedback to students' questions is crucial in online communication activities. The researchers recommend lecturers to use social networking elements or social networking tools such as *whatsapp, wechat, line* and others to create a special group for students. If the student needs immediate answers from the lecturer, that particular student could inform the lecturer via these tools and the lecturer could promptly give feedback to the student.

CONCLUSION

The data gathered from the observation of the activities in *i-Discuss* via the *i-Learn* portal has led the researchers to conclude that the online communication activities do aid the learning of Mandarin. Most of the participants/students showed a positive attitude towards online communication activities as indicated by their participation in online language exercises and online communication activities such as chatting and discussing with their peers and lecturers. Students also shared information and resources with each other. The online communication activities motivated students to collaborate on their learning. Moreover, they enhanced students' social capital (information and interaction) and human capital (knowledge and skill) (Belz, 2002; Chung, Graves & Wesche, 2005; Cai, 2011; Chen, 2011; Shrewsbury, 2012). The online discussions promoted active learning, cooperative learning and collaborative learning aside from flexible learning and flipped learning among students.

In conclusion, this study yielded a wealth of information on online communication activities as a suitable platform to learn Mandarin.

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Integration of TQM in Blended Learning

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ABSTRACT

Many tools have been developed to assist the teaching and learning process. However, it is difficult to find one suitable for all students' needs. With strong support from the top management, TQM can be applied to higher education which can provide better service. Blended learning, which includes student-centered and independent learning approaches, requires a strong sense of motivation. Although motivation is an important factor in blended learning, the literature has not adequately explored how students can be motivated in blended learning. The integration of TQM in Blended Learning using PDCA will ensure more efficient learning. 99 students, who took Computer Programming in Universiti Malaysia Terengganu were involved in this research. This study proposed the use of the TQM approach in the implementation of Blended Learning. Using this approach, the element of Plan and Do was used in the preparatory work. For face-to-face learning, the Check element was implemented, while the Action element was found to be very useful for enrichment work. The result of the study found that the total mean score after intervention was 18.49 higher than before the intervention showing that TQM integration in Blended Learning enhances student learning performance. This paper contributes to the motivation to apply TQM to learning using a web-based environment and face-to-face mode.

Keywords: Total Quality Management, blended learning, PDCA, teaching and learning

INTRODUCTION

Education is a continuous learning process which helps to develop and explore further information. In recent years, computers with the support of internet access and distance learning capabilities have been dominant in the learning environment. Blended Learning (BL) is a mix of traditional methods of teaching, such as face-to-face teaching and on-line teaching. The use of different teaching methods provides students with a higher level of independence in the learning process but requires a strong sense of motivation.

Total Quality Management (TQM) has gained wide acceptance in the global market. Previous researches have proven that TQM methodologies have been successfully implemented in many different fields such as the automotive industry, software products, software quality, process reengineering and software testing. Due to the success of TQM in manufacturing companies, it was then applied to service organizations, universities, hospitals, hotels and education (Al-Tarawneh & M. Moayyad, 2011). Deming's concept of TQM is applicable to both academia and industry (Ooi et. al., 2011; Aldaweesh, 2011; Sabet, 2012) which provides guiding principles for needed educational reform (Mehrotra, 2011).

The purpose of this study is to discuss the integration of TQM in BL. This paper is organized as follows: Introduction in Section 1; Section 2 presents Related Work; and Section 3 focuses on Issues and Challenges in Teaching and Learning. The paper then continues with Section 4 which includes the Integration of TQM in Blended Learning while Section 5 presents the Research Methodology used. Finally, the Results and Discussion are presented in Section 6 with the Conclusion in Section 7.

RELATED WORK

BL is a type of learning that is facilitated through the combination of learning environments like lectures, workshops, self-packed study, simulation, online collaboration and the use of interactive multimedia (Draffan & Raingerb, 2006). BL can generally be classified into six models: Face to face drivers, rotation, flex, labs, self-blend and online driver. BL was chosen as a learning

tool for three reasons: to improve pedagogy, to increase access and flexibility, and to increase cost-effectiveness. Most researchers agree with the positive effects of using e-learning course material. Some of the potential are to improve students' commitment to the learning process and become more responsible and active participants in e-learning environments (Norfadilah et. al., 2009). Students' views on BL in terms of their learning styles are positive (Uğur et. al., 2011) and significantly reduces the need for face-to-face instruction (Napier et. al., 2011). However, although blended learning is now being practiced in the higher education sector, there has been much debate about the usefulness of the term (George-Walker & Keeffe, 2010). BL, which includes student centered and independent learning approaches, requires a strong sense of motivation. Although motivation is an important factor in the blended learning system (Rovai & Downey, 2010), the literature has not adequately explored how students can be motivated during BL (Ocak, 2013).

Continuous improvement is one of the core values of TQM. The benefits of TQM include enhanced customer satisfaction, reduction or elimination of problems, improved attitudes, enhanced communication, reduced waste and rework (Shakuntalaben, 2013). TQM can be applied to higher education which can provide better service (Al-Tarawneh & Moayyad, 2011) by modifying some important aspects in terms of institutional needs (Shakuntalaben, 2013). With strong support from the top management, the higher education sector should become more innovative in knowledge creation to achieve a higher standard in providing good services (Zabadi, 2013). TQM is a management approach to sustain long-term organizational success. There is no particular standard to follow in adopting the TQM method, because their unique concept is implemented based on individual organizational needs or cases (Trehan & Kapoor, 2011). Refer to Table 1 for the implementation of TQM in various industries including education.

Table 1: The Implementation of TQM

Author	Education	Medical	Software	Engineering
Feng & Chen (2010)			√	
Zhang (2010)			√	
Jingsong et. al. (2010)		√		
Vieira et. al. (2012)				√

Gordon et. al. (2008)		√		
Raouf (2008)	√			
Lyu (1996)				√
Walasek & Kucharczyk (2011)	√			
Beth (2010)				√
Wood & Petocz (2008)	√			
Mat Jani (2011)	√			

ISSUES AND CHALLENGES IN TEACHING AND LEARNING

There have been several studies in the literature reporting the issues and challenges in teaching and learning (T&L). In education, the issues and challenges of T&L were widely reported especially in the area of mathematics, chemistry, programming and medicine. In computer science, the programming subject is among the most important and difficult subjects (Ibrahim et. al., 2011; Teague, 2009; Muratet et. al. 2009). T&L for basics in programming is a challenge for both instructors and students (Johnny, 2010). Among the problems faced include students finding this subject boring, difficult to understand and the use of uninteresting teaching methods (Roslina & Nazli, 2009).

Motivating and supporting student interest in the T & L process is one of the biggest challenges in chemistry teaching (Aksela & Bostrom, 2012). In addition, students also have trouble in mastering discrete mathematics, even though it is a very important course for computer majors. Discrete mathematics is not easy for students because it is a highly abstract subject (Yahong et. al., 2011). Meanwhile, in medical education, an alternative T & L approach can be carried out by enhancing the interaction between learners to make them more independent (Muhsin, 2008). Two major problems have been identified: weak motivation and usage of unsuitable learning strategies among students (Liu & Lin, 2010).

Based on the abovementioned issues, an effective and suitable pedagogical method should be used in class implementation as a step to

motivate and support students' learning. Refer to Figure 1 for the causes and effects of T&L in chemistry, mathematics, medical and programming courses.

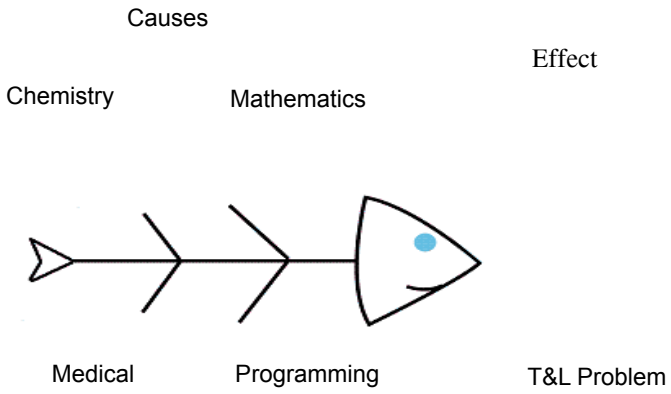

Figure 1: Fish Bone Diagram for the Causes and Effects on T&L

INTEGRATION OF TQM IN BLENDED LEARNING

An extensive review of literature on TQM was applied in generating the model for this research. This research proposes a TQM based method for related subjects, through the use of BL, as a medium for learning. Refer to Figure 2 for the implementation of TQM in BL.

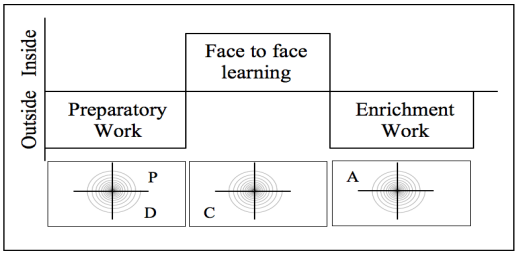

Figure 2: TQM based Method in BL

Table 2: Details of TQM Integration in BL

Preparatory Work	P	Define the concept, aims and objectives of learning.
		Determine Learning Activities
	D	Implement the planned processes
		Prepare Learning activities
Face to face learning	C	Distribute, Check and Discuss the learning activities.
		Measure and compare the results with the established goals
Enrichment Work	A	Take Action for Enrichment Work

An exhaustive literature review was carried out to understand the conceptual development of TQM in order to highlight the importance of various factors that lead to effective implementation of BL. Using conventional learning, instructors are responsible for preparing teaching material before the class session. During class, the instructor usually asks students to do some exercises using a computer by distributing a set of papers. This current approach contributes to the higher cost of paper, waste of time and higher workload for assessment. Table 2 represents the implementation of TQM in Blended Learning.

This paper proposes a model to overcome the limitations involved in the current learning process implemented. Through this idea, the T & L can be divided into two sessions: outside the classroom and inside the classroom. It begins with the *Plan and Do* (P and D) phases, outside the classroom, which is related to preparatory work. A set of questions is included in the e-learning system. Working as a bank of questions, a variety of related problems is attached in this learning tool for students to access and work on before coming to class. Meanwhile, inside the classroom, during the face-to-face interaction between the students and instructor, discussions can be conducted. The activities given before the class implementation will be *Check*ed (C) at this time, and additionally, the results can be measured. As enrichment work, *Action* (A) can be taken for every result obtained inside the classroom. This will ensure that the BL activities will continuously improve.

Applying the PDCA approach will hopefully provide a guideline for continuous improvement in BL. If any problems appear, the important thing to do is to classify the problem within the scope of the four important steps: Plan, Do, Check and Action. This type of learning can automatically access the performance of learners, and is believed to motivate teachers by reducing the workload.

RESEARCH METHODOLOGY

99 students who took the Computer Programming subject were involved in this research. However, only 92 completed the testing successfully. A set of questionnaires was distributed to obtain the respondents' demographic profile and examine their programming background and perceptions toward this subject. Paired-samples T-Test was implemented to test for any significant differences between total mean scores before and after the implementation of TQM in BL. The data were gathered as in Figure 3.

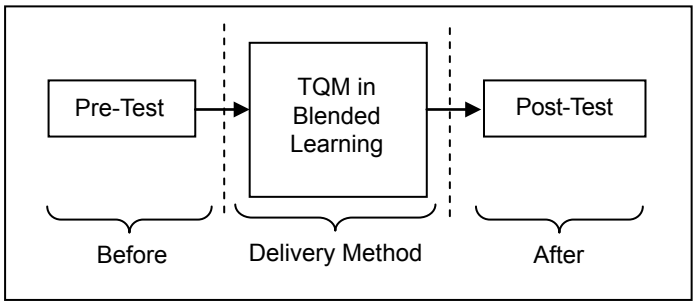

Figure 3: Data Gathering for the Delivery Method

Research Question

Are there any significant differences between students' total mean scores before and after the implementation of TQM in BL?

Hypothesis

H_0: There are no significant differences between students' total mean scores before and after the implementation of TQM in BL.
($\mu_{post} - \mu_{pre} = 0$)

H_1: There are significant differences between students' total mean scores before and after the implementation of TQM in BL.
($\mu_{post} \neq \mu_{pre}$)

RESULTS AND DISCUSSION

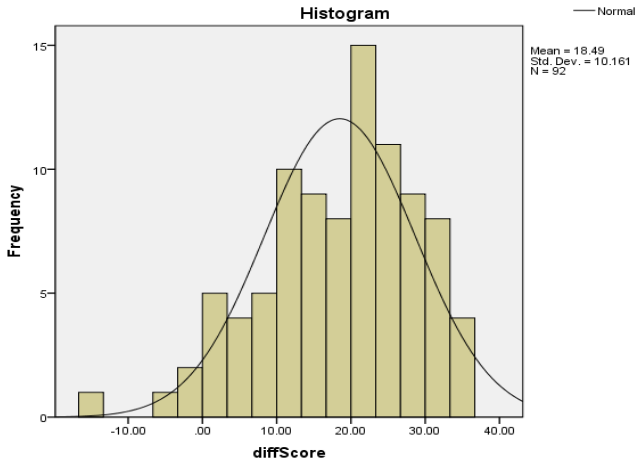

Figure 4: Difference in Scores for Pre-test and Post-test 1

Table 3: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean	
Pair 1	posttest 1	86.5043	92	11.25081	1.17298	
	pretest	68.0136	92	5.80496	.60521	

Figure 4 shows that the data is normally distributed. Table 3 shows that the mean score for posttest1 is 86.50, and 68.01 for the pretest. Table 4 shows the p-value=0.00. Since p-value=0.00<0.05, H_0 can be rejected. Hence, there are significant differences between students' total mean scores before and after the implementation of TQM in BL. The total mean score after intervention is 18.49 higher than before the intervention. TQM integration in BL has been shown, in this study, to enhance student learning performance. It can be said that the implementation of TQM in BL in this research was successful.

This study proposed using TQM in the implementation of BL. As the PDCA model suggests, once the actions are planned, they are carried out, checked and actions are taken based on the results. The PDCA cycle is continued until the problem is sufficiently solved. This approach is advantageous in the implementation of T & L using BL. In this research, the PDCA cycle will always be evaluated for better results in BL.

Table 4: Paired Samples Test

Paired Differences (Pair 1= posttest 1 – pretest)							
		Std. Error	95% confidence Inter of the Diff				Sig.
Mean	Std. Dev	Mean	Lower	Upper	t	df	(2-tailed)
18.49	10.16	1.059	16.39	20.59	17.46	91	.000

CONCLUSION

In this research, the total mean scores after intervention is 18.49 higher than before the intervention showing that TQM integration using PDCA in BL was successful in enhancing student learning performance.

This paper has contributed to motivating instructors to apply TQM to subject learning integrating a web-based environment and face-to-face mode. This approach will help decrease the "distance" between the students and the instructor by allowing for continuous interaction even after classes are over. The methodology relating to the implementation of web-based and face-to-face aims to ensure a high and constant quality of the T & L process, particularly in difficult and complex subjects.

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Malaysian MOOCs: Students' Patterns of Interaction

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ABSTRACT

Massive Open Online Courses (MOOCs) provide an interactive avenue for an unlimited number of participants to interact and collaborate on joint projects. Realizing the potential of MOOCs in accommodating more and diverse learners, four MOOCs were introduced by the Malaysian Ministry of Education in 2014. These courses allowed students from all Malaysian public higher educational institutions to benefit from the shared content. They were expected to discuss issues related to their field of studies and share their experiences. Postings sent were analyzed to study their patterns of interaction particularly the number of postings, threads and patterns of turn-taking. The contents of the messages were also analyzed to determine if they reflected effective learning. The study found that there was not much evidence of collaborative learning and co-construction of knowledge. There was a high percentage of greetings and sharing of 'words of wisdom' compared to discussions on issues related to the lessons taught. It was also observed that they wrote much more in the reflection page than in the discussion forum.

Keywords: MOOC, interaction pattern, collaborative learning, knowledge co-construction

INTRODUCTION

Online courses are gaining popularity among higher education students as they offer flexibility, convenience and accessibility (Croxton, 2014). Online communication enhances learning both in distance and blended learning contexts. Participants who are some distance away, introverts or extroverts and of mixed abilities can all meet in a virtual learning environment to co-construct knowledge. Well-designed online courses can be as effective as face-to-face classes (Muilenburg & Berge, 2005). Despite their good designs, students' personal characteristics and abilities have been identified as among the barriers to effective adoption of this innovation. Factors such as motivation and aptitude may influence students' willingness to participate in such a course. The less motivated and the weaker ones are likely to drop out of the course (Levy, 2007).

For effective online learning to take place, both students and teachers have to change the way they interact to suit the online environment (Picciano, 2002). This involves their readiness to communicate in a non-linear manner (handling several discussions progressively and simultaneously), their willingness to share ideas, to collaborate, to handle information overload and to filter misinformation (Mackay, 1989; Picciano, 2002; Ruberg, Taylor & Moore, 1996; Sproull & Kiesler, 1991).

Members of a discussion group can join the online forum anytime and anywhere. They may respond to a specific idea or issue and stay within the thread. They may also start a new thread. Studies have found that this mode of communication can be disjointed since participants can choose to join, withdraw or ignore the 'conversation' (Stodel, Thompson & MacDonald, 2006; Thomas, 2002). Often the quality of postings made by students does not meet the objectives of the online activities which are supposed to mediate critical inquiry and produce a community of inquiry. "Keeping the discussion threads lively and informative is [indeed] a challenge" (Wishart & Guy, 2009, p.130).

PROBLEM STATEMENT

In a Massive Online Open Course (MOOC) environment where the interactions can involve thousands of participants, a long thread is expected with a myriad of views on any given subject. This provides a good opportunity for the participants to co-construct knowledge collaboratively. The large number of strangers communicating online can, however, make it more challenging to form a supportive bond of interaction (Yang et al., 2013). The lack of structure and support is said to limit the potential for learning (Mackness, Mak, & Williams, 2010). Maurino (2006) also reported that online discussions did not help to develop higher order thinking skills. Yet, more MOOCs are being developed including MOOC Malaysia which is the initiative of the Malaysian Ministry of Higher Learning. This is unique because all Malaysian public universities which offer common courses are expected to use the materials on MOOC as part of the course teaching materials. This study hopes to determine the extent to which the online discussions on these MOOCs promote collaborative learning and thus, co-construction of knowledge among the participants. Even though there have been a number of studies on the quality of interactions on online courses, more reports on the patterns of these interactions among Malaysian students are deemed necessary.

OBJECTIVES OF RESEARCH

Thus, the objectives of this research are:

1. to study students' pattern of interaction on four Malaysian MOOCs; and

2. to determine if the students' postings reflect effective learning.

BACKGROUND OF THE STUDY

MOOC was introduced to the students of the Malaysian public universities in Semester I, 2014/2015 starting from September 2014. Four universities were selected to offer the MOOC courses and these were:

1. Universiti Putra Malaysia (UPM) - Islamic and Asian Civilizations (*Tamadun Islam dan Tamadun Asia)*;

2. Universiti Teknologi MARA (UiTM) - *Introduction to Entrepreneurship*

3. Universiti Kebangsaan Malaysia(UKM) - Unity and Ethnic Relations (*Kesepaduan dan Hubungan Etnik)* ; and

4. Universiti Malaysia Sabah (UMS) - *Information and Computer Technology (ICT) Competencies*.

These are common courses at all Malaysian public universities (except for the International Islamic University, Malaysia). Thirty percent of the above courses were offered on the MOOC platform which covered five weeks of the semester. All faculty members at the 20 public universities who were teaching these courses were urged to use these resources to support their lessons.

Collaborative Learning via Social Networks

The mass of literature praises collaborative learning (either face-to-face or technology-aided) over individual learning for its educational benefits. This includes its potential to promote deep learning and higher thinking (Gokhale, 1995; Reeves, Herrington & Oliver, 2004; Garrison & Cleveland-Innes, 2005; Schellens & Valcke, 2005). Students play a more active role as they are made to be more responsible for their own learning (Soller, 2001; Veldhuis-Diermanse, 2002; Roschelle & Pea, 2002; Blasco-Arcas, Build, Hernandez-Ortega & Sese, 2013). Working collaboratively with peers in small groups, each member shares a common academic goal. The success of the group relies very much on the contribution of each individual in the group (Gokhale, 1995; Trentin, 2009; Judd, Kennedy & Cropper, 2010). Students are given more control and leeway to determine what and how to learn (Panitz, 1999; Estes, 2004) especially with the changing role of the teacher from the authoritative figure to a facilitator in the learning process (Sormunen, Alamettälä & Heinström, 2013).

With the advent of Computer Supported Social Networks (CSSNs), more interaction can be encouraged. Asynchronous communication via

social networks enables more participation as participants are free to contribute whenever they are ready. Despite all the benefits, Inaba and Mizoguchi (2004) contend that it is the quality of interaction among learners, which is greatly dependent on a learner's knowledge and/or cognitive states, that determines the educational benefits that the learner gets through the collaborative learning experience.

Co-construction of Knowledge via Social Networks

Co-construction of knowledge involves individuals internalizing knowledge from socially mediated group discourse or activities (Vygotsky, 1978; 1986). The co-construction of knowledge among diverse participants is further heightened by Computer Supported Social Networks (CSSNs). Computer mediated communication can be accessed and elaborated on by others at different times and places in a manner not possible with face-to-face communication. It would give the impression that the dispersed group members are actually together. In other words, members feel the "social presence" of other individuals even though they are not physically together. The social networks support information exchanges, thus offering the conditions for treating knowledge as an object of inquiry. "People can easily post a question or comment and receive information in return. Broadcasting queries through CSSNs increase the chances of finding information quickly and alters the distribution patterns of information. It gives those working in small or distant sites better access to experienced, skilled people" (Wellman, 1996, p.2).

Hence, a point to remember, for co-construction of knowledge to occur via the social networks, dialogues elicited in the computer-mediated learning environment should have potential for result in activities, and reflection on these activities is viewed as development. Knowledge building according to Scardamalia and Bereiter (1996) requires that participants work on the creation and improvement of ideas. Thus, exchanges of meaningful ideas are sought as they constitute quality discussion threads that promote critical thinking and self-regulatory learning (Vonderwell, Liang & Alderman, 2007; Rizopoulos & McCarthy, 2008-2009). The role of a moderator should then be "…one that structures initial problem tasks for the group, and continually follows group discussions, ready to respond to participants when the time is appropriate for them to move to higher levels of engagement" (Hull &

Saxon, 2009, p.627). Participants, on the other hand, are to put significant thought and effort into the discussions by posing good questions and responding with clarity to help reinforce their own understanding and that of their peers (Maurino, 2006; Zingaro, 2012).

Collaborative Knowledge Construction Interactions

An online forum is said to be very useful in encouraging participating learners to actively engage in discussions and collaboratively construct their knowledge with their peers and instructor (Roschelle et al., 2000; Knowlton, 2001). Anderson and Kanuka (1997) argued that online forums can be a useful medium for group collaboration. Thanasingam and Soong (2007) also reported higher mental functions and better understanding of concepts as students critically asked and answered questions, expressed opinions, stated disagreements, provided clarification comments and negotiated knowledge.

There are also some findings which indicated higher phases of co-construction of knowledge though online collaboration was difficult to achieve. Sing and Khine's (2006) content analysis of students' online interactions revealed that the students did not aggressively respond to challenge or negotiate knowledge but were more actively asking/answering clarification questions and suggesting ideas for improvement. Similar findings were also found in studies by Schellens and Vackle (2005) and Zhao and Rop (2001).

Culture and Online Interactions

Students' cultural background can also influence their manner of interacting online (Yang et al., 2014). Chinese students for instance have been found to be concerned with maintaining their own "face" or status in social settings and thus, would choose to be quiet until they were sure that they were correct (Hwang, 1987; Tarone & Yule, 1989; Liu & Littlewood, 1997, Yang et al., 2014). They would also make sure that they preserved other's face. Consequently, they would avoid public criticism. Kim and Bonk (2002) who studied asynchronous discussions of students from Korea, America and Finland discovered similar findings. They reported that the Koreans were more social compared to the Americans and Finnish students. Lampert and Ball (1999) explained that due to culture, some online course

participants tend to offer mostly nice comments as they tried to avoid anything perceived to be disrespectful or confrontational. Effects of culture on interactions can only be overruled by an individual's personality (Neyer & Harzing, 2008).

METHOD

This study analyzed the messages posted on the first four Malaysian MOOCs. The units of analysis for synchronous discussion forums vary from messages, paragraphs and sentences to illocutions (Rourke et al., 2001). In order to evaluate the knowledge construction process, Pena-Shaff and Nicholls' (2004) instrument was used in this study. The theoretical framework for this instrument is based on the social constructivist learning theory. According to them, statements of clarification, interpretation, conflict, assertion, judgment and reflection are more directly related to the process of knowledge construction. Pena-Shaff and Nicholls (2004) also claimed that, "By posing questions, elaborating on the ideas presented, debating and interpreting their own statements and those of others, students explored the course topics, reaching their own interpretations about the social, psychological and ethical issues related to CMC." (p.252)

Participants

The participants of the study consisted of students who participated in the first four MOOCs that were offered by the four selected universities. In many cases, it was not known which university they belonged to since only their names appeared on the screen. As of 25th April 2015, the total number of students who registered for these MOOCs was 25,896 for *Islamic and Asian Civilizations;* 24,111 for *Unity and Ethnic Relations;* 13,201 for *Introduction to Entrepreneurship;* and 6,961 for *Information and Computer Technology (ICT) Competencies*. The duration of this study for each of the subjects is given in Table 1 below:

Table 1: Duration of Study

	Subjects	Duration of Study
1.	*Introduction to Entrepreneurship*	14/9/2014 – 31/3/2015
2.	*Unity and Ethnic Relations*	28/2/15 – 1/4/2015
3.	*Islamic and Asian Civilizations*	25/3/2015 - 31/3/2015
4.	*Information and Computer Technology (ICT) Competencies.*	23/3/2015 - 31/3/2015

Data Collection

Data for this study consisted of the postings on the selected MOOCs particularly to gather information on discussion threads and knowledge construction indicators.

FINDINGS OF STUDY

The postings on *Introduction to Entrepreneurship* were analysed from 14/9/2014 – 31/3/2015. Since these lasted for nearly two semesters, two cohorts of students from each of the universities were involved in the study. This course was observed for a longer period of time because the course was compulsory in all the twenty public universities in Malaysia. Though about 13,000 students registered for the course, only 1,680 participated in the online forum. All greeted the rest using various forms of greetings which included 'Hi!' and '*Assalamualaikum*'. Out of 1,680 prompts, there were only 300 responses, and out of these, only 164 lead to discussion threads. However, only nine of the discussion threads were organized around the lessons. Others fall under what Pena-Shaff and Nicholls (2004) categorise as *'Other'*, which were messages that were difficult to categorize and social statements. These would include social comments not related to the discussion such as greetings and jokes. There were no elements of interpretation, conflict, assertion, judgment and reflection in the whole period of discussions.

Although this course was taught in English, most of the discussions were held in Malay. One of them asked:

S411 -..... now I do not doubt yet...atau ada sesiapa lagi yang nk meyakinkan saya.....please reply...kenapa ye dia guna dalam bahasa inggeris? sedangkn belajar dlm bahasa melayu, betul tak?...make me feel so confused…

(S411 in response to S514 – Note nobody responded to this question)

Just as the above, many of the questions were not responded to. There were very few inquiries, and yet nobody responded to the inquiries. One of them was:

hello..just wanna ask..how do we know if our lecturer give an assignment? until now i cant found anything

(StudentS542)

An almost similar pattern was observed in *Unity and Ethnic Relations* MOOC. Language seemed to be an issue as well, as mentioned by a few participants:

Table 2: Language Issue

Prompt		Reply
Assalamualaikum dn salam sejahtera... nk tanya knp subjek hubungan etnik xde dalam bahasa inggeris????? Bila lg nk memperkasakan bahasa Inggeris kalau mcmnie (Peace be upon you…would like to know why Ethnic Relations subject is not in English? When are we going to improve our English?	S1	kalau semua nk guna bahasa inggeris..bahasa melayu nk guna buat ape (if English is used in all aspects…what are we going to do with Malay language?)
	S62	bahasa melayu just utk komunikasi jela.....subjek etnik biar dlm bahasa inggeris...bru perkasa (Malay language is just for communication…Let Ethnic Relations be in English… then it can be strengthened)

As in the *Entrepreneurship* course, very few of the discussions threads were seriously on the lessons. Less than ten of them were related to the course. The content did not require any interpretation, and there were no elements of conflict, assertion, consensus building and judgment. Some

comments were cynical and government service tax (GST) seemed to be an issue of interest to them. They seemed to share the same feeling on certain issues which included GST.

Table 3: Current Issues in the *Entrepreneurship* Course

No.	Prompt	Reply
1.	"Rakyat didahulukan, Pencapaian diutamakan". Apakah slogan selepas GST? ("People first, achievement is prioritized". What is the slogan after GST?)	Politik! Politik! Politik! (Politics, Politics, Politics)
		kita hidup mesti politik aa kawan. Hahaha (We cannot live without Politics, my friend. Ha…ha…ha…)
		Apa nie? Nk berpolitik ke? (What is this? Are you politicking?)
		nak tau pendapat je pung. Hahaha (Just would like to know your view.)
		bahya ni ada bau2 politik..kne tngkap t..hahaha (This is dangerous… there are elements of politicking…you will be caught).
		hahaha.... problem besar dh nie!!!!! (…this is a big problem)
		hahahaha
2.	Lagi 3 hari akan bermula sistem GST di Malaysia ini, makanya saya ingin bertanya sedikit kepada rakan-rakan disini, apakah pandangan rakan-rakan terhadap GST dan bagaimana GST dapat membantu menaikkan sumber ekonomi Malaysia? (The GST system will be implemented in 3 days. So I would like ask fellow friends, what is your opinion on GST and how does GST help to improve Malaysian economic resources?)	Tapi di Malaysia negara yg mempunyai petroleum, sawit, getah dan segala mcm sumber tapi rakyat tetap kena GST. Ini sbb rasuah, ketirisan dan kronisme yg tinggi di Malaysia dan yg tanggung adalah rakyat. Harga kereta mahal, rumah mahal, pendidikan tidak percuma, harga barang mahal dan semua benda mahal. Hutang negara hampir mencecah 500 bilion ringgit. Cukai GST menjadikan yg kaya semakin kaya yg miskin mcm gua ni semakin miskin. Sbb itu kita patut tolak GST (But in Malaysia we have petroleum, palm oil, rubber and many other resources and yet the people still have to pay the GST. This is because of bribery, lack of integrity and cronyism in Malaysia and the people have to bear the cost. Cars and houses are expensive. Education is not free, the price of goods is expensive and everything is expensive. The country's debt amounted to RM500 billion. The GST makes the rich richer and the poor like me poorer. That is why we have to reject GST.
		Saya fikir sumber ekonomi Malaysia akan meningkat kerana cukai merupakan salah satu sumber ekonomi negara. Walau bagaimanapun, cukai akan menaikkan harga barangan itu sudah pasti dan apabila harga barang meningkat, rakyat yang hidup susah akan bertambah susah (I feel that the Malaysian source of income will increase because tax is one of the country's income. However, tax will surely increase the price of goods and the poor will be poorer.)
		belilah iphone sekarang..hehehehe (Better buy a iphone now.... hehehehe)

The nature of discussions on *Information and Computer Technology (ICT) Competencies* course was different from the first two MOOCs in that many videos were uploaded to explain certain topics and the discussions were more in the form of quizzes rather than interactions.

Table 4: Responses to an Uploaded Video

Prompt	Reply
Part 1: What is Open Source?	good explanation
	good
	smooth explanation
	reasonable explanation and analogy
	good
	good
	nice one
	nice
	good

In the *Islamic and Asian Civilizations* course, more Arabic greetings/replies were utilized, which included "*Assalamualaikum*" and "*Waalaikumussulam*". The discussion was more serene in nature, with more quotable quotes and words of wisdoms being uploaded. The participants were in agreement with each other on most of the issues. The following are some of the examples of the discussions:

Table 5: A Discussion on Religion

No.	Prompt	Reply
1.	Jika hati tertoreh, bukan darah yg mengalir tetapi Air mata yg mengalir.. hebat ciptaan Nya... (: (If your feelings are hurt, it is not blood that flows but your tears will drop.. How great is His creation)	subhanAllah (Glory be to Allah)
		subhanaallah... (Glory be to Allah)
		btol tuu..subhanallah..^_^ (That is right. Glory be to Allah)
		Btl2..mukin air mata lagi laju mngalir dr darah yg mengalir...(That is right, maybe eye drops flow faster than blood)
		Luka dalaman lagi parah dari luka luaran juka x dirawat... chewahh..m :D (Internal bleeding is worst than external bleeding if not treated)
		^_^
		ngantukkk…(I feel sleepy)
		Tidur… (Sleep)

DISCUSSION OF FINDINGS

The results show that there were very few complex threads of discussions. Unlike Pena-Shaff and Nicholls' (2004) findings, not many of the threads extended over several days or several weeks. The lack of depth in the discussions could be one of the reasons for the lack of interest in discussing the issues at hand. One thing that the students exhibited in common was the importance of saving one's face in their culture. This might have inhibited them from debating a topic openly in a public forum. This seems to be in line with Yang et al.'s (2014) proposition that students' cultural background influences the way they interact online.

It was also observed that the sentences or rather the messages were short and there were elements of textisms where spellings were abbreviated. 'Proper' English was hardly used, and this could be due to students' lack of proficiency in the language. As stated by Levy (2007) their personal characteristics and abilities may be the barriers to effective learning. The minimal elements of co-construction of knowledge could also be due to the lack of effort to 'adjust' the formal interactions to suit the online learning environment (Picciano, 2002).

CONCLUSION

The fact that all the public universities were willing to share their resources by offering them on MOOC mode was an important milestone for the institutions involved. It also reflects a changing trend in Malaysian higher education. This calls for a paradigm shift in the way learning is approached. However, the study has revealed that the online activities have, so far, failed to initiate, mediate, or sustain higher phases of co-construction of knowledge. The postings analyzed in this study hardly reflect effective collaborative learning and critical thinking. In order to produce a community of inquiry there is a need for a greater involvement of the instructors and curriculum designers to ensure that the discussions are well crafted to maximize co-construction of knowledge at higher levels of thinking. In order for students to take the activity seriously, the assessments and evaluation process of their online activity must be factored into the process as students are known to be very concerned about their evaluation and this may trigger more higher level, subject oriented discussions.

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Engaging Students of Low Proficiency Level in Writing Classes by Using Wallwisher Tool

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ABSTRACT

Recent online development of learning tools such as Wallwisher can be used to enhance student engagement in the classroom especially in writing classes. Some problems encountered when teaching low proficiency students relate to the application of the knowledge gained in classrooms and to write more using this tool. Two categories of student engagement in classroom that work as the base for this study as outlined by McCarthy (2012) are self-interactions and student instructor interactions. Data were collected from 22 pre-diploma students who were enrolled in a business course and were obliged to pass an English course as a prerequisite for them to enroll in diploma courses. Students' levels of engagement were coded using Perkins and Murphy's (2006) instrument and later, four students were subjected to informal interview sessions for further investigation of phenomena.The responses recorded that they would be more participative and engaged with their learning materials and online technologies if they were being graded. It is vital to create active learning situations among the students which will assist them in applying the skills that they have learned in daily situations.

Keywords: active learning, informal interview, learning tools, students' engagement, writing courses.

INTRODUCTION

New technologies provide us with better learning tools like Web 2.0 technology which can empower instructor visibility in the classroom. Many studies have been carried out all around the world which prove the effectiveness of this recent technology (Anzai, 2012; Aoki & Molanar, 2010). It is also suggested by Oakley (2012) that the use of Web 2.0 will increase student motivation and creativity in promoting the culture of independent learning, thus providing more opportunities for students to explore and gain knowledge from the virtual realm. Other scholars like Skocko (2012) also shared the same view that this technology will encourage student centered learning to cater for students' educational needs.The instructor plays a vital role to enliven the class environment and to assist in expanding the face-to-face learning situation. The creativity of the classroom instructor is important in implementing eclectic methods to integrate Web 2.0 elements in promoting more conducive, modern and futuristic teaching and learning (T & L) (Shabudin et al, 2014). For classes with large student numbers, correcting each and every single sentence of students' written assignments and tasks will be far from possible. Engaging students in online writing courses would be a good alternative to ensure their motivational level throughout the 14 weeks of the semester.

Jennings and Angelo (2006) have defined student course engagement as "the amount, type, and intensity of investment students make in their educational experiences" (p.6). Their definition concurs with Coates (2007) who viewed student engagement as "active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational experiences, and feeling legitimated and supported by university learning communities" (p.122). This means that students' involvement in learning is enhanced with additional active interaction with academic staff and the university learning communities which include their peers. In looking at student engagement, Macquarie University (2009) stated that it is 'the extent or quality with which students are committed and actively involved in their learning'. It can be concluded that student engagement is the most important element in any learning environment and students need to be actively involved and participative in creating their own meaningful educational experiences.

Active learning as elaborated by Embi et al. (2012) involves i) the input or delivery of learning content ii) the process or learning activities iii) the output or learning evaluations. In making sure students are highly motivated to participate in learning activities, it is highly recommended that the more complex the learning activities are, that is, in terms of thought and effort, the greater the interaction with the content. This will then record a better result in greater retention of the course content materials. Aligning with this view, the researcher utilized both more traditional learning tools like 'Spell-it-Out-Loud' before implementing the more recent learning tool that is Wallwisher for the purpose of this research.

Wallwisher is a useful and advanced web-based tool which allows students to post their thoughts or responses on a particular topic or questions posed by the teacher using electronic sticky notes on a shared digital wall (Embi et al, 2012). The students would find it interesting as they can incorporate some images, audios and videos related to that particular topic. Students are required to click on appropriate web address links to access information and this tool is similar to other social media such as Facebook. The maximum number of characters on the electronic sticky notes is 160 which will ensure students' engagement in any topic in that particular class. Some of the ways how Wallwisher can be used to enhance learning is elaborated extensively by Embi et al. (2012) especially in writing classes, include brainstorming ideas on particular topics, assessing students' understanding of a concept in a formative manner, getting students to summarize their understanding of learning and allowing students to pose questions on areas that are still vague and unclear.

LITERATURE REVIEW

In locating theories on student engagement, the most significant framework which has its base in the United States lies in the National Survey of Student Engagement (NSSE, 2005a). This framework was the first explicit model of university student engagement and integrates widely accepted higher education practices and policies. Five dimensions are outlined in the framework; level of academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, and supportive campus environment. An essential and adequate range of

the educationally important qualities of the university student experience has been captured in these dimensions.

Having conducted a study on campus based early year students' engagement in this study, Coates (2006) conceptualized nine qualities derived from that particular study: constructive teaching, supportive learning environments, teacher approachability, student and staff interaction, academic challenge, active learning, collaborative work, beyond class collaboration and complementary activities. In a more contemporary and recent campus based study, online learning is also being acknowledged and accepted as playing a formative role thus making Coates (2006) propose an additional seven qualities of the online dimensions of campus based study: online engagement, online active learning, online academic relevance, online teaching, online collaboration, online social interaction, and online contact with staff. The results from this study show that it provides an interpretive context for diagnosing and setting the benchmark for student engagement.

Recognizing that higher education is now embracing more digital communication often using online applications, it is undoubtedly important to utilize such applications to enhance reading and writing skills which can be supplemented with images, music, sound and graphics. These new applications are not aligned to our educational policies and national testing as the focus is more on skills related to reading of print based texts. This is the challenge for literacy educators to consider ways how digital technologies can be incorporated within classroom literacy and to what extent it can adhere to the educational policies and national testing. Looking at how essential rich, imaginative and cultural knowledge is, multiliteracies (Cope & Kalantzis, 2000; Unsworth, 2001; Healy 2008) are then viewed to be the crucial proficiencies for communication in a more modern world. This is an essential step to ensure student engagement in classroom activities while being cooperative and collaborative.

For this study, the model of multimodal literacy as represented by Walsh (2010) as shown in Figure 1 was used. It depicts the interrelationship between different texts, mediums and modes that includes traditional and digital features that tested all four skills; speaking, listening, reading and writing.

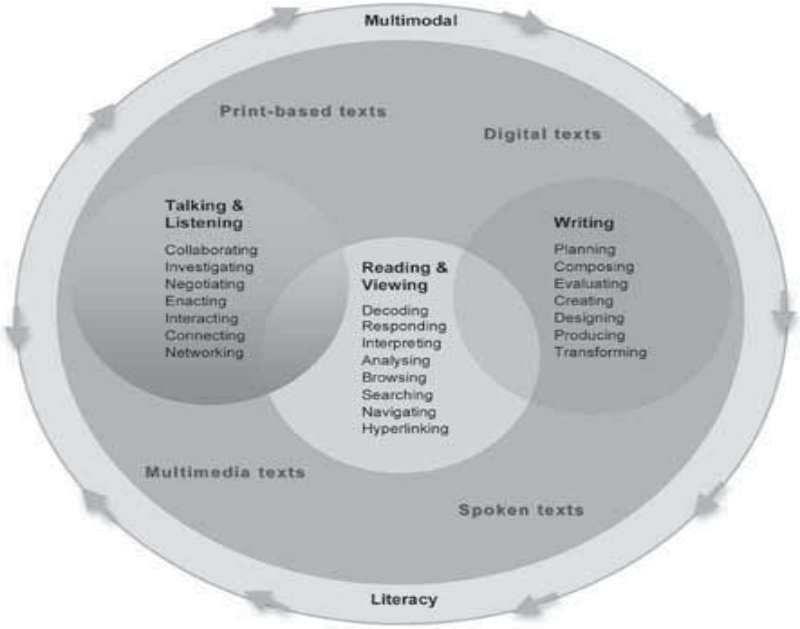

Figure 1: Multimodal Literacy in Classroom Contexts

The diagram shows the interchangeable resources such as spoken, print, digital, and multimedia texts that occur within the classroom settings as operating within the context of multimodal literacy. Students are first given some reading materials or even videos for them to respond to by writing about them. The three smaller circles within the diagram shows the interdependency and fluidity between these language skills and literacy practices. Specific terms are listed under the categories of talking and listening, reading and viewing and writing to demonstrate those practices that normally take place. Other terms are also proposed by Walsh (2010) to show further practices that happen in digital communication. The terms are not definitive but are useful as an initiative to demonstrate ways language and literacy practices work in developing further dimensions within new communication environments.

In this study, the researcher utilized theories on student engagement according to McCarthy (2012) who categorized two types which are; student with self interactions and students with instructor interactions. The first type

of interaction serves the students at the pre-stage sessions. For the first few weeks of the course, the instructor is expected to make the students feel at ease with the classroom environment and the way it is being conducted. It is a norm for Malaysian students to be quite passive for that period of time as they hardly know their classmates. They are normally shy to participate in classroom activities as they are afraid that their friends would laugh at them if they respond wrongly. The educators would probably opt for a simple and easy lesson to get the students thinking about any particular topic given using some of the terms from the introductory classes, and to get them to process all the information from the previous classes.

The second type of interaction is elaborated by McCarthy (2012) as observed to happen during formal and informal feedback. The learners can be given graded assignments that allow them to work on revision in this form of interaction. After few weeks of conducting lectures and tutorials with the students, they would surely have become comfortable with the classroom environment. Web 2.0 technologies like Wallwisher tool is then viewed as an appropriate online application that would allow students to share their thoughts about any particular topic that they have learned. The usage of this tool in teaching and learning will enhance students' confidence level to express their thoughts and ensure them that they are on the right track. All students enrolled in that course could then be given equitable treatment and no one would be left out or passive. A very straightforward example is the use of outlines for writing essays: "Create an outline of three idea charts to support the most important ways that we enhance our writing skills. Include a common, summary reflection." This assignment indicates how well the student has integrated the writing assignment into his or her understanding of the course topic.

The existence of these two types of interaction as outlined by McCarthy (2012) were observed in this study based on the data collected from 22 pre-diploma students focusing on the students' engagement in writing classes. They were enrolled for one semester with the minimum requirement of three credits in the Malaysian school leaving national examination *Sijil Pelajaran Malaysia* (equivalent to the GSE O level) including *Bahasa Melayu* and had passed Mathematics and English. They were not offered any other places to further their studies at the tertiary level. They were obliged to pass the English course at the pre-diploma level as a prerequisite for entry

into diploma level courses. These students' English language proficiency level was considered to be weak with only a few of them who could write well in the class. This study aimed to investigate the literacy strategies that the students needed to master writing skills with multimodal texts and to identify the most appropriate pedagogy for a more current approach to teaching writing to these students. Across different curriculum areas, educators can work to develop integrated programs combining all needed skills like responding to viewing, writing and producing texts.

METHODOLOGY

In this study, students' levels of engagement were coded using Perkins and Murphy's (2006) model. The rubric measures individual engagement in an online discussion on a particular topic or lesson. This model is deemed satisfactory to cater for both asynchronous and synchronous modes of communication for different levels of engagement, as illustrated by students' varying levels of critical thinking questions and comments.

Table 1: Perkins and Murphy's (2006) Model in Identifying Engagement in Critical Thinking

Engagement Category	Indicators				
Clarification: All aspects of stating, clarifying, describing (but not explaining), or defining the issue being discussed.	Proposes an issue for debate.	Analyzes, negotiates, or discusses the meaning of the issue.	Identifies one or more underlying assumptions in a statement in the discussion.	Identifies relationships among the statements or assumptions.	Defines or criticizes the definition of relevant terms.
Assessment: Evaluating some aspect of the debate; making judgments on a situation, proposing evidence for an argument or for links with other issues.	Provides or asks for reasons that proffered evidence is valid.	Provides or asks for reasons that proffered evidence is relevant.	Specifies assessment criteria, such as the credibility of the source.	Makes a value judgment on the assessment criteria or a situation or topic.	Gives evidence for choice of assessment criteria.

Inference: Showing connections among ideas; drawing appropriate conclusions by deduction or induction, generalizing, explaining (but not describing), and hypothesizing.	Makes appropriate deductions.	Makes appropriate inferences.	Arrives at a conclusion.	Makes generalizations.	Deduces relationships among ideas.
Strategies: Proposing, discussing, or evaluating possible actions.	Takes action.	Describes possible actions.	Evaluates possible actions.	Predicts outcomes of proposed actions.	

The goal of this study is to provide a meaningful learning experience for the students who enrolled in a writing course. Data was obtained from students (n=22) at the researcher's university in Penang, Malaysia. Going by the students' school based national exam results, the researcher had already established that the level of the students' proficiency was low and the expectation should not be as high as with diploma students. The syllabus for this batch of students tested all the four skills but the focus was more on reading. The final skill which is writing was embedded in the more complex and difficult level of the lesson by using Wallwisher tool. The researcher collected the data on weeks 3, 6, 9 and 12 of the semester. The reason for the data collection in these four weeks was because reading and writing (as the post-activity) classes were held on these weeks. The students had critical reading practice which would then be applied in the writing activities in weeks 1, 2, 4 and 5. In weeks 3 and 6, the students were given texts and required to do a post activity of "Spell-it-Out-Loud" to enhance their vocabulary and to work in pairs to write an outline. This component, writing an outline, would be tested during the on-going assessment. This activity was conducted using the traditional approach to make the students feel more comfortable with the classroom environment. Bearing in mind that this group of students were experiencing classes in university for the first time, they were given easier and 'less-threatening' activities. Below are the two tables that show the observations made on the levels of engagement in weeks 3 and 6 of the semester for the pre-diploma classes.

Table 2: Testing the Students' Understanding on the Reading Text (Unit 3)

Engagement Category	Clarification: All aspects of stating, clarifying, describing (but not explaining), or defining the issue being discussed.				
Explanation	Proposes an issue for debate.	Analyzes, negotiates, or discusses the meaning of the issue.	Identifies one or more underlying assumptions in a statement in the discussion.	Identifies relationships among the statements or assumptions.	Defines or criticizes the definition of relevant terms.
Number of students:				4	18
Engagement category	**Assessment:** Evaluating some aspects of the debate; making judgments on a situation, proposing evidence for an argument or for links with other issues				
Explanation	Provides or asks for reasons that proffered evidence is valid.	Provides or asks for reasons that proffered evidence is relevant.	Specifies assessment criteria, such as the credibility of the source.	Makes a value judgment on the assessment criteria or a situation or topic.	Gives evidence for choice of assessment criteria.
Number of students				2	20
Engagement Category					hypothesizing
Explanation	Makes appropriate deductions.	Makes appropriate inferences.	Arrives at a conclusion.	Makes generalizations.	Deduces relationships among ideas.
Number of students				2	20
Engagement Category	**Strategies:** Proposing, discussing, or evaluating possible actions				
Explanation	Takes action.	Describes possible actions.	Evaluates possible actions.	Predicts outcomes of proposed actions.	
Number of students			3	19	

Table 3: Testing on the Students' Understanding on the Reading Text (Unit 6)

Engagement Category	Clarification: All aspects of stating, clarifying, describing (but not explaining), or defining the issue being discussed.				
Explanation	Proposes an issue for debate.	Analyzes, negotiates, or discusses the meaning of the issue.	Identifies one or more underlying assumptions in a statement in the discussion.	Identifies relationships among the statements or assumptions.	Defines or criticizes the definition of relevant terms.
Number of students:				6	16
Engagement category	**Assessment:** Evaluating some aspects of the debate; making judgments on a situation, proposing evidence for an argument or for links with other issues				
Explanation	Provides or asks for reasons that proffered evidence is valid.	Provides or asks for reasons that proffered evidence is relevant.	Specifies assessment criteria, such as the credibility of the source.	Makes a value judgment on the assessment criteria or a situation or topic.	Gives evidence for choice of assessment criteria.
Number of students				4	18
Engagement Category					hypothesizing
Explanation	Makes appropriate deductions.	Makes appropriate inferences.	Arrives at a conclusion.	Makes generalizations.	Deduces relationships among ideas.
Number of students				3	19
Engagement Category	**Strategies:** Proposing, discussing, or evaluating possible actions				
Explanation	Takes action.	Describes possible actions.	Evaluates possible actions.	Predicts outcomes of proposed actions.	
Number of students			5	17	

Based on these two tables, the researcher plotted in the number of students who had engaged in the categories of clarification, assessment, inference and strategies. The majority of the students fell under least

engaged for all the categories. They were not that critical in reading and not analytical in their writing as well. The activities required a long duration to be completed in order to ensure every student could be tested on the 'Spell-it-Out-Loud" activity and also to present their outline in pairs in front of the class. It was observed that the students who had completed their presentation did not focus on their friends' presentation. While waiting for their turn, some pairs were busy preparing themselves memorizing words and discussing their outlines with their partners. Plotting the numbers into these categories was done based on the researcher's perception and limited to the researcher's capability to listen to several pairs' discussion. Hence, the researcher might have missed out on important points in their discussion. When the researcher attempted to have a class discussion on the topic, the students hardly responded which is why the researcher got the students to work in pairs and and participate in the 'Spell-it-Out-Loud' and writing an outline activity.

The scenario differed for weeks 9 and 12 as the students were involved in Web 2.0 technology using the Wallwisher application. It was easy to spot how participative they were in this activity conducted in the classroom. The researcher initiated a synchronous discussion just to make sure everyone paid attention to the activity and to give opportunities to all participants to actively voice their thoughts and opinions. This can be seen from the pop-up notes on the wall which got responses from others who wanted to share their point of view and who had not been part of the discussion.

Table 4: Testing on the Students' Understanding on the Reading Text (Unit 9)

Engagement Category	Clarification: All aspects of stating, clarifying, describing (but not explaining), or defining the issue being discussed.				
Explanation	Proposes an issue for debate.	Analyzes, negotiates, or discusses the meaning of the issue.	Identifies one or more underlying assumptions in a statement in the discussion.	Identifies relationships among the statements or assumptions.	Defines or criticizes the definition of relevant terms.
Number of students:			2	6	14
Engagement category	**Assessment:** Evaluating some aspects of the debate; making judgments on a situation, proposing evidence for an argument or for links with other issues				
Explanation	Provides or asks for reasons that proffered evidence is valid.	Provides or asks for reasons that proffered evidence is relevant.	Specifies assessment criteria, such as the credibility of the source.	Makes a value judgment on the assessment criteria or a situation or topic.	Gives evidence for choice of assessment criteria.
Number of students			1	5	16
Engagement Category					hypothesizing
Explanation	Makes appropriate deductions.	Makes appropriate inferences.	Arrives at a conclusion.	Makes generalizations.	Deduces relationships among ideas.
Number of students			2	8	12
Engagement Category	**Strategies:** Proposing, discussing, or evaluating possible actions				
Explanation	Takes action.	Describes possible actions.	Evaluates possible actions.	Predicts outcomes of proposed actions.	
Number of students		4	8	10	

Table 5: Testing on the Students' Understanding on the Reading Text (Unit 12)

Engagement Category	Clarification: All aspects of stating, clarifying, describing (but not explaining), or defining the issue being discussed.				
Explanation	Proposes an issue for debate.	Analyzes, negotiates, or discusses the meaning of the issue.	Identifies one or more underlying assumptions in a statement in the discussion.	Identifies relationships among the statements or assumptions.	Defines or criticizes the definition of relevant terms.
Number of students:		1	3	6	12
Engagement category	**Assessment:** Evaluating some aspects of the debate; making judgments on a situation, proposing evidence for an argument or for links with other issues				
Explanation	Provides or asks for reasons that proffered evidence is valid.	Provides or asks for reasons that proffered evidence is relevant.	Specifies assessment criteria, such as the credibility of the source.	Makes a value judgment on the assessment criteria or a situation or topic.	Gives evidence for choice of assessment criteria.
Number of students			3	5	14
Engagement Category					hypothesizing
Explanation	Makes appropriate deductions.	Makes appropriate inferences.	Arrives at a conclusion.	Makes generalizations.	Deduces relationships among ideas.
Number of students		2	3	6	11
Engagement Category	**Strategies:** Proposing, discussing, or evaluating possible actions				
Explanation	Takes action.	Describes possible actions.	Evaluates possible actions.	Predicts outcomes of proposed actions.	
Number of students	1	4	7	10	

All the four tables indicate the analysis of the discussion in determining various levels of student-to-student engagement in more traditional and current ways using Wallwisher tool. Increasing numbers of student

engagement according to Perkins and Murphy's (2006) model shows the preference of students for using more recent technology like Web 2.0 tool in their learning. The notes appearing at the Wall generated during the synchronous teaching observations were analyzed in a similar manner using content analysis. The researcher had conducted an independent analysis of the data to decide the level of students' engagement in their responses during discussion.

As for further investigation for this study, the researcher used a qualitative design incorporating learning and research influenced by UKLA *Reading on Screen Report* (Bearne et al., 2007). That survey had investigated students' literacy activities outside the school in order to consider how these activities might be impacting on students' literacy learning in school. Thus, the researcher used this model to observe if a similar trend occurred in first year university students with low proficiency level but who had become familiar with digital texts. Some digital and mobile technology like instant messaging, online gaming and social networking are technological applications that could enhance student engagement in classroom activities. This relates to the challenges that educators need to face in maintaining students' motivation to engage in learning activities. Thus, to obtain some response on this issue, four students were selected to participate in informal interview sessions. Some of the responses are summarized in the table below.

Table 6: Responses from the Informal Interview Sessions

Students' responses about their feelings and suggestions in conducting classroom activities
1. They prefer reading for entertainment and not for academic purposes.
2. The reading texts could possibly include some images and be colorful together with some movements. (online version)
3. The reading texts should use simple language and can be understood easily.
4. To do more role play activities from the reading texts.
5. To have complete facility so that all of them can have online discussion in that particular class.
6. They will be more confident if they can record the materials to be presented and to be more prepared.
7. To have in pairwork as to allow them to discuss before posting at the Wall in Wallwisher.

8. To be able to get to know the correct answer or view of their lecturer in Wallwisher.
9. Letting them know that activities from reading texts are being tested and graded.
10. Reward them with permission to play online games after they have finished their work.

RESULTS AND DISCUSSION

This study contributes to higher education research by developing a study of pre-diploma student engagement. The data calls for the needs of literacy to be redefined within current curriculum contexts. In order to retrieve information from the reading texts, the students were seen to investigate and apply strategies to solve language activities by using images and sounds and some keywords given. They were observed to successfully apply their understanding to obtain information online even more than in printed texts. This is what Walsh (2010) claims as 'orchestrating the different modes to make meaning'. This scholar's opinion concurs with Lawless and Schrader (2008) who presented insights into the processes of navigating hypermedia in cyberspace environments using both intertextual and intratextual characteristics. Understanding how we read on screen especially utilizing Web 2.0 technology like Wallwisher includes the process of responding to animated icons, hypertext or hyperlink, and sound effects while dealing with the aspect of continuity in pathways between and within screens for internet and intranet.

In order to understand how online experiences play a critical role in contemporary campus-based learning, Coates (2006) reflected on three main dimensions that show how first year students engaged online. The first dimension refers to web and computer software usage with the aim of supporting learning and accessing resources. Meanwhile, the second dimension focuses on the role of ICT in facilitating more independent and self-initiated learning which contrasts with the final dimension of online engagement which aims for communicating and building communities using ICTs. This study can be categorized within the first dimension as outlined by Coates (2006). This is because the students' engagement in this study was only limited to accessing the video linked to Wallwisher and to respond to the application of the Web 2.0 technology. For future research, students

with a higher proficiency level can be studied, where they are allowed to explore the second and third dimensions as in encouraging them to work more independently and even to communicate among themselves and create their own community.

CONCLUSION AND IMPLICATIONS

A thorough analysis of the data from the coded model by Perkins and Murphy's (2006) and informal interview sessions with the targeted students presents the Malaysian perspective on student engagement especially in using online learning tools with the focus on very low proficiency level first year university students. This study directs attention to the importance of developing a broader comprehension on engagement and to redefine and reshape policy and practice in accordance with the syllabus and to consider demographic factors with the changes that the students will face over time through their undergraduate studies.

The skill of responding prior to the reading texts provided by the instructor in the class can be seen from the language production in terms of how they write about their views and comments using Wallwisher application. It was observed that the students interacted with texts together with the other students and also their instructor. Being literate is not only limited to being able to read, understand and write but is also essential for online interaction skill. This includes multisensory activities as mentioned by Walsh (2010) as "searching, viewing, browsing, scrolling and navigating together with clicking and scrolling of a mouse, responding to animated icons, hypertext, sound effects, and the continuous pathways between and within screens".

The findings from this study reveal some important points that require reconsideration when structuring and implementing a syllabus in the classroom. It is vital to create active learning situations among the students to assist them to apply the skills that they have learned. Active learning is the key to success and this can be achieved if we continue to blend the more current and traditional approaches in the teaching and learning process. The most important consideration for instructors is the need to adapt classroom communication with digital communication practices

outside allocated classroom periods in order for this to be significant in the future for the students. The biggest challenge that instructors might have to deal with will be to incorporate digital communication technologies that cover basic aspects as mentioned by Walsh (2010) as reading, writing, language learning, grammar, spelling and punctuation. All of these language elements are being tested in the syllabus of the course taught, thus, we need to consider their incorporation into curriculum setting to be aligned with our teaching and assessment. The key point of educating our youngsters is basically not just to have them reproduce the language being taught but to ensure that they can participate actively in their learning and become part of the communicative society.

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Blended Learning and Application of Web Tools for Materials Engineering: A Case Study

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ABSTRACT

The present study aims to examine students' perception of online learning through the university's Learning Management System (LMS) as opposed to free online LMS and free web tool environment which allow blended learning. Subjects involved are the students of the Materials Engineering course in semester 1, 2014/2015 session. 28 students enrolled for the course but only 21 students responded to the survey. Apart from an online short survey, data were collected from the available learning tracks, where blended learning was carried out using both the university's and free online LMSs. It was found from the learning track evidence that the majority of the students used resources from Blendspace many times more (more than 80%) than the LMS, when the same resources were made available at both platforms. The result from the self-reported survey also supported this trend where the majority of respondents agreed that they preferred the free web tools compared to the university's LMS. On the other hand, the academic staff when asked about the issues of teaching and learning with technologies claimed that their preference for the free web tools is mainly because the platforms are more interactive and attractive compared to the university's LMS. The study shows that the efficacy of e-learning depends on the students' buy-in as the majority of them claimed that although they feel more engaged through e-learning, they still prefer face-to-face learning.

Keywords: blended learning, e-learning, higher education, technology

INTRODUCTION

One of the program outcomes highlighted by the Engineering Accreditation Council (EAC) is to be able to display lifelong learning skills (EAC, 2012). Since the previous announcement of PSPTN (2007), e-learning has grown in importance. Consequently, the Malaysian Education Blueprint (Higher Education) (MOE, 2015) also posited initiatives that echo program outcomes in terms of the requirement to teach and learn through the online environment. E-learning in the Malaysian educational scenario started as early as in 2000 at *Universiti Teknologi Tun Abdul Razak* (UNITAR) and Open University of Malaysia (OUM) (Azizan, 2010; Asia-e University, 2011). After 15 years, academics are still debating on one single term, the meaning of e-learning. It is accepted that e-learning means, learning that is done through information accessed or shared from or through the internet or simply technology-enhanced learning. Blended Learning on the other hand, is a new enforcement in institutions of higher education in Malaysia where a part of the course is done or delivered through digital or online media.

Few researchers have looked into the challenges of implementing technology-enhanced learning and role attributes of the senior leadership and instructors (Juhdi et al., 2010; Puteh, 2007). Whilst many Malaysian Institutes of Higher Learning (IHL) are still not quite past acculturating technology-enhanced learning or blended learning amongst the instructors, according to Saad (2014), students who are more comfortable with technology in their everyday lives, may be more ready to accept active learning with technologies. Oye et al. (2012) statistically showed how 215 students of the Faculty of Computer Science and Information Systems in Universiti Teknologi Malaysia (UTM) benefited from e-learning which affected their Grade Point Average (GPA) performance.

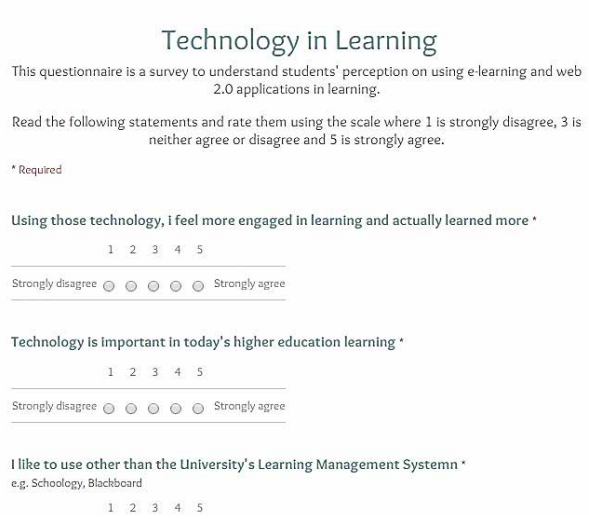
In the case of Universiti Pertahanan Nasional Malaysia (UPNM), the practice of blended learning covers just about 40% of the whole course offered in a year. Being a boutique university, there are only about 350 courses offered in a year. Blended learning in UPNM is defined by the operational definition set by the Ministry of Education where currently at minimum, 7 resources files should be uploaded, 3 synchronous and asynchronous activities and 2 assessments activities must be conducted. However, the current LMS is limited in the aspect of allowing optimum

interactions between instructors and students. Therefore, this case study aims to examine students' perception of online learning through the university's LMS as opposed to free online LMS and free web tools which allow blended learning. It is interesting to see whether the students really care about the limitations of the current LMS and their perception of the free web tools. It will also be interesting to see if the perceptions about technology enhanced learning and blended learning by the students are mutually felt by the instructors.

METHODOLOGY

Since the cohort of the students was from the previous semester, it was felt that an online survey would be the best method to get immediate and fast response from the students. Albeit that, only 21 from a total of 28 (75%) students enrolled for Materials Engineering of Semester 1 2014/2015 responded to the survey. 14 of the respondents were male students and the rest were female. However, the survey did not have any sections on demographic background because the students were all from the same batch and it was not the aim of the study to compare gender. The screenshot of the online survey is shown in Figure 1.

Figure 1: Screenshot of the Questionnaire using Google Doc

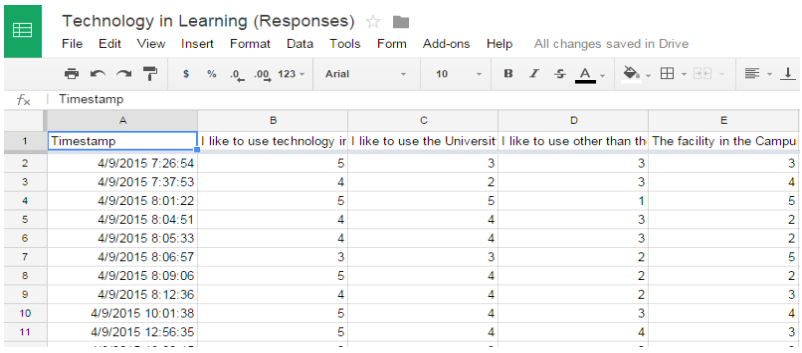


The course outcomes for Materials Engineering are as shown in Table 1. The Materials Engineering course is considered a reading subject course as compared to other mechanical engineering courses. The main technical skill required in this course is for the students to be able to interpret and analyze various graphs related to changes in material properties as a result of various processes.

Table 1: Materials Engineering Course Outcomes

CO1	Identify and describe the internal structure of various engineering materials and explain the relationship between structure and properties of engineering materials in terms of properties and behaviour (C1)
CO2	Explain the mechanism and factors affecting the changes in internal structures, the resulting effect on material properties and their practical applications and determine the changes to material properties due to specified changes in internal structure / processing (C2)
CO3	Apply properties of engineering materials to select and specify suitable materials specific design requirements (C3)

The online survey was prepared with simplicity and accessibility (Carbonaro & Bainbridge, 2000) in mind where it was hoped that subjects could answer the survey through their smartphones or tablets. The survey was created using Google Docs and the responses were collected automatically through Google Sheet (as shown in Figure 2). The students were invited to the survey using a link posted on the class's message group on Whatsapp. The survey was found to be reliable where the Spearman-Brown split half analysis value was 0.85.



	A	B	C	D	E
1	Timestamp	I like to use technology ir	I like to use the Universit	I like to use other than th	The facility in the Campu
2	4/9/2015 7:26:54	5	3	3	3
3	4/9/2015 7:37:53	4	2	3	4
4	4/9/2015 8:01:22	5	5	1	5
5	4/9/2015 8:04:51	4	4	3	2
6	4/9/2015 8:05:33	4	4	3	2
7	4/9/2015 8:06:57	3	3	2	5
8	4/9/2015 8:09:06	5	4	2	2
9	4/9/2015 8:12:36	4	4	2	3
10	4/9/2015 10:01:38	5	4	3	4
11	4/9/2015 12:56:35	5	4	4	3

Figure 2: Survey Responses Collected through Google Sheet

A very brief interview was also carried out amongst a few instructors or academic staff, just to uncover their perception of using technology in their teaching. The questions were as follows:

1. How do you feel about using technology in your teaching and learning (T&L)?

2. How do you feel about using the university's LMS in your T&L?

3. What is the reaction of your students towards using technology in their learning?

RESULTS AND DISCUSSION

Students' Survey

The result from the survey is shown in Table 2. It can be seen that the medians and modes of the responses are inclined to agree and strongly agree on items that support technology-enhanced learning. On the items that do not support the aim of the survey, the medians and modes are found to be neutral. The majority (85%) of the students agreed and strongly agreed to the notion that they like to use technology in learning. Surprisingly too, the majority of them (42% agree) like to use the university's LMS despite its limitations. However, it cannot be said that they like or did not like to use tools other than the university's LMS because the majority chose to be neutral about it. Similar responses were observed on the question of the application of Web 2.0 tools during class time. Although one of the authors as the instructor of the course had used various Web 2.0 tools during class, it was never mentioned that those were Web 2.0 tools. A good example of that was experienced by one of the authors whose videos were always shared through Blendspace and embedded in the university's LMS (e.g. of how to read stress-strain curve and TTT diagram). However, from the learning tracks of both platforms, videos at Blendspace were accessed sometimes four times more than the number of the students enrolled in this course. Meanwhile, the same videos at Blendspace which were embedded in the university's LMS were not watched by students at all. It can be assumed that many of the students did not understand the meaning of Web 2.0 tools.

This is also supported with answers to questions 7 and 12 (42% and 47%, respectively) where the students agreed that the free web tools had helped them.

It is also interesting to point out that the majority of the students prefer face-to-face learning (42%) although they feel neutral about having hardcopy materials or textbooks. The students understand that technology is important and strongly agree that ICT would help them in their lifelong learning. They also claimed that they felt more engaged in learning and that the university's LMS did facilitate their learning of the course.

Table 2: Responses from the Students to E-Learning Aspects for Materials Engineering Subject

No	Survey Item	Percentage (%)					Response	
		1 Strongly disagree	2	3	4	5 Strongly agree	Median	Mode
1	I like to use technology in my learning	0.00	4.76	9.52	57.14	28.57	4	4
2	I like to use the University's Learning Management System	0.00	4.76	38.10	42.86	14.29	4	4
3	I like to use other tools than the University's Learning Management System	4.76	23.81	42.86	23.81	4.76	3	3
4	The facility in the Campus allows the application of web 2.0 tools during class time	0.00	23.81	33.33	23.81	19.05	3	3
5	I prefer text book and printed materials than softcopy/online notes	4.76	0.00	42.86	23.81	28.57	4	3
6	I am forced to use University's Learning Management System by my lecturer	9.52	28.57	33.33	23.81	4.76	3	3
7	I prefer to use Schoology and Blendspace directly than the University's LMS because they are easier to assess from my smartphone/ tablet	4.76	9.52	38.10	42.86	4.76	3	4

8	Using the technology, I feel more engaged in learning and actually learned more	0.00	9.52	14.29	57.14	19.05	4	4
9	I learn more from a face to face class than from online learning	4.76	4.76	19.05	42.86	28.57	4	4
10	Technology is important in today's higher education learning	0.00	4.76	14.29	23.81	57.14	5	5
11	The ICT skills I have gained at the University will improve my job prospects	4.76	4.76	23.81	42.86	23.81	4	4
12	The use of resources from Blendspace has facilitated my study in Materials Engineering Course	4.76	4.76	23.81	47.62	19.05	4	4
13	The use of resources from the University's LMS has facilitated my study in Materials Engineering Course	4.76	0.00	23.81	61.90	9.52	4	4

It seems that the finding from Brook and Beauchamp (2015) is similar to the responses obtained in this study. Although students claimed that they feel more engaged (57% agree) and very positive on the aspects of e-learning and ICT in learning (57% strongly agree), they still value face-to-face interactions (42% agree). This can lead to the conclusion that blended learning has its potential in engaging students in learning and will be beneficial to them.

Stake (1995) as cited in Puteh (2007) was quoted defining a case study as an analysis of the complexity of a single case and disagreed if a case study is used to penetrate into the particular details of a situation and how things actually worked. Obviously, the results of this survey alone does not represent the perception of the rest of the students in UPNM, what more other IHL in Malaysia. However, it gives hope that more can be done to help students to benefit from technology enhanced and blended learning.

Instructors' Interview

In order to understand whether the perceptions about technology enhanced learning and blended learning by the students are mutually felt by the instructors, five instructors were interviewed. The instructors are

involved in teaching these students although not Materials Engineering but other courses. Comments from two instructors that are glaringly contradictory are shared here.

Instructor 1

The exact comments from Instructor 1 who is a young lecturer who teaches Engineering Mathematics and Control System subjects regarding the three questions are:

"I love using technology in teaching and learning for face-to-face or non-face-to-face hours. It engages the students more and students are encouraged to use technology more instead of just gaming and Facebooking. But, wifi (in UPNM) is very slow. (Further) our LMS lacks interaction between students and lecturer. Also, students can't submit their works online so we need to find alternatives like Edmodo or Schoology. They (the students) love it (using technology in their learning). Especially gamification tools like Kahoot. They put extra efforts out of competitiveness. But, many commented on limited capability of our Wi-Fi. Also, giving them lecture on YouTube is not working since UPNM blocked YouTube. "

Interpretation for Instructor 1

The instructor being young and technology savvy from generation Y shows interest in using technology actively in teaching. It was suggested that other than uploading materials or resources, instructor 1's class students prefer blended learning that includes gamification and active participation on their part. However, the facility issue is a hindrance to fully utilize technology for student learning.

From the authors' point of view, although facility support is the basic requirement to implement active e-learning or blended learning during class time, it is not necessarily a total deterrent. Some applications are simple enough to be used through smartphones, for example, the Padlet or assessment games such as Hot Potatoes (Half-baked software) or Kahoot. it. Instructors could prepare the materials prior coming to the class, and use them as attention drivers or closure activities. Most IHL students nowadays have a basic smartphone. Activities from the mentioned applications can

be conducted using smartphones or as a flipped class activity where the students use technology to enhance self-directed learning.

Instructor 2

Instructor 2, instead of commenting on each question just summarized it in despair as:

(I do) Not using it to the maximum as the course involves a lot of calculations. It is easier to use the white board. A lot of videos from Khan Academy were shared through the LMS, but the students were not bothered to watch them. Their excuses such as "no time" or "internet is slow", are just too common."

Interpretation for Instructor 2

The instructor who is from generation X, when responding sounded a little bit frustrated when reported that the students did not watch all the videos that have been shared through the University's LMS. The instructor truly believed that the videos could help the students when doing their revisions. However, results from the available learning track from the university's LMS seem to demotivate her to do further active learning using technology during her class. The same complaint about students criticizing the incompetency of facility support was also reported.

Both instructors' views were shared by other instructors interviewed especially the idea of using videos and Web 2.0 applications for their courses. However, most of them expressed their frustration about the slow internet speed and how their shared resources on the university's LMS were not accessed by their students. Some of them also complained about the lack of interactions or the limitation of the university's LMS. They said that they had to depend on other free web tools to receive assignments or materials submission or sharing from the students. It is not just troublesome for everyone having to login into different websites, but also a waste as it is difficult to monitor and do analytics survey on the real usage of e-learning of each student from a random sampling of the students.

CONCLUSION

The study shows that the students used resources from *Blendspace* many times more than the LMS, although the same resources are available at both platforms. Although, when asked about using Web 2.0 activities in the class, they do not agree nor disagree with that notion. It shows that the students might not understand the term Web 2.0 tools. It is also reported that the majority agree that they prefer the free web tools compared to the university's LMS. On the other hand, the instructors or academic staff when interviewed claimed that the major problem in applying technology enhanced learning during class is the speed of the internet. However, their preference for the free web tools over the university's LMS is mainly because the platforms are more interactive and attractive. The study shows that the efficacy of e-learning depends on the students' buy-in as the majority said that although they feel more engaged through e-learning, they still prefer face-to-face learning. Nevertheless, they believe technology enhanced learning does not only help deliver the information about the course but also prepare them with ICT skills for better job prospects.

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Effects of Group Problem Solving Activities on Active Learners' Performance in Online Learning

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ABSTRACT

Online learning is one of the 21st century teaching methods but researchers and practitioners face problems in applying appropriate teaching strategies to improve learners' performance. Previous studies have shown that matching learners' learning styles with appropriate teaching methods present great potential in making online learning easier and more effective as well as enhancing learners' performance. Based on that promising finding, this study aims to investigate the effects of matching teaching strategies using the group problem solving approach with active learning styles to gauge learners' achievement. The Felder and Silverman Learning Style Model and Group Problem Solving were used in this study to investigate the effects of teaching strategies on active learners' performance. Twenty-one learners enrolled in the Multimedia Interactive Application course were used as study samples. The instruments used were learners' log data, performance test results and learning activities in Moodle based LMS. The results showed that online learning utilizing the group problem solving approach on active learners improved their performance.

Keywords: learning style, problem solving, online learning

INTRODUCTION

Web-based learning facilitates online learning any time without distance and cost effect constraints in contrast to the face-to-face approach. The education community, however, is faced with the challenge to exploit the innovative characteristics of online learning in order to produce a flexible education system that meets the needs of different individuals and also to encourage learner participation during the learning processes (Huang, Lin & Huang, 2011). The pedagogical aspect is related to the quality of online learning and has become the focus of researchers as teaching and learning is very challenging and complex especially for online learning where the instructor merely functions as a facilitator and learning focuses more on the learners as the main agent for the implementation of the learning processes. This is made more complex as each learner has different characteristics and learning needs. These individual characteristics are the variables frequently forecast as the contributing factor for the success of online learning (Lim, Morris & Yoon, 2006).

Teaching practitioners believe that one of the individual characteristics that needs to be given due consideration when developing online learning is learning styles. They believe that learning styles can improve the performance of the learners by matching their learning styles with the appropriate teaching method; more popularly known as adaptive learning (Gilbert & Han, 1999). Adaptive learning has the potential to make the learning processes easier and more effective (Graf, Liu & Kinshuk, 2010). However, earlier researchers faced problems looking for the appropriate mechanism to match the teaching method with learning styles that was able to optimize learner achievement. Thus, this paper aims to investigate the effects of matching one of the teaching methods, i.e. Group Problem Solving with Active Learning Style in an online learning environment.

BACKGROUND OF PROBLEM

According to James and Blank (1993), learning style is defined as 'the complex manner in which, and the conditions under which, learners most efficiently and most effectively perceive, process, store and recall what they are attempting to learn'. For instance, some learners learn easily when it

involves visuals such as, diagrams, graphs, images and videos. This type of learner operates in the visual learning style dimension. On the other hand, if the learner is more comfortable with verbal form of learning, they are categorized as having a verbal learning style.

Kolb, Myer, Mumford, and Felder and Silverman have come up with a few learning style models (Coffield et al., 2004). Kolb categorized learning styles based on learning choices; accommodating, converging, diverging and assimilating while Myer focused more on personality stability choice; extroversion / introversion, sensing / intuition, thinking / feeling, and judging/perceiving. There are two methods to determine learning styles, i.e. using questionnaire and automatic behaviour detection in online learning. However, the Felder and Silverman learning style model has received greater attention as it implements a reliable and valid questionnaire (Litzinger, Lee & Wise, 2005) and the automatic detection based on online learning behaviour. Furthermore, this model provides a clear and detailed dimension of learning styles based on a scale ranging between +11 to -11. The added value of the Felder and Silverman model has been recognized by Kuljis and Liu (2005) who adopted this model for online learning usage.

Active Learning Style is one of the learning style dimensions in the Felder and Silverman model (Felder & Silverman, 1988)others demonstrate or discuss; some focus on principles and others on applications; some emphasize memory and others understanding. How much a given student learns in a class is governed in part by that student\u2019s native ability and prior preparation but also by the compatibility of his or her learning style and the instructor\u2019s teaching style. Mismatches exist between common learning styles of engineering students and traditional teaching styles of engineering professors. In consequence, students become bored and inattentive in class, do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and in some cases change to other curricula or drop out of school. Professors, confronted by low test grades, unresponsive or hostile classes, poor attendance and dropouts, know something is not working; they may become overly critical of their students (making things even worse. In this dimension, a learner who possesses an active learning style tends to use an active physical approach to gather certain information. An active learner can learn effectively if their learning situations give them the opportunity to play around with the learning material such as executing

an experiment or debating or conducting a discussion in groups. In defining a learning style, two approaches can be utilized, which are the collaborative and automatic approaches. In case of the collaborative approach which uses a questionnaire as a tool to identify learning styles, it is observed that the results from this approach are inaccurate, caused by self-conceptions (Graf, Kinshuk & Liu, 2008) or perfunctory answers by the respondents (Garcıa et al., 2007). Thus, the results do not reflect the actual learning styles which potentially give a negative effect on adaptive learning.

In order to overcome this problem, an automatic approach is suggested to identify the learning styles. The automatic approach is based on the actual behaviour patterns during online learning process. The assessment of the behaviour pattern can be done via two approaches; namely, data driven method and literature based method (Garcia et al., 2007; Graf et al., 2008). The former method uses sample data of behaviour that matches the questionnaire in model development to infer the learning style. Neural networks, Decision trees, Hidden Markov model, Fuzzy Clustering and Bayesian Networks are among the techniques used on the data driven Approach (Garcia et al., 2007). The literature based method on the other hand, uses behaviour patterns acquired and aligns them with the Felder-Silverman learning style model (Graf et al., 2008).

The main aim of matching teaching methods with learning styles is to overcome the 'one-size-fits-all' approach that is commonly used to design the learning materials and activities for online learning (Brown et al., 2005). The 'one-size-fits-all' is a teaching approach that does not take into consideration the different characteristics of individual learners and thus only uses a single method for all. The 'one-size-fits-all' approach may result in some learners having learning difficulties (Felder & Brent, 2005).

Felder and Brent's (2005) statement is supported by teaching practitioners who believe in the need to consider individual differences to develop effective online learning activities. An online learning system that does not emphasize individual differences could demotivate learners and thus affect their academic achievement (Aviram et al., 2008). Research has shown that online learning systems that practice the 'one-size-fits-all' approach is not successful (Despotovic-Zrakic et al., 2012). This statement is supported by a few other researchers (Felder & Brent, 2005) who claimed

that this issue has caused a significant reduction in the use of online learning systems because learners are not satisfied with the static form of learning that uses a single method for every learner.

The matching of teaching methods and learning styles approach is an adaptation technique. A few adaptation techniques exist such as matching learning styles with curriculum arrangements, presentation of learning materials and navigation adaptation. However, empirical studies have not proven that the adaptation technique has been widely accepted, as the results of such studies are inconsistent (Brown et al., 2005). The adaptation technique which matches teaching methods with learning styles has the potential to make the learning processes more convenient (Felder & Silverman, 1988; Graf et al.,2010), reduce effort and learning time (Graf et al., 2010) and improve learner performance (Akdemir & Koszalka, 2008). The adaptation technique is still understudied and needs thorough research especially to determine the learning styles utilizing automatic detection (Garcia et al., 2007).

Franzoni and Assar (2008) have come up with a Learning Style Matching Taxonomy based on the Felder and Silverman (1988) learning style model and teaching method. Franzoni and Assar (2008) claim that the taxonomy is developed based on the classification of teaching methods according to the Felder and Silverman (1988) learning style model. This taxonomy has passed through a verification process by a panel of experts using the Delphi method during The III Congreso de Estilos de Aprendizaje di Cáceres Spain in July 2008 (Franzoni and Assar, 2008). One of the taxonomies is matching teaching method based on problem solving with active learning style.

Problem solving refers to the integration of concept and skills to solve an incomplete situation (Lester, Stone & Stelling, 1999). The Problem Solving Technique is a teaching strategy that can improve learner thinking enabling them to become more critical, logical and creative (Dogru, 2008). It is a teaching and learning approach developed from John Dewey's theory. According to John Dewey, a good way of thinking is deep thought utilizing fuzzy situation, doubt, conflict and disruption of clear, coherent, complete and harmonious situations. Problem based learning is a learning technique to strengthen the learners by carrying out research, integrating

theory and practice, and using knowledge and skills to develop solutions to problems. Problem Solving Learning refers to the method commonly used by instructors, that is giving lectures or reading materials to the learners and then presenting the learners with problems referring to the given lectures and reading materials.

According to Franzoni and Assar (2008), this teaching method is suitable for learners with sensory and active learning styles as both facilitate learning when presented with problems. They prefer facts, procedures and practical activities and these elements are needed for problem solving (Felder & Silverman, 1988; Franzoni and Assar, 2008). A few past researches had studied the effect of matching teaching method with learning style on learner achievement but the results are inconsistent. Therefore, an indepth study which is realistic and practical to overcome certain problems such as the development of sophisticated learner's model (Garcia et al., 2007), a complex learning adaptation mechanism (Brown et al., 2005) as well as a study on the comprehensive effect of learning adaptation, needed to be conducted.

RESEARCH METHODOLOGY

This study was conducted over a 15 week duration in a selected polytechnic. The duration of this study was divided into 4 main timeframes. In the first week, a pre-achievement test was executed. Meanwhile, in the second time frame which was 8 weeks consecutively, a learner was observed to determine his/her online learning style in the LMS environment. The literature based method was used to measure the online learning style pattern in this environment (Graf et al., 2008). The third frame consisted of the remaining 6 weeks, where active learners were exposed to the LMS environment with active learning techniques consisting of group problem solving activities using forum. Finally, in the final week, a post-achievement test was executed.

Samples in this study were fifth semester diploma in engineering learners who were enrolled in the Multimedia Interactive Application (MIA) course. The 21 learners were purposely selected to be the samples in the study based on their online learning style. Automatic detection as

active learner is based on actual learning behavior in online learning. The sample was further classified into 4 female and 17 male learners. The total population sample was 130 electrical engineering students from one of the Malaysian polytechnics.

The instrument used in this study is divided into two. The first part of the instrument is used to identify the online learning style using an activity and resources available in the LMS. The activity and resources include notes in the form of SCORM package, quizzes, forum and journal. The second part of the instrument was an add-on of a group problem solving activity. A forum for the online group problem solving learning activity was created for this purpose.

In order to identify the learning style based on log data, 10 learning behavior patterns were used in determining the learners' online learning style. This log data was analyzed using a literature based method (Graf et al., 2008) from weeks 2 until 8. Table 1 shows the details of the online learning behavior pattern under study.

Table 1: Patern Of Online Behavior

Features	Pattern of Online Learning Behavior
Content	Content_visit, Content_stay,
Exercise	Exercise_visit, Exercise_stay,
forum	Forum_visit, Forum_stay, Forum_post
Journal	Journal_visit, Journal_stay, Journal_post

Meanwhile, for problem solving activities, each group of active learners was given 3 topics related to the content of the course to carry out the online learning problem solving activity for a duration of two weeks for each topic. A total of 6 weeks of discussions were carried out using online discussion forum. Throughout the process, the learners were assisted by the instructor with feedback, encouragement, as well as provision of clues to scaffold learners' discussions.

Achievement tests were developed to measure the effectiveness of adaptive learning based on group problem solving activities for active learners. There were two achievement tests involved in this study; pre-

achievement test and post-achievement test. The tests were arranged into two sections namely, Section A and Section B. Section A consisted of 5 short essay questions at Bloom Taxonomy's knowledge and comprehension levels while Section B consisted of 5 questions at the application and analysis levels. The pre-achievement test was given in week 1 while a post-achievement test was executed at week 15.

The discussion topics and achievement tests were validated by an instructional expert with more than 5 years of research background on online problem solving and a content expert with more than 5 years of experience in teaching the subject. The reliability of the achievement tests were established through repeated test with Pearson correlation value of 0.763.

DATA ANALYSIS

The learners online learning style is formulated in Eq. (1) (Graf et al., 2008), with (denoting an online learning style, ($h_{dim,\ i}$) indicating each learning style dimension (*dim*), value of behavior pattern score (*i*), and accumulated behavior pattern score behavior (P_{dim}). (1)

The next step is to normalize the online style value (into 0 to 1 range of value using Eq. (2). The output of learning style after normalization is further categorized into four classes as shown in Table 2. (2)

Table 2: Category of Processing Information Learning Style

Normalization value	Learning Style Preferences
$nls_{dim}>0.75$	Strong active
$0.5 < nls_{dim}\leq 0.75$	Balance active

In addition to that, a paired-samples *t*-test was used to compare the mean value from pre- and post-scores at 0.05 confidence level. This test was carried out to investigate any significant effect of adaptive learning based on learning style towards active learners' performance in tests. The hypotheses set are as follows:

H_o: There is no significant difference in active learners' academic performance before and after using adaptive learning based on learning style.

H_1: There is significant difference in active learners' academic performance before and after using adaptive learning based on learning style

Consequently, meta-analysis on the t test, related to the effect size of the given treatment is calculated to obtain Cohen *d* value. Finally, to estimate the exact sample size and the power value for the effect size value being previously obtained is analyzed using power analysis.

RESULTS

Results from the analysis of the log data shows that 2 learners possess a strong online learning style and the remaining 19 learners have a balanced score. Upon finding the active learners' score to be normally distributed ($p>0.05$) when conducting a Shapiro-Wilk normality test, a paired-samples t-test was implemented. The results of the t-test indicate that adaptive learning using learning strategy based on group problem solving activities contribute a significant achievement on the active learner score that is equivalent to $p=0.000$ and $p<0.05$ as shown in Table 3. This highlights that matching teaching strategy based on group problem solving could improve active learners' achievement in tests.

Table 3: T-Test Result on Active Learners' Performance

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Post-test –Pre-test	43.357	20.88	9.555	20	0.000

In view of the analyses in Table 4 below, outcomes from post hoc analysis show an effect of size the power of value 2.714 is 1.00 ($p>.05$). This confirms that the value is the biggest size effect that has been suggested.

Table 4: Comparing Performance

	Mean, *M*	Standard Deviation, *SD*	Effect size, *d*	Power *(1-β)*
Post-test	47.623	22.370	2.714	1.00
Pre-test	4.266	3.158		

Meanwhile, Table 5 illustrates the result from priori analysis that show a usage of 10 samples is enough to give size effect of 2.714. Thus, the size of sample used in this study (n=21) achieves a significant level (p>.05) with power of (1-β=1.00) needed.

Table 5: Power Analysis Results

Effect Size, *d*	Power	Critical *t* (16)	Delta	Minimum Sample size, *n*	Degree of freedom, *df*
2.714	1.00	2.306	4.050	10	8

DISCUSSION

This study presents and evaluates the effect of group problem solving activities on active learners' learning performance in an online learning environment. The study used matching teaching method (group problem solving activities) with learning style (active learning style from the Felder and Silverman Learning Style Model) in order to study its learning effectiveness. The main findings and their reasons are discussed below.

Based on the finding, this study proves the research hypothesis that learning activities with adaptive learning using group problem solving is able to improve the active learners' performance significantly. This result is consistent with the findings by Franzoni and Assar (2008) who claimed that the learners' performance can be enhanced when the appropriate teaching method was matched with the learners' learning style. Besides that, previous studies (Despotovic-Zrakic et al., 2012; Graf & Kinshuk, 2007) also revealed that learners whose learning styles were perfectly matched with the appropriate teaching method gained a significant score compared to unmatched ones.

The group problem solving method has been acknowledged to increase learners' learning performance without considering their differences (Shukor et al., 2014). Yet, the learning process will be far more effective if it is applied to learners who are interested in problem solving learning or active learning, compared to those who lack interest. When this learning style is matched with group problem solving teaching method, it can make the active learner's learning process easier and more efficient (Graf, Liu & Kinshuk, 2010). This is due to the role of group problem solving technique becoming the catalyst to trigger a more meaningful discussion in an effort to understand and use all concepts learned in solving the given problem (Felder & Silverman, 1988). A study conducted by Popescu (2009) showed that the implementation of the learning style matched with adaptation was more beneficial to learners in terms of learning gain, enjoyment, motivation, increased overall satisfaction and shorter learning time compared to learners who had to go through a mismatched course.

Besides the selection of matching learning style and teaching method in order to increase learner performance, the selection of learning style models used are also considered a critical issue influencing the effect of matching learning style and teaching method (Papanikolaou & Grigoriadou, 2004). It covers the selection of learning style models and the diagnosis of learners' learning styles. There are many models of learning styles (Coffield et al., 2004), but a model that can characterize the learning style dimensions in detail with valid and reliable instruments as adopted in the Felder and Silverman learning style model should be given due consideration (Papanikolaou & Grigoriadou, 2004). Hence, this study used the Felder and Silverman's active learning style dimension model and found that it has given a positive impact to the chosen teaching method. The result is probably due to the use of the Felder and Silverman model that is able to analyze clearly the dimensions of learning styles based on a scale range of between +11 to -11 (Felder & Brent, 2005). In addition, the Felder and Silverman model's questionnaire also has acceptable reliability and validity (Felder & Brent, 2005). In addition, previous research using Felder and Silverman model showed a positive effect of matching the appropriate learning style with the teaching method (Despotovic-Zrakic et al., 2012).

Apart from the selection of the learning style model, the automatic approach adopted to determine the learning style also plays a vital role

as it is more accurate compared to the collaborative approach (Graf et al., 2008). The automatic approach is based on the actual behavior of learners while doing online learning and is not solely based on perception. Previous researches have shown that the impact of the achievement of learning adjustments could potentially be more optimal if personal parameters used for the adjustment are based on actual learner behavior (Graf et al., 2008), compared to the determination of learning styles using a questionnaire that is solely based on perception. The combination of the Felder and Silverman learning style model and the automatic approach adopted to create a unique adaptive learning style and matched with appropriate teaching method has probably increased learners' achievement in this study.

CONCLUSION

In short, this research proves that three elements have to be considered in determining the effect of matching teaching method with learning styles to improve learners' performance. Firstly, the selection of teaching method needs to be matched with the learning style. Next, is the selection of learning style models which can range from Felder and Silverman's Model, Myers-Briggs Type Indicator, Kolb's model or any other models. Thirdly, is the method used to determine the learning styles, either collaborative or automatic. For future work, the researchers propose using the teaching method matching technique on other active learners as suggested in the taxonomy of matching teaching method with learning styles by Franzoni and Assar (2008) such as question and answer, games and simulation, etc. On the other hand, studies utilizing other learning dimensions as stated in Felder and Silverman learning styles model such as reflective, visual and others are also suggested for future research in order to uncover the effects of matching teaching method with other learning styles.

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Fight Obesity App: A Proof-of-Concept Prototype of Mobile Game-based Treatment

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ABSTRACT

This paper presents how a mobile game was designed and developed in an education research laboratory as a proof-of-concept for treating obesity in preschool children. It depicts how a pediatrician cooperated with game based learning researchers to produce a mobile app for a game based obesity treatment. The intention of the pediatrician was to guide preschool children between the ages of three to six years old, to understand the concept of childhood overweight and obesity, while keeping in mind the long term consequences of obesity, and how to choose healthy food in Malaysian daily living contexts. The interdisciplinary cooperation between these individuals resulted the creation of the Fight Obesity 2.0 mobile app. The mobile app has been featured through tablet computer as a platform to gamify healthcare education contents for toddlers and young children. The major difficulty faced in the game production was determining the modality of multimedia content presentation and selecting appropriate pedagogical approaches for preschool children. This paper illustrates how the difficulty was overcome and reflects lessons learned from the interdisciplinary cooperation. The experience shown in the study would benefit professionals in medicine, preschool education and game experts who are interested in initiating cross-disciplinary cooperation for making treatment of obesity fun, engaging and meaningful for children.

Keywords: childhood obesity, game-based learning; game-based treatment; mobile learning; preschool children

INTRODUCTION

Overweight and obesity among children has increased alarmingly and become a serious public health problem (Lobstein & Frelut, 2003). In Malaysia, one out of five school going children is overweight or obese (Alya Hamzah, 2014). The issue of overweight and obesity is not only a heavy healthcare burden to a nation and a society, but also causes physical and psychological disturbance in the affected children. Therefore, it is very important to prevent and treat childhood overweight and obesity.

The data and statistics revealed by World Health Organization (WHO, 2015) indicated that childhood overweight and obesity have increased dramatically since 1980. Forty-two million children under the age of five were overweight or obese in 2013 (WHO, 2015). This issue of child obesity is no longer considered a problem faced by high income nations. Instead, the issue is on the rise in low and middle income nations. The increment rate of childhood obesity in the low and middle income nations has exceeded 30% more than in high income nations (WHO, 2015).

In Malaysia, the Third National Health and Morbidity Survey reported the overall prevalence of overweight (including obese) children was 19.9% (Suzana et al., 2012). In particular, Khor et al. (2009) found out that 3.4% of Malaysian children below 5 years old were overweight.

Comorbidities associated with overweight and obese children are similar to adults, such as elevated blood pressure, dyslipidemia, increased risk of fractures, early markers of cardiovascular disease, psychological effects, experiencing breathing difficulties and a higher prevalence of factors associated with insulin resistance. Although overweight and obesity are associated with many severe medical consequences even at a young age, the most common short term consequences of pediatric obesity are psychosocial in nature, such as psychological problems, discrimination or teasing (Wille et al., 2010). The results of a multicenter study done by Wille et al. (2010) indicated a considerably reduced Health Related Quality of Life (HRQOL) in overweight and obese pediatric clinical samples. In a recent study, Solveig et al. (2014) examined and discovered that the incidence of childhood obesity between the ages of 5 and 14 years was more likely to occur at younger ages, primarily among children who had entered kindergarten overweight in

the United States of America. Thus, the prevention and treatment of obese children would be more cost effective at the preschool stage.

Game-Based Treatment for Overweight and Obesity

The process of treating overweight and obese preschool children in present medical practice, from diagnosis to treatment, is tedious and time consuming (see Figure 1). The shaded areas shown in Figure 1 cover procedures which can be replaced by treatment through game playing or game based treatment. To date, the processes which still cannot be replaced by game based treatment include medical check on the physical body and laboratory examinations. If the diagnosis and the treatment could be done when children play games, a lot of time, energy, money and other resources could be saved.

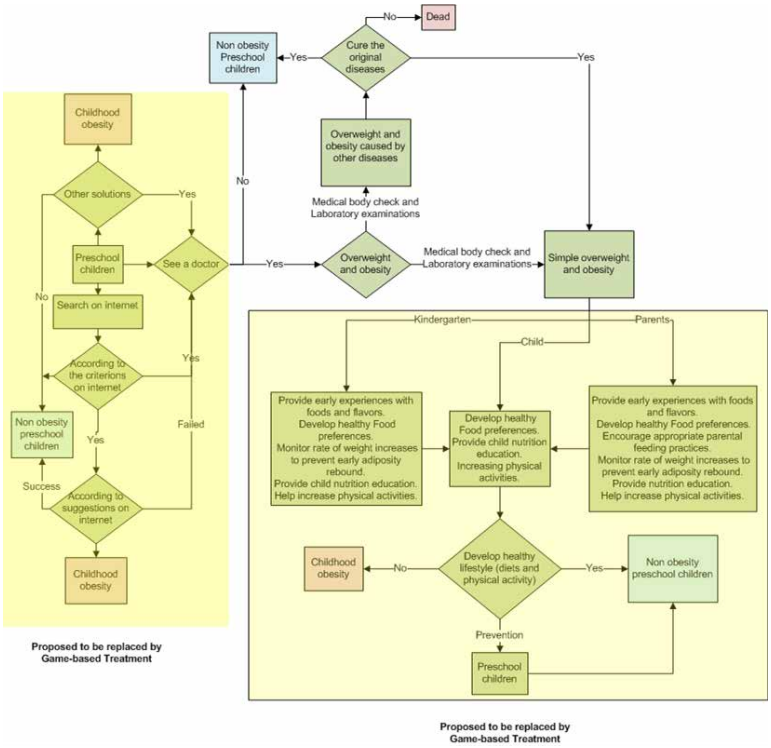

Figure 1: Processes (Shaded) which can be Replaced by Game based Treatment

Game based treatment is a form of patient centered treatment that uses games for health purposes. The notion of "game" in the concept of game based treatment is not about *what* types or genres of games can be used for treatment, instead it is about *how* various types or genres of games can help patients, doctors and the government to achieve the goals of prevention and therapy. In this sense, any type or genre of games which are related to achieving the goal of preventing or treating overweight and obese preschool children can be regarded as game based treatment in this study. Through game playing, patients get to know the causes, process, therapy and prevention of diseases associated with childhood obesity.

Game based treatment can be regarded as a form of electronic intervention. According to a systematic review on electronic interventions for prevention and treatment of overweight and obesity in young people, most studies demonstrated some forms of significant outcomes, i.e. reported changes in dietary or physical activity behaviors among the participants who received interactive electronic interventions (Nguyen et al., 2011). In medical science, game playing sessions were evaluated in randomized trials with the similar scientific rigor applied to pharmaceutical therapies (Kato et al., 2008).

One form of game based treatment is called exergaming. As introduced by Graves et al. (2008), exergaming involves using physically active digital games to provide a safe and fun means of energy consumption for children to lose weight. Exergaming dates back to 2004, when Vandewater et al. (2004) reported a study on how game playing was related to the fight against overweight and obesity. In fact, video games which feature wireless game console systems (e.g. the Nintendo Wii) and certain accessories (e.g. the dance pad in *Dance Dance Revolution*) showed a significant increase of energy expenditure among players (Graves et al., 2008). With the rapid development of electronic technology, children are commonly exposed to mobile and handheld devices, such as laptops and tablet computers, thus exergaming would continue to gain popularity among children (Kang, 2013).

Mobile Apps for Treating Obesity

According to Alexander (2013), mobile apps or mobile applications are software created to operate on mobile or portable devices, particularly

on smartphones and tablet computers. Through dedicated operation systems such as Android, iOS and Windows Phone, the apps facilitate mobile devices in performing practical tasks which are beyond the physical operation of the devices themselves.

In this study, mobile apps which are designed specifically for treating obesity are classified as mobile apps for treating obesity (MATO), regardless of the types of content, the genre of game play, and the choice of treatment approach. An ideal MATO for children should support the conceptualization and visualization of a healthy childhood lifestyle, while preventing overweight and obesity in daily living. In terms of cognition, the use of text based contents should be minimized if not avoided.

In general, there are a vast number of existing mobile apps and games that offer contents on how to lose weight. These apps might be used as MATO among children up to a certain extent. However, generally two issues would pop up. First, most mobile apps were created as games and published in Google Play Store and Apple App Store, in which the targeted players were not limited to preschool children. When this is the case, the contents were not dedicated specifically for children, thus the effectiveness of the apps in treating childhood obesity would be in doubt. Second, some of the mobile apps are wordy and require users or players to read lengthy instructions. The demand for comprehension would be a barrier of cognition among preschool children.

Game based Treatment Mobile App Design and Development

Tan, Nurul Fazmidar and Wang (2014) proposed a gamification model for designing and developing educational games. The model is based on outcome based education, in which learners become the center of teaching and learning activities, in which defining the intended learning outcomes is the first step of gamification. Each of the intended learning outcomes consists of three components, i.e. observable behaviour, degree of attainment, and conditions of attainment.

In the context of game based treatment, this model could be modified to gamify treatment of childhood obesity. In this sense, the intended outcomes of MATO are aligned to three structural components of games (Prensky,

2007), as shown in Figure 2. In the gamification process, the goal of the game needs to reveal intended observable behaviours, such as choosing appropriate food and drinks at the right time of the day. Rules that depict attainment conditions should be made explicit to players, i.e. the game should inform players what they can and cannot do to attain the game goal. Players' actions and reactions in the game playing session should be given feedback, informing the players of the degree of their attainment of the game's goals. In a word, game based treatment design is essentially a series of alignment between medical treatment steps and the structural elements of games.

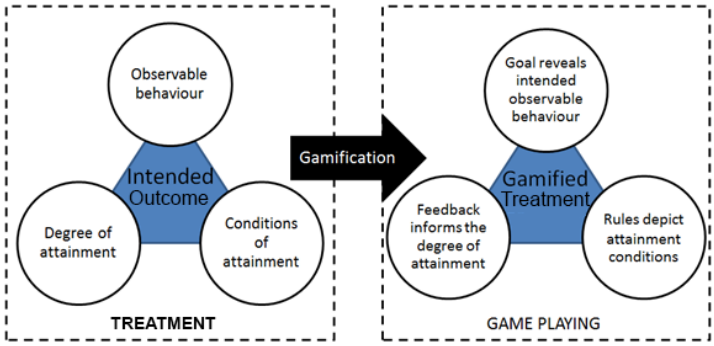

Figure 2: Fight Obesity is Created by Adapting the Gamification Model Proposed by Tan, Nurul Fazmidar and Wang (2014)

As for the mobile app development, medical practitioners ought to work alongside the game graphic artist, game audio specialist and game programmer. Every step of construction of the mobile app should be tested for its validity of contents and its quality of play. The contents must be validated by qualified medical practitioners, while the quality of play can be verified through play testing and usability testing.

Fight Obesity 2.0 App Design and Development

Fight Obesity 2.0 is a proof-of-concept educative mobile app dedicated to get children to conceptualize and visualize the importance of maintaining a healthy lifestyle, as well as the consequences of an improper diet which leads to obesity. The targeted players have been set as Malaysian preschool children. The game is playable on smartphones and tablet computers. Figure 3 shows the splash screen of the game.

Figure 3: The Splash Screen of Fight Obesity 2.0

In terms of development of game contents, a pediatrician structured the knowledge needed by children to prevent obesity into three types, i.e. knowledge of terminology in childhood obesity, knowledge of ways and means of treating childhood obesity, and knowledge of universals and abstractions in treating childhood obesity (see Table 1). The contents become the materials for gamification, i.e. the basis for preparing the intended treatment outcomes.

Table 1: Type of Knowledge Needed for Game-Based Treatment

Knowledge Type	Prompting Questions
Knowledge of terminology in childhood obesity	Q1. What is childhood overweight and obesity?
	Q2. What the cause of childhood overweight and obesity?
	Q3. What are the consequences of obesity?
Knowledge of ways and means of treating childhood obesity	Q4. What can be done to fight the childhood obesity epidemic?
	Q5. How can we develop a healthy diet?
	Q6. What is the recommended level of physical activity for children aged 2 to 5 years?
Knowledge of the universals and abstractions in treating childhood obesity	Q7. What are the principles for treating overweight and obesity in children?

When the pediatrician was preparing the game contents of Fight Obesity 2.0, the production team began to pitch game ideas to the pediatrician. A constructive alignment was done to ensure game playing activities in Fight Obesity would be parallel to the acquisition of knowledge and skills in three game levels: 1) Choosing Healthy Food Level, 2) Doing Exercise Level and 3) Answering Question Level.

At the beginning of the play session, players are allowed to choose the gender and body size of an in-game character to represent their actual body size. The customization of players' character or *avatar* is meant to create a sense of ownership and motivate the players to attain intended outcomes.

In Level 1, the game goal is to help tackle the problem of obesity in Malaysia by educating the children of the virtues of healthy eating habits, where the players need to choose the healthy foods and feed the in-game character (see Figure 4). The outcome players obtain in Level 1 will be carried forward to Level 2, to signify consequences of their dietary choice.

Figure 4: Screenshot of Level 1 in Fight Obesity 2.0

In Level 2, players are directed to learn the importance of doing exercise. By controlling the *avatar* in this level, players would be able to establish the connection between exercise and three important concepts, i.e. overweight, normal weight and underweight.

Figure 5: Screenshot of Level 2 in Fight Obesity 2.0

As for Level 3, the players are guided to learn the characteristics of a good lifestyle and habits (see Figure 6). Most of the questions use colorful graphics as opposed to text to minimize the need to comprehend textual information. To win the game, players need to answer all the questions correctly. If a player fails repeatedly in Level 3, he or she will be directed to visit a pediatrician for dietary advice (see Figure 7).

Figure 6: Screenshot of Level 3 in Fight Obesity 2.0

Figure 7: Lose Scenario, in which the Player Visits Doctor for Dietary Advice

DISCUSSION AND CONCLUSION

The idea of game based treatment is indeed not new, but it is rare to have a medical practitioner participate in the design and development of MATO. Thus, Fight Obesity 2.0 can be seen as a credible gamification attempt at obesity treatment. Nonetheless, the design of game based treatment should be initiated by defining the intended treatment outcomes, particularly the observable behaviour, the conditions and the degree of outcome attainment.

When Fight Obesity 2.0 was published in Google Play Store in mid May 2015, its contents were rated by Google Inc. and set by the International Age Rating Coalition (IARC). The result of the age based rating indicates that the minimum maturity level of content in Fight Obesity 2.0 is suitable for children aged three years old and above (see Figure 8). Also, Fight Obesity 2.0 won a gold medal in the International Invention, Innovation and Technology Exhibition (ITEX), after scoring more than 80 out of 100 marks in the following five judging criteria:

1. Novelty and inventiveness

2. Usefulness and application

3. Presentation and demonstration

4. Market and commercial potential

5. Environmental friendliness

With the endorsement of IARC and the level of quality assured by ITEX, Fight Obesity 2.0 can be used by preschool teachers and parents to encourage children to conceptualize and visualize the importance of keeping a healthy lifestyle, in addition to the outcomes of an incorrect diet that cause childhood obesity. In practice, teachers or parents should begin by introducing the objectives of the game to the targeted child players. When the children fail to overcome challenges at any game level, teachers or parents should provide suitable explanations for the failure and then guide the players to win every game level. Upon completion of the game, teachers or parents should debrief the players as to their achievement, helping individual players to transfer knowledge gained through playing the game to daily living.

Medical practitioners who get involved in game based treatment design should be guided to understand how the contents they prepared could be gamified into game features. This is important to validate contents created for treating overweight and obesity.

Although the usefulness and the content maturity were validated by experts, empirical studies should be carried out to gauge the effectiveness of Fight Obesity 2.0 in treating childhood obesity. In other words, experiments, or at least quasi-experiments should be conducted with actual preschool children in Malaysia to examine the effectiveness of the game.

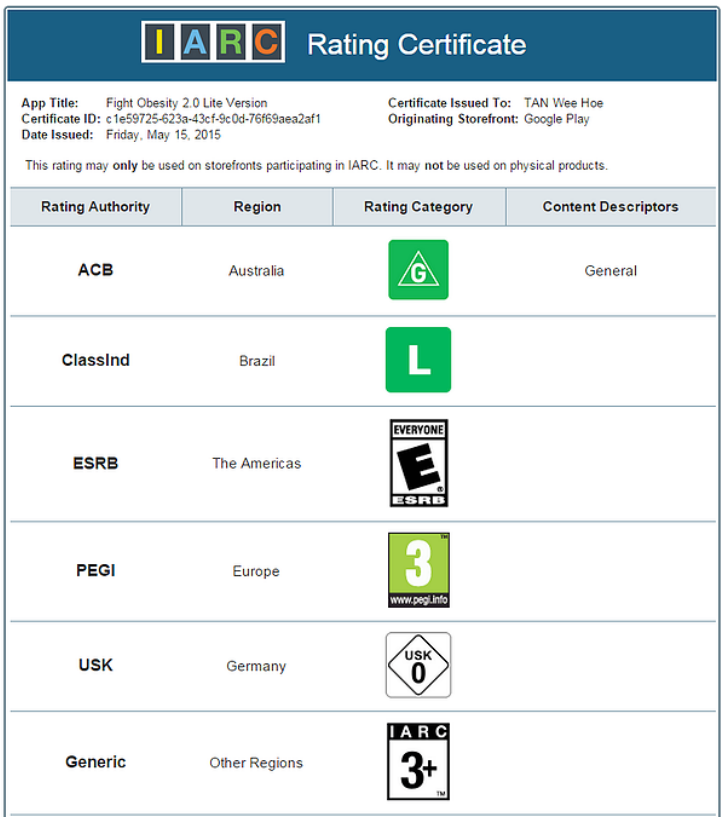

Figure 8: Age-Based Rating Certificate of Fight Obesity 2.0

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Using Themes-Based Ontology for Learning *Al-Quran* Knowledge

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ABSTRACT

Learning Al-Quran knowledge involves the classification of Al-Quran verses into a better understanding for the readers. This research aims to explore a themes based ontology approach to classify Quranic verses. Nowadays, Information and Communication Technologies (ICTs) are becoming increasingly important, which requires Quranic knowledge representation to be understood by both humans and computers. Efforts have been carried by many Muslim scholars and intellectuals in developing ICT applications for Islamic uses, and at the same time promote Islamic knowledge and information through ICT enabling tools which has become a driver for readers all over the world to collect, exchange, share and spread information about Islam. Current approaches use conventional methods to classify knowledge, such as taxonomy, hierarchy or tree structure, which only provides a concept definition without a link to other sources of knowledge. Therefore, due to the significant benefits of the theme based approach, this research uses a theme based classification approach to develop the Quranic Ontology. The ontology model for the Al-Quran was developed based on the Quranic knowledge themes which are defined in the "Syammil Al-Quran" ("Miracle the Reference"). Understanding the depth of Islamic knowledge and teaching needs an established academic method. On the other hand, learning Quranic knowledge through ICT has shown great impact on new learning methods for readers and has proved to be an effective way for enhancing the knowledge of the Al-Quran.

Keywords: e-Learning, knowledge representation, knowledge classification, theme-based approach, *Al-Quran* ontology

INTRODUCTION

The *Al-Quran* is the holy book of Muslims which teaches morals, purification, good deeds, as well as those forbidden by the Almighty *Allah*. The *Al-Quran* provides guidance to mankind, promotes justice, and provides guidance on how to live on earth and with neighbors (Ahmad et al., 2013; Yauri et. al., 2012). A related study described that the *Al-Quran* as a source of knowledge on any subject matter concerning the world and the hereafter (Shoaib et al., 2009). As Allah said in the following verses:

> *This [Qur'an] is enlightenment for mankind and guidance and mercy for a people who are certain [in faith].*
>
> *(Al-Quran 45:20)*

In fact, knowledge in the *Al-Quran* cannot be compared with any scientific text because the Messenger Prophet Muhammad SAW provides real and deep discussions of matters under examination (Ahmad et al., 2013; Shoaib et al., 2009). However, in the current Information Technology (IT) scenario, to learn the *Al-Quran* is a big challenge, whether in the Muslim education system, or in the western education system (Atwell et al., 2010). The search for knowledge in the *Al-Quran* is either unclear or inaccurate, and the search is not based on proper knowledge classification (Khan et al., 2013). These aspects are the major shortcomings of existing research on issues related to learning the *Al-Quran* using ontology.

Ontology defines knowledge or concepts in the *Al-Quran* as classes, and relationship between the classes as properties used to generate rich knowledge from the *Al-Quran.* These concepts refer to the Quranic verses as defined by the structure of the Division (*Juz*), Chapter (*Surah*), and Verse (*Ayat*). Importantly, the knowledge of the *Al-Quran* is identified by Chapter and Verse, which is the most important step of applying an ontology based approach (Ta'a et al., 2014). Several studies indicate that further researches are required to classify knowledge in the *Al-Quran* and establish a semantic search method in order to acquire knowledge in Quranic ontology (Ahmad et al., 2013; Yauri et al., 2012). However, the classification of Quranic knowledge requires a well structured definition of the contents of the *Al-Quran* by Islamic scholars. Thus, this research adopts the classification of Quranic knowledge from the book "*Syaamil Al-Quran Miracle The*

References" (Kementerian Agama Indonesia, 2010). The aim of this paper is to elaborate the use of Quranic ontology for learning the *Al-Quran* and the knowledge of *Al-Quran* are defined according to a theme based classification. The development of Quranic ontology is the most crucial task in order to support the development of an *Al-Quran* learning application.

INFORMATION TECHNOLOGY FOR LEARNING THE *AL-QURAN*

Learning the *Al-Quran* is a grand challenge in information technology (IT) due to difficulties of trying to represent Quranic knowledge in Information Systems (IS). Despite a lot of applications available for querying the knowledge of the *Al-Quran*, most of the applications lack the production of the actual meaning or translation of the query accordingly (Abbas, 2009). Moreover, the Quranic translations used in such applications are normally written in languages such as Malay or English without the supporting original Quranic text in Arabic. This will distort the meaning of the *Al-Quran* in certain contexts leading to slanderous misrepresentations of the sanctified and miraculous knowledge contained in the *Al-Quran*. Currently, the traditional method uses Division, Chapter, and Verse to provide an interpretation of Quranic knowledge. This gives rise to several fundamental problems, such as incomplete and inaccurate results and in most cases, the search is unable to retrieve the relevant knowledge and verses (Yauri et al., 2012). In addition, ul Ain and Basharat (2011) identified that searching and retrieving Quranic knowledge is unclear or uses classification that is difficult to understand. Most learners such as students, teachers and scholars face difficulty when using the current approach (Saad et al., 2009). These reasons have led the researchers to explore the possibility of classification and searching methods using a theme based approach to develop a Quranic ontology.

THEME BASED *AL-QURAN* ONTOLOGY

The ontology used to represent knowledge in a more structured manner using a thematic approach is also known as theme classification to support the understanding of the particular knowledge among the learners (Jones

et al., 2011). Therefore, the use of ontology to capture the semantics of the information domain has been successfully applied in some research fields, including Quranic knowledge (Staab & Studer, 2010). Current approaches uses conventional methods such as taxonomy, topic map or tree structure, which only provides the definition of the concept without linking it to other possibilities of Quranic knowledge (Ahmad et al., 2013). It is difficult to obtain accurate knowledge using these approaches because knowledge is traditionally classified without proper reasoning connecting it to other related knowledge. Therefore, this research also has explored semantic based searching approach in thematic classification of Quranic knowledge.

Theme-Based Learning Approach

The thematic approach is a method for teaching and learning where many areas of knowledge are integrated and connected within a theme. It allows learning to be less fragmented and more natural (Hislop, 2013). The theme is defined as a unit derived from a pattern such as "topic", "vocabulary", "meaning", and identified by bringing together components or fragments of ideas and experiences, which would normally be meaningless when viewed alone (Aronson, 1994; Braun & Clarke, 2006). Quranic knowledge has been analyzed by scholars according to theme-based classification in the book entitled "*Syaamil Al-Quran Miracle The References"* (Kementerian Agama Indonesia, 2010) or "*Al-Qur'an - The Miracle of Miracles"* (Deedat, 1991). This research has adopted the themes defined by the Indonesian Ministry of Religious Affairs (Kementerian Agama Indonesia) (2010) in "*Syaamil Al-Quran Miracle The References"* written in Indonesian language which is almost similar to the Malay language. The themes were defined according to four main topics in the *Al-Quran*: Faith (*Iman*), Deed (*Akhlak*), Way/Path (*Syariah*), and Life/Journey (*Sirah*). Furthermore, these main themes were classified into 15 thematic indexes. The selected themes were chosen for ontology construction and the particular verses of the *Al-Quran* would be linked to the themes to facilitate learner/reader understanding. This paper aims to present the theme based ontology approach to learning Quranic knowledge. The prototype application provides semantic searching functionality for retrieving Quranic knowledge according to thematic classification. Moreover, the classification and searching of Quranic knowledge requires a well structured definition of themes that is supported by the ontology.

Ontology Development

Building the ontology is the foundation in ontology based softwares. Several approaches and tools were developed in order to support the development and maintenance of ontology. However, none of the approaches or tools really covers all aspects of the ontology development process such as an integration, mapping, automation, interoperability, visualization, evaluation, user model and versioning (Tawfik, Giunchiglia & Maltese, 2014). This is because most of the approaches were mainly developed for particular projects or as academic exercises. Moreover, no methods have been accepted as a standard in developing the ontology and some development methodology with tools helps a developer to develop and maintain a particular ontology. Quranic ontology is referred to as domain or task ontologies which represent the generic concepts related to a specific domain or task (i.e., *Al-Quran*). Therefore, the ontology for the *Al-Quran* was developed based on selected themes (i.e., Faith (*Iman*), Deed (*Akhlak*) and Property (*Harta*)). These themes were analyzed to identify the appropriate classes, properties and individuals according to the ontology model as shown in Figure 1.

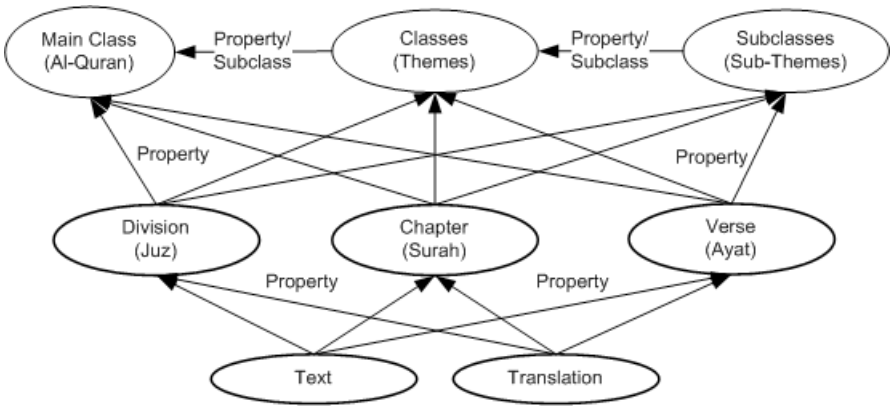

Figure 1: Theme based Ontology Model for the *Al-Quran* (Ta'a et al., 2014)

This is important to establish the ontology that embraces Quranic knowledge, which define the concepts about Faith, Deed and Property. The detailed explanation about the concept, and the relationship between these

concepts and sub-concepts were elaborated further. Protégé-OWL was used as the tool to develop the ontology as shown in Figure 2. Figure 2 presents the concept of Deed which is linked to the sub concepts of Good Deed and Thoughtfulness. With these linkages, the reference verses were annotated by division and chapter.

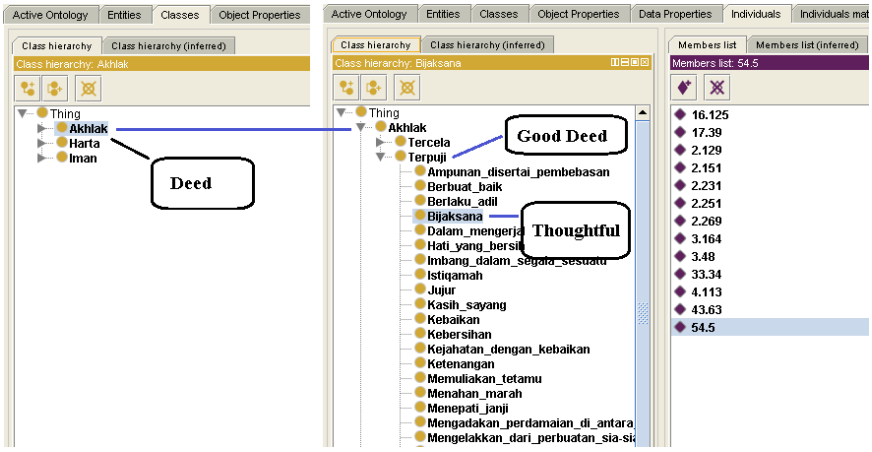

Figure 2: *Al-Quran* Ontology in Protégé-OWL

Based on Figure 2, the Quranic ontology model comprises classes (the themes), sub-classes (the sub-themes), property (the relationship between the themes or sub-themes) and individual (the verses) that referred to particular verses (text and translation). The verse is represented by the sequence number of chapter and verse. Then, to develop an ontology as shown Figure 2, the specification of the ontology which described the relationship between themes and sub-themes, themes and individual, and axiom are defined in Table 1.

Table 1: *Al-Quran* Ontology Specification

Terms	Structure	Al-Quran Knowledge Themes
Root	Main class	Al-Quran
Theme(s)	Class / subclass	Faith, Deed
Sub-theme(s)	Class / subclass	Faith (Allah, Judgment day, Books of Allah, Angels, Invisible problems, Believer, Prophets and Messenger) Deed (reprehensible behavior, admirable character)
Division, Chapter, and Verse	Class / subclass	Division, Chapter , and Verse
Relationship	Property	Link between classes to classes, classes to subclasses and, sub-classes to sub-classes. Example: Faith (class) obliged to (property) Judgment day (subclass)
Al-Quran Text and Translation	Individual	Good Deed – (Division:2, Chapter:2, Verse:44) أَتَأْمُرُونَ النَّاسَ بِالْبِرِّ وَتَنْسَوْنَ أَنْفُسَكُمْ وَأَنْتُمْ تَتْلُونَ الْكِتَابَ ۚ أَفَلَا تَعْقِلُونَ *Do you order righteousness of the people and forget yourselves while you recite the Scripture? Then will you not reason?*

Semantic Search Functionality

The searching functionality is important for learning the *Al-Quran* in the computer system. Most existing Quranic applications provide searching facilities using keyword based search or browsing whole chapters of the *Al-Quran* that reside in the database systems. However, ontology does not necessarily reside in a database, thus requiring a different approach of searching called *semantic search* (Vallet et al., 2005). Semantic search is not new in information retrieval, but applying it for the Quranic ontology domain has recently been in the limelight (Shoaib et al., 2009; Yauri et al., 2012; Khan et al., 2013). Ontology has opened up an extensive space for information to be retrieved and this search utilized a semantic search approach to overcome the problems in traditional based searching methods. This research has developed a searching method adapted from Vallet et al. (2005) as illustrated in Figure 3.

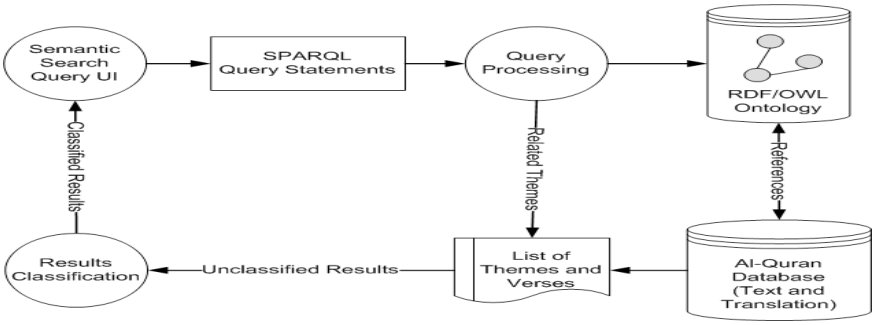

Figure 3: Al-Quran Ontology Searching Framework

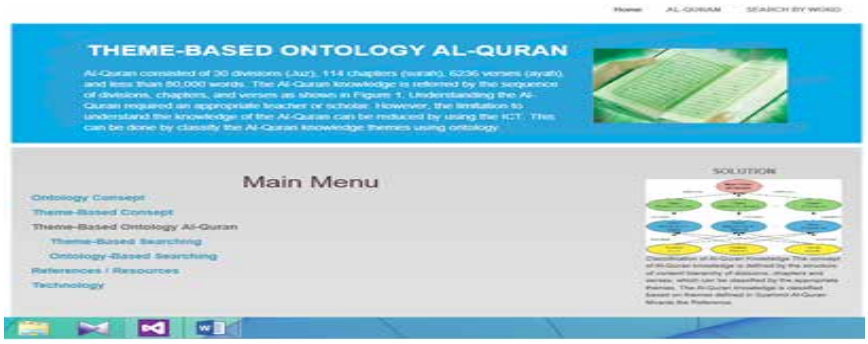

Figure 4: Q-Learning Main Menu

PROTOTYPE APPLICATION FOR LEARNING THE *AL-QURAN* (Q-LEARNING)

A prototype application for learning the *Al-Quran* (Q-Learning) through Quranic ontology has been developed in a web-based environment. The purpose of this application is to provide user friendly interfaces to retrieve Quranic knowledge using the semantic search capabilities as described in the framework shown in Figure 3. The main menu for this application is shown in Figure 4. For the purpose of benchmarking, Q-Learning provides two types of searching facilities: theme based searching and ontology based searching.

Theme-Based Searching

Theme based searching performs a search in the database (i.e., SQL Server) environment, where the ontology data is transformed into database structures. The database schemas store data about themes, sub-themes and related verses reference. Searching is performed by using a query written in normal SQL statements. For example, search for a theme Judgment Day will produce results as shown in Figure 5.

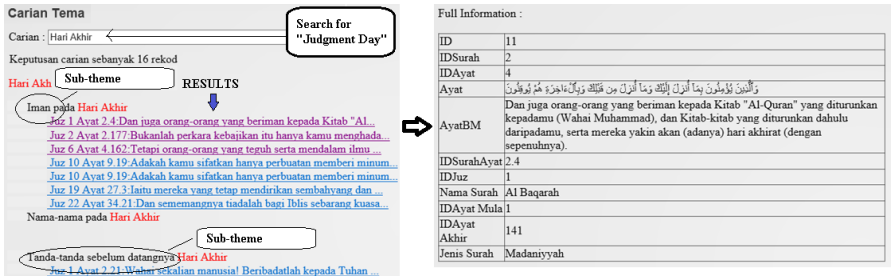

Figure 5: Search Results for *Judgment Day* Theme

Ontology based Searching

Ontology based searching is a method to search a query in ontology directly by using semantic query language such as SPARQL. Ontology as *graph based* database model defines a query as subject-predicate-object (N-Triples format) statements and produces the results according to this format. SPARQL provides a formal language for a subject-predicate-object query (i.e., meaning-driven query). By using TWINKLE[1] tool, the written SPARQL queries become easier and produce meaningful results. An example of the search for Judgment Day theme is shown in Figure 6.

1 https://code.google.com/p/twinkle-sparql-tools/

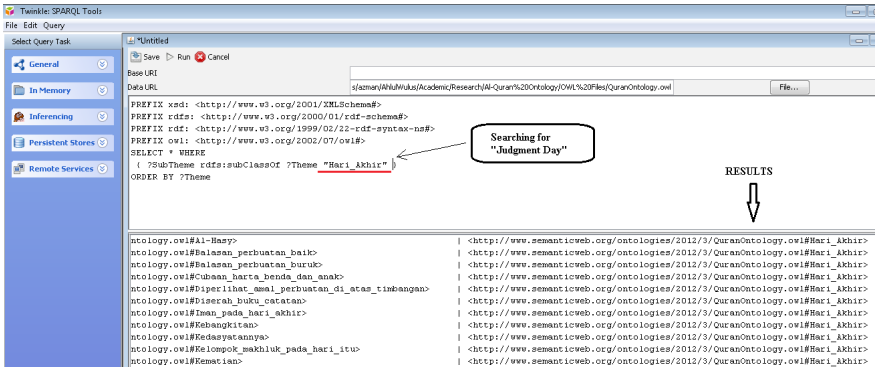

Figure 6: Ontology Searching Results for Judgment Day Theme

EVALUATION AND DISCUSSION

The success of online learning can be measured by how much information can be gathered or retrieved from the online sources (Seiver & Troja, 2014). Much information retrieved from the search will provide more options to understand particular knowledge. The relevance and accuracy of the information retrieved will determine the success of the search method. This paper evaluated the success of searching functionality in Q-Learning for a particular theme (i.e., Judgment Day). The query for searching is performed using two different methods: traditional theme based and ontology based. Both methods were implemented in same computer platform (i.e., Windows 8 operating system). For traditional theme based approach, Microsoft SQL Server was used as a database system. Table 2 shows the benchmark of searching results from both methods.

Table 2: Benchmark of Searching Functionality

Method/ Item	Traditional Theme-Based Method	Ontology-Based Method
Main Theme	Faith	Faith
Theme(s)	Judgment Day	Judgment Day
Query Language	SQL (run on .Net apps)	SPARQL (run on TWINKLE)

Number of Records/ Number of N-Triples	16 records	38 N-Triples

Table 2 shows the results that the ontology based method has produced 38 triples/records compared to traditional theme based method which produced 16 records. This benchmark has shown that the ontology based searching methods produced higher records/triples compared to the traditional theme based method. The matching results will provide a wider range of knowledge to the users learning the *Al-Quran*. Detailed explanations for the information retrieved can be obtained from the various chapters and verses. Even though this benchmark was only performed for one theme, the results highlighted that the semantic based search method has produced multiple answers to the query. This provides rich information for users to be selected and learned. However, further research needs to be done in order to identify specifically the relevant (*recall*) and correctness (*precision*) of searching functionality (Aleksovski, 2008).

CONCLUSION

This paper has presented Q-Learning, the system that uses a theme based ontology approach to learning the *Al-Quran*. The ontology based approach used in Q-Learning has shown the ability to retrieve Quranic knowledge with higher output produced from a particular input theme. The search method is evaluated by benchmarking a search approach in two different environments: traditional theme based and ontology based. The benchmark has shown the success of the ontology based method compared to the traditional theme based method. Moreover, this paper has attempted to contribute towards the theory and practice of using ontologies for learning the *Al-Quran* using information technology, particularly in storing and manipulating vast and complex knowledge as that contained in the *Al-Quran*. Theoretically, this research adds to the literature and provides insightful methods used in the development of semantic searches. This research also presents an integrated information system based on ontology and offers a more systematic approach to be used in Islamic studies. Further research will focus on the relevancy and accuracy of the search functionality without neglecting the importance of Quranic scholars to deliver the truth and accuracy of Quranic contents.

The results are expected to increase the level of understanding of learners through computer applications by offering a new approach to searching and browsing the *Al-Quran*.

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Massive Open Online Courses: Learning From Our Learners

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ABSTRACT

A Massive Open Online Course (MOOC) is an emerging model of delivering learning content online via video-recording interspersed with quizzes and interaction through social media to virtually anyone usually for free. Its enrollment is usually massive, and the massiveness can be attributed to the reputation of the course professor and/or the university. A typical MOOC can be scheduled for live webcast or accessed asynchronously, involving activities such as watching lecture videos, participating in discussion forums, and working or commenting on assignments. As the MOOC instructional model was new, this study was conducted to find out how a class of 15 undergraduates of a Malaysian public university responded to learning from a five week MOOC on academic writing in English. The aim was to investigate if they encountered any challenges while learning from their very first MOOC, and also the instructional activities or features that motivated or demotivated them. Such qualitative data were collected from the students' reflection essays. The results highlighted some important issues of the MOOC pedagogy including the feasibility of the key features, course format and evaluation processes. The findings should provide useful feedback to instructors who plan to design or adopt a MOOC for instructional purposes across disciplines.

Keywords: e-learning, cMOOC, MOOC, peer-to-peer learning, xMOOC

INTRODUCTION

Information and Computer Technology (ICT) continues to change the education system in both traditional and e-learning formats as the recent development of Massive Open Online Courses (MOOCs) begins to revolutionize the e-learning context (Guthrie, 2012; Kop, Fournier & Mak, 2011; Mangan, 2012; Pappano, 2012; Wen, Yang & Rose, 2014). Various journal articles and blog posts have discussed the importance of MOOC, considered the most important educational technology in 200 years in the form of a global virtual university (Fini, 2009; Regalado, 2013). Many elite universities have paid attention to MOOC and offer courses through collaboration with MOOC providers. By September 2013, 91 elite universities in the world had joined Coursera, one of the better known MOOC platforms, to offer 463 courses. Coursera is the largest MOOC provider which has more than 5 million users registered for its smorgasbord of courses. Other prominent MOOC providers include edX and Udemy. Instructional researchers have identified potential advantages of MOOC stating that learning on MOOC happens through connections (Chamberlin & Parish, 2011; Cormier, 2010; Marshall, 2013; McAuley, Stewart, Siemens, & Cormier, 2010; Waite, Mackness & Roberts, 2013).

MOOCs aim at large scale participation and open access via the Internet (Cormier, 2010; Kop, Fournier & Mak, 2011). In MOOC environments, learning can proceed at any age, or any time, place or space (Educause, 2012). MOOCs open the doors of a dynamic online education and accommodate massive participation free of cost, as well as offer efficient conversational and collaborative possibilities for learners to come together to work on the instructional content (Bruff, Fisher, Mcewen & Smith, 2013; Educause, 2012; Stewart, 2013). To cope with the huge student enrollment, MOOC instructors rely on using social media tools to initiate participatory and peer-to-peer learning. This approach has the appeal of distributing the instructional responsibility to the whole class rather than resting it solely on the teacher.

Up to now, MOOCs have enticed the enrollment of people of all ages and locations and from all walks of life. A MOOC usually gains from an enriched array of diverse ideas contributed by people from various regions and cultures. At the same time, it enables the hosting college or university to

extend its service to a wider population, extending the institution's aspiration into the local community.

In general, two models of MOOCs are being discussed in the research community: cMOOC and xMOOC (Siemens, 2012). The cMOOC model is different from the xMOOC in several specific features (Kafai & Peppler, 2011). The cMOOC tends to apply connectivism inspired approaches, and the xMOOC reflects the Coursera type offerings (Siemens, 2012) that replicate old-fashioned lectures and exams. In xMOOCs, institutions such as Harvard University, Stanford University, Duke University design courses in a traditional face-to-face manner, whereas the underlying principle in cMOOCs is that each individual is empowered to design a learning experience. Siemens and Downes (2008) describe four important features of the connectivist MOOC that are openness, autonomy, diversity and connectedness. In short, cMOOCs stress on knowledge creation, while xMOOCs focus on knowledge duplication (Kop & Hill, 2008; Siemens, 2012). In a cMOOC, students create videos, develop quizzes or learning activities, whereas in an xMOOC, students watch the videos and do the quizzes. Most of the MOOC providers tend to adopt the xMOOC format that follows a behaviorist pedagogy because it is easier to administer and evaluate learning outcomes. A few studies have shown that cMOOCs and xMOOCs share several similar features but they differ in the pedagogical model and learning theory *(*Kop, 2011; Rodriguez, 2013).

PURPOSE OF THE STUDY

This case study reports 15 undergraduates' novel experiences and engagement with an xMOOC on academic writing called *Principles of Written English* designed by the University of California at Berkeley and administered through edX over five weeks. According to edX, the MOOC is an introduction to academic writing for English language learners, focusing on essay development, grammatical correctness and self-editing. The study scrutinized some important issues of MOOC and highlighted the feasibility of the key features, course format and evaluation process. By gaining a deeper understanding of the learners' patterns of engagement in the MOOC, the study might contribute useful feedback to how future MOOCs could be better developed to support more effectively the learning needs of students.

METHODOLOGY

This section describes the sampling, data collection and data analysis methods of the study.

Sampling

15 ESL undergraduates from a public university in Malaysia participated in the study. They were from an intact class taking an obligatory course called *Language and ICT*, and the MOOC participation is an assignment of the course. Most of the participants (n=10) were female, and they were all majoring in English language.

Data Collection

To collect data regarding students' experiences and engagement with the MOOC, the students were required to describe and comment on every stage of their learning on the MOOC in a logbook throughout the five weeks, and later use such records from their logbook to write a reflection essay upon the completion of the MOOC. More specifically in the reflection essays, students were asked to discuss the perceived strengths and weaknesses of the MOOC features, tools and course format in the light of the face-to-face university courses they had attended.

Data Analysis

The study analyzed fifteen reflection essays to establish holistically the interpretive framework for each student regarding his/her experience about the MOOC. The study analyzed repeated words, patterns, and positive or negative comments of the MOOC for emerging themes. Then the sub-themes were compiled to form major themes that are presented and discussed in the next section.

RESULTS AND DISCUSSION

As revealed by their reflection essays, the students had benefited from the MOOC especially since it taught them to write better English. Almost all the participants of the study appreciated some of the distinctive features

of MOOC such as video lectures, quizzes and discussion forum. They also felt proud at attending a course offered by an elite university from North America. A participant never thought that he would attend a course from the University of California. He thanked edX for offering such a course and the opportunity to learn from it for free to make his dream come true. Another student stated that, "I enjoyed joining such a big family because we learned together; we shared our ideas unselfishly and helped each other regardless of different nationalities, cultures, job positions and so on. Besides, it is interesting to learn through this special and provoking teaching method. The professor emphasized on participation and asked some questions in each lesson to test our understanding. His body movement and hand gestures in the video lectures made me stay attentive in following the lecture."

Further comments from the participating students are organized in the sub-sections below.

Engagement with Video Lecture

One of the most significant features of the MOOC is its video features which ensure students' engagement with the learning content (Bruff, Fisher, Mcewen & Smith, 2013; Guo, Kim & Robin, 2014; Hanley, 2013). Within the videos, multiple opportunities are created for interactions such as embedded sub-titles and questions. The PDF or PPT version of the video lectures were also available. The video frequently paused to ask a question or a series of questions to test if the students were following the instructional materials. The students often mentioned the benefits of watching the video lecture as it resembled face-to-face teaching. One student (Participant 2) mentioned that it was less difficult for him to understand the lectures because of the embedded subtitles on the video. The video lectures are such an advantage that the student said, "I really did feel like I was in class with some other students, listening and watching." Another student (Participant 5) wrote that "at first I found the questions annoying; they interrupted my listening. In time, I came to realize that they helped me confirm my understanding of the key ideas of the subject."

Despite the advantages of the video lectures, students faced some difficulties while downloading or streaming the videos due to slow Internet speed. According to Participant 4, "Basically, the challenges are the Internet

connection here in the university. Slow Internet connection prevents me from learning the course smoothly as the course videos lagged. ”

Engagement with Quizzes and Assignments

Some students also added their success over the quizzes and assignments. A student (Participant 12) stated, “I had scored well in all the quizzes although the final progress had reduced slightly. I had performed well in the self-test sections for each lesson.” Another student (Participant 4) added, “I have achieved the highest score in Week Two quiz. It was quite difficult but after watching the video lectures again, I was able to score 10 out of 12.”

Furthermore, students’ logbook entries recorded the added benefits of developing their writing skills in English. According to one student (Participant 8), “The MOOC platform helped me improve my writing skills through several ways. There were peer responses, teacher responses, a discussion forum, and course materials. Peer responses gave me general comments about my essay. Also my classmates can look at my essays.” Such comments focused on the perceived benefits of MOOC from the students’ perspective, confirming that instruction and course objectives were being met.

Engagement with Discussion Forum

The students also talked about the discussion forum which allowed them the convenience to discuss various topics. Students asked many questions while participating in the MOOC, and they received numerous responses from their peers. The responses to their questions were found to be thoughtful, supportive and fun to read. Each week of their learning from the MOOC had its set of discussion topics. Some topics were promoted by the video lectures. However, the discussions were prompted by the students’ interests. One student (Participant 15) commented that “the forum part is the best part of the MOOC. We can exchange our opinions and so on. There are topics including the relevant and irrelevant ones.” Some students could not contribute much in the discussion forum; they only introduced themselves. For example, Participant 13 penned that, “I couldn’t contribute anything on the discussion forum because I was busy with other activities

such as doing the quizzes and assignments, evaluating peers' essays, and watching the videos." She added that she read many thoughtful comments posted by other students.

Another student (Participant 9) inscribed that, "Apart from the advantages of the course features and tools, I made a lot of friends from other countries with different job positions, cultures, races, and of different age range. I truly appreciate it. The discussion forum used in the course allows all the people on this course to share their knowledge as we know sharing is caring. It is useful and the way they shared different opinions on different topics allowed me to gain widely and learn more through this course."

Certification

The MOOC participants could use tokens given for task completion to earn a certificate after they completed the course successfully. The certificate may be useful for learning or career advancement. In the case of Coursera, participants who attain an average score of 70% and above receive Statements of Accomplishment, and those who achieve more than 85% receive Statements of Accomplishment with Distinction (Course Logistics, 2012). Udacity provides four types of certificates: Completion, Accomplishment, Accomplishment with High Distinction, and Accomplishment with Highest Distinction, while edX provides only Certificates of Completion (Murray, 2013).

Students were excited after they received the Certification of Accomplishment. Only three students could manage course completion certificates. However, a realistic question is that if a student completes a MOOC successfully and receives an accomplishment certificate or verified certificate, will the certificate be of any value for him to apply for a job or further studies? Acknowledging this concern, Coursera is working with the American Council of Education (ACE) to ensure that credits that come from Signature Track courses will be considered by many of the ACE member schools such as Amherst University, Boston University, and Carnegie Mellon University. Nevertheless, whether or not a completion certificate has any value, we cannot ignore the fact that learning from a MOOC certainly has some inherent value such as meeting up with friends online from all over the world, and learning some useful content.

Peer Evaluation

Evaluating peers' assignments is often a significant challenge to students in a MOOC. The usual methods of assessment on MOOC include machine graded multiple choice quizzes or tests, and peer assessed written assignments. The machine grading of written assignments is still under development. Peer assessment is usually guided by model answers and rubrics, which help the student grader on how many marks to give to different answers. The MOOC students are required to learn the skill of grading and responding to having peer-review. One student (Participant 10) commented, "In my opinion, the weakness of this course is that it lets the students give marks to other students' assignments. The evaluation marks from peers contribute to the overall marks. " Some students found the evaluation procedures more difficult than doing the assignment. In this respect, Participant 3 stated that "evaluating a peer assignment is time consuming. As a student myself, it is difficult for me to complete the assignment as well as to evaluate a peer's paper."

Many MOOC providers such as edX and Coursera have implemented peer assessment whereby students grade one another's work independently (Coursera, 2013). Multiple peer assessments can also be administered for any single assignment. However, experts such as Ragan (2012) are skeptical about peer assessment and feedback. Thus, there are arguments for and against peer assessment. The peer assessment is simply a part of the learning process, and certainly not the only way to evaluate learning attainment (Sharples et al., 2012). Evaluating higher level writing and thoughts requires human experts and formal examinations for the evaluation to be valid.

In addition to the challenges from peer evaluation, plagiarism is yet an important issue not being given much attention by the current MOOC providers. Plagiarism among students, if left unchecked, may impact on the trustworthiness of the instructional evaluation and the university reputation. As an effort in discouraging plagiarism, Coursera has initiated an honour code after a frequent occurrence of plagiarism (Young, 2012). In the same vein, Subramanian (2012) believes that it is possible to solve plagiarism by changing the assessment system. Both formative and summative assessments are often automated in MOOCs to serve the huge student enrollment. However, automation is only applicable to objective assessments such as

quizzes, while higher level thoughts cannot be evaluated by using technology alone (George, 2012). George (2012) used the analogy of a driving test to explain this. In his words, "Driving test is an example of a blended online assessment course where some of the information [like the Highway Code] is perfectly acceptable for testing online ... Driving a car is something you can't do online" (George, 2012).

Other Challenges

The MOOC, being a course on written English, was taught in English naturally. Some students who had lower English proficiency had difficulties in understanding the lectures. A few students commented that they had difficulties understanding American English. In this respect, Participant 11 responded, "The MOOC lecturer is an American and he is using American English while I am using British English. Therefore, I have a doubt in my heart. When I write my assignments in British English, will the assignments be marked down?"

On a different note, Participant 5 said that the significant challenge for him is to manage his time for the course, as he had to watch videos of approximately 10 to 15 minutes each (sometimes around 20 minutes), do the quizzes and assignments, and evaluate the peers' papers. Another student (Participant 9) added, "Challenges that I have to face while attending this course is to really put my time in very tight consideration due to my preparation for my final year project while doing this MOOC. Another challenge is that I have to complete watching two sets of video lecture, quizzes, a mini project and peer evaluation for this course, and it is really time consuming."

CONCLUSION

The results presented above indicate that students had appreciated most of the features and tools for learning afforded by the MOOC. However, most of them faced some form of difficulties such as low English proficiency and time constraints while completing a MOOC. Students appreciated watching the lecture videos, doing the quizzes, contributing on the discussion forum as well as the MOOC certification. However, in addition to the challenges,

problems that hampered their learning included slow streaming of the videos, meeting the assignment deadlines, and evaluating the peers' assignments. Although the study has some limitation, as there were relatively low numbers of participants involved in the case study, some valuable findings have been attained with regards to peer evaluation and certification in the MOOC environment that deserve further research.

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Perceived Contextual Factors Affecting Learning Strategy Choice

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ABSTRACT

This study identified contextual factors that were perceived as influential in determining the learning strategy adopted by undergraduates at a higher learning institution in Sabah, Malaysia. Questionnaires were distributed to 168 students using survey items adopted from the Learning Approach model developed by Baeten et al. (2010). The data were analyzed using the statistical software, SPSS. The cross tabulation results indicated that more than 50% of the respondents adopted the deep learning strategy. It was established that "Clarity of Teaching and Learning Goals" (87.2%), "Teaching Quality" (80.1%) and "Assessment" (70.1%) were the main factors affecting students' choice of deep learning strategy. Similar results were also obtained through factor analysis, which can offer suggestions for educators and academics to consider improving the contextual factors in order to encourage university students to adopt the deep learning strategy.

Keywords: deep learning, learning strategy, surface learning

INTRODUCTION

Factors affecting the academic performance of university graduates have been studied in various disciplines for many years. Among the aspects that have been explored by scholars are teaching pedagogy (Caldwell, Weishar & Glezen, 1996; Ditcher, 2001; Norman, Rose & Lehman, 2004; Sullivan, 1996; Wijnia, Loyens & Derous, 2011), students' assessment (Clayson, 2009; Clinton & James Kohlmeyer III, 2005; Smith & Spindle, 2007), and students' background (Bryne & Flood, 2008). However, while most studies investigated the relationships between learning environments such as classroom methodologies and techniques, and academic performance, few empirical studies have explored learning strategies adopted by university students and how choices of learning strategy would impact students' learning outcomes (Entwistle, 2000). This paper aims to identify contextual factors that affect the learning choices made by undergraduate students at Universiti Teknologi MARA Sabah, Malaysia (UiTM Sabah) in adopting certain learning strategies. Specifically, this study investigates whether contextual factors such as workloads, teaching quality, clarity of teaching and learning goals, independent study and assessment as suggested by Baeten et al. (2010) are perceived by students as motivating factors in choosing the 'deep learning' strategy. Understanding contextual factors that can stimulate deeper learning among university students is crucial in assisting academics at higher learning institutions to design and provide effective and conducive teaching and learning infrastructure. This paper is organized in the following manner. The following section discusses related literatures pertaining to students' learning strategies and the Learning Strategy model by Baeten et al. (2010) which was adapted as the research instrument in this study. This is followed by a brief description of the research method used in the study. In the ensuing section, results and findings of this study are presented. The paper ends with a discussion on the practical implications of the study and a concluding remark.

LITERATURE REVIEW

A review of literatures on students' learning has indicated that successful learning is associated with effective learning strategies. Pintrich and De Groot (1990) suggested that the adoption of higher order thinking and self

regulated learning approaches are related to excellent academic performance (Blom & Severiens, 2008). The researchers stated that using metacognitive skills in learning such as 'elaboration' and 'critical thinking' will help students to better understand a particular subject matter. Students employing higher order thinking were found to have the ability to link items to be learned with prior knowledge and are able to retain their knowledge longer than those who employed 'surface learning', which is a strategy to learn only for the sake of obtaining a passing grade (Vos, Meijden & Denessen, 2011). Apart from that, these researchers also stressed that academic achievement is influenced by the students' attitude to learning. A self-regulated learner is found to be more successful because s/he is able to manage his or her own learning environment and therefore, the student is more motivated to achieve his or her study objectives (Blom & Severiens, 2008).

There are two learning strategies that are likely to be adopted by students, which are deep learning strategy and surface learning strategy. Deep learning refers to the active use of cognitive capacity in learning that involves a learner searching for a deeper meaning of a particular subject matter (Vos et al., 2011). It includes paying attention to the underlying meaning of study material and is associated with the use of analytic skills, cross-referencing, imaginative reconstruction and independent thinking (Warburton, 2003). Deep learning is driven by the intention of acquiring a deeper understanding, rather than to simply pass an assessment task (Warburton, 2003). Deep learning is oftentimes linked to the holistic learning approach where active learning is evident in the learning process. A learner who adopts the deep learning strategy knows how to interconnect different ideas and is able to transform disparate types of information into a new set of ideas (Diseth, Pallesen, Brunborg & Larsen, 2010; Warburton, 2003). Deep learners look for patterns and principles in study material and form arguments based on evidences and logic (Entwistle, 2000). This process enables such learners to monitor the development of their own understanding about certain subject matter. Self-consciousness in the pursuit of knowledge is a key feature of the deep learning strategy and this attitude enables learners to achieve more sustainable and successful learning outcomes (Warburton, 2003).

In contrast, surface learning is a rather shallow learning approach. According to Webb (1997, p. 195), "A person using the surface approach

does not see past the text to the sense and meaning of the passage: they would simply try to remember the text". In other words, surface learners simply memorize facts without making any effort to integrate the ideas that are embedded in the study material into their cognitive structure (Ke & Xie, 2009). Among learning methods used by a typical surface learner are skimming, memorizing and regurgitating study materials which are intended only to fulfill minimal test or assessment requirements (Newman, Webb & Cochrane, 2004). Contrary to the deep learning strategy, the motive to employ the surface learning strategy is driven by external factors, such as students' perception regarding the role of university and academic certificates as a means to obtain a desirable job (Biggs, 1991). It was further argued by Biggs (1991, p. 29) that students adopting this approach tend to take shortcuts in order to balance "avoiding failure against working too hard" and therefore, try to limit the target to what they perceive as essentials which can be reproduced through rote learning. Compared to the deep learning approach, surface learning is considered less effective as it focuses heavily on tangible aspects of a task component, rather than on their meaning, and treats them as unrelated to each other or to other tasks (Biggs, 1991). Therefore, it can be argued that surface learners are unable to produce high quality work outcomes due to their rather narrow and restrictive views.

In a study based on an eight year (1992-2000) review of literatures on students' learning approaches, Baeten, Kyndt, Struyven and Dochy (2010) identified several factors that led students to adopt the deep learning strategy. These factors were grouped into three main categories. The first category which was labeled as contextual factors, described those factors that were associated with the environment in which the student learned. This included teaching methods, course assessment, teacher's feedback and personality, classroom characteristics and so on. Factors affecting the learning environment as perceived by students were categorized as perceived contextual factors. Workload, teaching style and clarity of goals were among factors that fall under this category. Factors relating to student's nature or characteristics such as age, gender, intellectual ability and personality were categorized as student's factors.

Guided by the Learning Strategy model as proposed by (Baeten et al., 2010), this study sought to explore learning strategies employed by

students of UiTM Sabah and to investigate whether perceived contextual factors could explain the students' choice of adopting the deep learning strategy. Five contextual factors were considered in this study, as listed in Figure 1. The discussion pertaining to each contextual factor is presented in the following subsections.

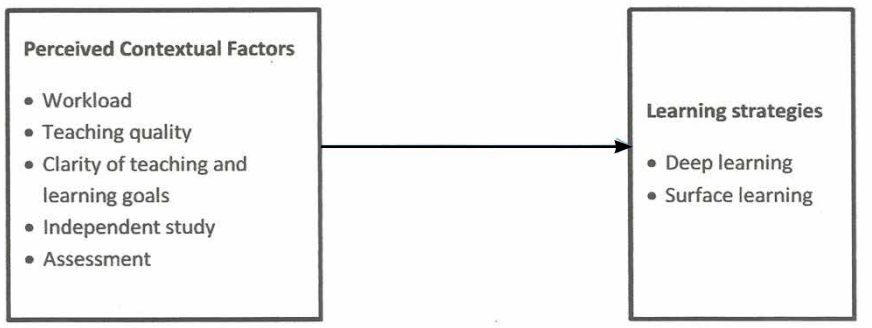

Figure 1: Learning Strategy Model (Baeten et al. 2010)

Workload

Previous studies have indicated that there is a relationship between workload and approaches to learning that students adopt. For example, it was found that the perceived appropriate workload was positively related to the deep learning approach, but was negatively related to the surface learning approach (Diseth et al., 2010). Moreover, Gibbs (1992) found that heavy workload is one of motivating factors for students to employ the surface learning approach (Kember, Leung & McNaught, 2008). Similar findings are also evident in a number of studies, such as Crawford et al. (1998), Diseth (2007), Kember et al. (2008) and Wilson et al. (2008) (Baeten et al., 2010). An explanation for these mixed results was provided by Kember (2008) where he stated that "students resort to short cuts and undesirable study approaches to cope with the perceived excessive demands" (Baeten et al., 2010).

Teaching Quality

Students' perception of teaching is also a factor determining their choice of learning approach. Teaching approaches that are perceived as

'good', refer to "the adequacy of a teacher's supportiveness, ability to deliver lessons effectively, and ability to guide students through potentially confusing concepts" (Barnhardt & Ginns, 2014, p. 800). It was found that students who perceive the teaching approach as 'good' (in terms of presentation, integration, lecturer's characteristics) are more inclined to use the deep learning approach (Baeten et al., 2010). It was also found that the delivery method employed by the lecturer plays an important role in determining students' choice of learning strategy. The perceived teacher centered teaching approach that uses a one way process of transferring knowledge was found to be positively correlated to surface learning. On the contrary, a positive relationship was found between the student centered teaching approach and the deep learning strategy (Baeten et al., 2010).

Clarity of Teaching and Learning Goals

Clear teaching and learning goals are important factors which could affect students' choice of a particular learning approach. According to Entwistle and Ramsden (1983), "Clear goals and standards reflect judgments of how clearly the specific purpose and performance criteria for work in a given class are communicated" (Barnhardt & Ginns, 2014, p. 800). It was found that students were more likely to employ the deep learning approach when they perceived that the lecturer had made teaching and learning goals clear throughout the course (Baeten et al., 2010; Crawford, Gordon, Nicholas & Prosser, 1998; Greene, Costa, Robertson, Pan & Deekens, 2010).

Independent Study

A number of studies have shown that students who planned and monitored their learning environments (practicing self-regulated approach in learning) had better chances of achieving high academic performance (Blom & Severiens, 2008; Greene et al., 2010). This self-regulated approach in learning or independent study is defined as the degree of what "…discretion students have over what learning they do in a course" (Barnhardt & Ginns, 2014). Prior studies have found that the independent study strategy is associated with deep learning as students play an active part in the learning and teaching process (Baeten, Douchy & Struyven, 2008; Blom & Severiens, 2008).

Assessment

It was found that differences in assessment preferences were correlated with differences in learning strategies (Baeten et al., 2008). A study conducted by Birenbaum and Feldman (1998) found that deep learners tended to prefer essay type questions compared to surface learners who preferred multiple choice formats (Baeten et al., 2008). In an earlier study by Gijbels and Douchy (2006), it was found that there was a significant positive relationship between the deep approach to learning and a preference for tasks that required higher order thinking. This finding supported the idea that students who adopted the deep approach in learning preferred assessment procedures that support their understanding (Baeten et al., 2008).

METHODOLOGY

A total of 168 students participated in this study. The respondents were final year students who were enrolled for the bachelor's degree in all six social science programs offered at UiTM Sabah. The rationale for selecting final year students was based on the researchers' assumption that students who have completed more than 50% of their study contents for a particular programme, are more likely to be able to provide views on contextual factors that affect their choice of learning strategies. In order to elicit respondents' views on contextual factors that affect their choice of learning strategies, a questionnaire was developed based on the Learning Strategy model as suggested by Baeten et al. (2010). Respondents' feedback on each question were measured using a five-point Likert scale ranging from 1= "Strongly Disagree", 2= "Disagree", 3= "Neutral", 4= "Agree" and 5= "Strongly Agree". The questionnaire was also used to attain information relating to respondents' background. Two types of statistical analyses were performed in this study. The first involved cross-tabulations to examine patterns with respect to the deep and the surface learning strategies among the respondents. This was followed with a factor analysis to identify main contextual factors that affect respondents' choice of a deep learning strategy.

RESULTS AND FINDINGS

Respondents' Demographic Profile

The average age of respondents in this study was 23, and the sample comprised 22.6% males and 77.6% females as shown in Table 1. The majority of respondents belonged to the Kadazan/Dusun (35.7%) and Brunei/Melayu (31.5%) ethnic groups. The largest number of respondents was from the Bachelor in Business Administration (Hons.) Finance (27.4%), followed by Bachelor in Business Administration (Hons.) Marketing (20.2%), Bachelor of Science in Tourism Management (Hons.) (18.5%) and other programs (33.9%).

Table 1: Respondents' Demographic Profile

Demographics	Frequency	Percentage (%)
Gender		
Male	38	22.6
Female	130	77.4
Ethnic groups		
Kadazan/Dusun	60	35.7
Bajau	26	15.5
Brunei/Melayu	53	31.5
Others	29	17.3
Programmes		
Bachelor in Business Administration (Hons.) Marketing (BM220)	34	20.2
Bachelor in Business Administration (Hons.) Finance (BM242)	46	27.4
Bachelor in Business Administration (Hons.) Business Economics (BM250)	15	8.9
Bsc. (Hons.) Tourism Management (HM241)	31	18.5
Bachelor in Accountancy (Hons.) (AC220)	13	7.7
Bachelor of Corporate Administration (Hons.) (AM228)	29	17.3

Learning Strategy Patterns

As evident from the mean scores in Table 2, the deep learning strategy was widely adopted by respondents for all contextual factors. It was also found that "*Clarity of Teaching and Learning Goals*" (87.2%), "*Teaching Quality*" (80.1%) and "*Assessment*" (70.1%) were highly rated by respondents as factors affecting their choice of the deep learning strategy.

Table 2: Learning Strategy Patterns Based on Contextual Factors

	Learning Strategy	
Perceived contextual factors	Deep (%)	Surface (%)
Workload	63.4	36.5
Teaching Quality	80.1	19.9
Clarity of Teaching and Learning Goals	87.2	12.7
Independent Study	56.1	43.9
Assessment	70.1	29.9

As can be seen from Table 3, similar patterns were also observed across programs whereby most respondents (> ⅔) were deep learners. In terms of types of programs, the majority of respondents who adopted the deep learning strategy were undertaking the Bachelor of Corporate Administration (Hons.) programme (75.48%), followed by Bachelor in Business Administration (Hons.) Marketing (73.24%), and Bachelor in Business Administration (Hons.) Finance (71.34%).

Table 3: Learning Strategy Choice Based on Academic Program

Programmes		BM220	BM242	BM250	HM241	AC220	AM228	Average
Learning Strategy		%	%	%	%	%	%	%
Workload	Surface	33.3	40.5	37.8	37.6	34.6	32.8	36.1
	Deep	66.7	59.5	62.2	62.4	65.4	67.2	63.9
Teaching Quality	Surface	20.6	20.4	12.2	26.3	25.6	16.7	20.3
	Deep	79.4	79.6	87.8	73.7	74.4	83.3	79.7

Clarity of teaching and learning goals	Surface	18.8	11.3	22.6	11.6	7.7	6.2	13
	Deep	81.2	88.7	77.4	88.4	92.3	93.8	87
Independent study	Surface	37.6	43.2	52	43.9	47.7	46.9	45.2
	Deep	62.4	56.8	48	56.1	52.3	53.1	54.7
Assessment	Surface	23.5	27.9	29.3	31.6	35.4	20	27.9
	Deep	76.5	72.1	70.7	68.4	64.6	80	72.1
Average (%)	Surface	26.76	28.66	30.78	30.2	30.2	24.52	
	Deep	73.24	71.34	69.22	69.8	69.8	75.48	

Factor Analysis on Perceived Contextual Factors Affecting the Deep Learning Strategy

A factor analysis was conducted to identify the main contextual factors that affected respondents' choice of the deep learning strategy. The analysis enabled researchers to identify emerging factor(s) based on items that are highly correlated with a particular factor. Three steps were involved in this analysis. In the first step, the Kaiser-Meyer Olkin (KMO) test was performed to determine the factorability of the analysis in terms of sampling adequacy. The Bartlett's Test of Sphericity was also carried out to examine the homogeneity of variances across factors that determine the suitability of using factor analysis. Results of both the KMO Test (0.787) and Bartlett's Test (Chi-square = 814.431, $p < 0.000$) indicated that data collected in this study fulfilled the requirements needed for conducting factor analysis (Field, 2009).

The second step involved performing the factor analysis using Principal Component Analysis and Varimax Rotation to identify factors based on scores of the deep learning strategy that were analyzed from the previous cross-tabulations analysis. There were fifteen items that represented three contextual factors (i.e. Clarity of Teaching and Learning Goals, Teaching Quality and Assessment) that were considered in this analysis. These factors were chosen because they were perceived by most respondents (⅔ students who adopted the learning strategy) as factors affecting their choice of the deep learning strategy. The initial eigenvalues indicated five factors which emerged from the analysis (eigenvalues > 1). However, the fifth factor was eliminated due to the fact that there was only one item. During this stage, an

item (TQ3) with factor loading less than 0.3 was removed, an item (TQ5) which initially belonged to the factor "*Teaching Quality*" was regrouped under a different factor (Assessment) and an emerging factor made up of two items (ASS1 and ASS2) was formed. Consistent with the term being used in a previous study (Pintrich and De Groot, 1990), the fourth factor was named "*Higher Order Thinking*" since the items that fell under this factor described metacognitive skills used in learning such as 'elaboration' and 'critical thinking'. These four factors that were retained in this study explained 59.59% of the variance in the dataset. Findings from the factor analysis for 15 items of the four factors are presented in Table 4.

Table 4: Factor Analysis for 15 items of Four Factors

Factors and items		Factor Loadings	Eigenvalues	Variance Explained
Clarity of Teaching & Learning Goals			**4.56**	**30.39**
CG1	Clarity of teaching goals enhance students' understanding	0.786		
CG2	Explanation of a lesson objective and significance in the early part of lecture	0.724		
CG3	Clarity of teaching objective helps in learning strategy planning	0.699		
CG4	Acquiring an overview of a lesson before attending lecture	0.657		
CG5	Explanation of a lesson objective	0.741		
Assessment			**1.75**	**11.44**
ASS3	Lecturers' comments on the On-going Assessment components	0.806		
ASS4	Prompt feedback from lecturers motivates student learning	0.873		
ASS5	Ensure consistent performance for both core and non-core courses	0.752		
TQ5	Feedback from lecturer on an academic task	0.604		
Teaching Quality			**1.51**	**10.09**

TQ1	The use of effective method in delivery lectures	0.807		
TQ2	The use of effective teaching aids	0.829		
TQ4	Two-way teaching approach	0.459		
TQ6	Supply of teaching materials	0.534		
Higher Order Thinking			**1.14**	**7.65**
ASS1	Assessment components that require higher order thinking	0.770		
ASS2	Assessment components that require elaboration	0.739		

In the final step, a reliability test for each factor was performed to examine the items' internal consistency. The reliability analysis indicated in Table 5 showed that the alpha values for "*Clarity of Teaching and Learning Goals*" (0.83), "*Assessment*" (0.82) and "*Teaching Quality*" (0.70) were within the acceptable range. This was achieved after the removal of three items as follows: "*Clarity of Teaching and Learning Goals*" – one item removed (CG4), "*Assessment*" – one item removed (TQ5) and "*Teaching Quality*" – one item removed (TQ4). The low alpha value for "*Higher Order Thinking*" (0.359) indicated a low correlation of items which was due to the small number of items that fell under this factor. The low alpha value disqualified "*Higher Order Thinking*" as one of main contextual factors affecting students' choice of the deep learning strategy.

Table 5: Reliability Analysis on the Contextual Factors

Factors and items		Reliability Coefficient
Clarity of Teaching & Learning Goals		**0.83**
CG1	Clarity of teaching goals enhance students' understanding	
CG2	Explanation of a lesson objective and significance in the early part of lecture	
CG3	Clarity of teaching objective helps in learning strategy planning	

CG5	Explanation of a lesson objective	
Assessment		**0.82**
ASS3	Lecturers' comments on the On-going Assessment components	
ASS4	Prompt feedback from lecturers motivates student learning	
ASS5	Ensuring consistent performance for both core and non-core courses	
Teaching Quality		**0.70**
TQ1	The use of an effective method in delivery lectures	
TQ2	The use of effective teaching aids	
TQ6	Supply of teaching materials	

Findings obtained in the analyses conducted in this study indicated three main contextual factors that explained the choice of the deep learning strategy among the selected undergraduates at UiTM Sabah. The factors were "*Clarity of Teaching and Learning Goals*", "*Assessment*" and "*Teaching Quality*". The next section will discuss practical implications of this study, specifically pertaining to the efforts needed to enhance contextual factors for the purpose of encouraging students to adopt the deep learning strategy.

DISCUSSION AND CONCLUSIONS

This study aimed to identify contextual factors affecting choices of learning strategies among university students at UiTM Sabah. It was found that "*Clarity of Teaching and Learning Goals*", "*Assessment*" and "*Teaching Quality*" are influential in determining students' adoption of the deep learning strategy. These findings have highlighted some important points relating to university students' choice of learning strategies.

First, it is apparent that students who adopt the deep learning strategy seek clarity of teaching goals so that they can set their own learning goals. Since students who adopt the deep learning strategy are concerned with their own understanding, it can be said that they will perceive understanding the learning process as equally important as understanding the study materials. Therefore, it is suggested that lecturers should provide students with a

comprehensive and concise overview of a particular course and its contents. This should be made at the beginning of the semester and be reiterated before the commencement of each lecture. These two aspects could be helpful for students to enhance their level of understanding for a particular course, hence helping them make necessary plans for their learning.

The second aspect of particular importance to the deep learning strategy choice pertains to how outcomes of assessment components are communicated to students. Findings of this study suggested that lecturer's feedback on students' assessment outcomes are vital as this will determine students' choice of learning strategy. Deep learners sought feedback on their assessments in order to evaluate their learning progress. Lecturer's feedback is perceived as vital in helping them identify areas in which they are still weak or lacking in knowledge which can therefore help them to strategize their learning. Apart from that, students adopting a deep learning strategy would expect prompt feedback from lecturers about their assessment outcomes. Therefore, lecturers teaching both core and non-core courses are expected to be cognizant of these needs.

Lastly, findings of this study indicate that teaching quality, in terms of materials used, teaching method as well as styles and teaching aids, are also important in determining learning strategy choice. Lecturers are expected to make the necessary effort to improve these teaching aspects by ensuring that their teaching materials are comprehensive, up-to-date and are readily available when needed. Lecturers are also expected to improve their teaching styles and adopt styles that can stimulate students' learning interest. This can be achieved by considering the integration of information technology in teaching.

However, efforts to encourage the adoption of the deep learning strategy among university students must not fall on the shoulders of lecturers alone. University administrators must also play a role, particularly in providing the physical and moral support needed in order to create a conducive learning environment that can promote deep learning among university students.

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Problem-Based Learning: 'One for All and All for One'

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ABSTRACT

Problem based Learning (PBL) is Learner Driven Learning that engages students to learn domain knowledge to solve real world problems in groups. Group work is not an option in PBL but in reflective journals, some students expressed a lot of frustration at having to work with others as with a student who lamented that "I didn't even realize he was one of our group members until the day of our presentation". From a PBL practitioners' point of view, the researcher views with frustration the situation where a single uncooperative group member can affect group learning and the success of the completion of their PBL projects. An informal questionnaire given to 58 students indicate mixed opinions regarding working in groups. All of them do not deny the benefits of group work over the lecture mode of teaching but many indicate a preference for working individually. The results indicate a need for PBL practitioners to monitor group performance during the PBL learning process outside of class time. Monitoring forms for the 3 stages of the PBL process: the group meeting at the problem stage (Form#1), the individual researching stage (Form#2), and finally, the group leader's report (Form#3). Reading the forms allowed the researcher, as the PBL facilitator, to provide feedback, ask questions, reprimand slackers and praise those working well.

Keywords: group work, problem based learning, self-directed learning

INTRODUCTION

Problem based learning (PBL) initiated by Howard Barrows for medical students in the 70's at McMaster University in Canada is a student centered instructional method. In PBL, real world problems are used to enable students to learn both domain knowledge and soft skills like working collaboratively in groups (interpersonal skills), communication, problem solving, self-directed and lifelong learning so vital in the working world. The success of utilizing real world problems to drive learning has indicated that students learn more meaningfully through PBL. A meta-analysis of evaluative research on medical education by Vernon and Blake (1993) reported that PBL is superior to the traditional lecture method of teaching although medical students learn more content (basic science knowledge) in the traditional method.

PBL requires students to employ a different learning process which is facilitated. The PBL learning process involves searching and sifting through a vast amount of information followed by synthesizing and organizing the information to complete an assigned task or project. The learning is self-directed and students participate in a lot of discussion. A lot of research has been done on the implementation of PBL and PBL facilitators' experiences managing the PBL learning process in tutorials. However, Krishnan, Gabb and Vale (2011) noted that there "are almost no published reports of research into how students work outside of formal group meetings – the self-directed study phase of the PBL process". Moust et al (2005) found that students become bored with the repeated prescribed PBL process for each problem. Students may skip a few stages because the facilitator does not manage their learning process outside of tutorials. This inability to remain motivated to follow through the PBL process could affect the outcome of their learning.

To date, research into how PBL groups function outside of class is negligible. Schmidt and Moust (2000) discovered that the little research that is available show students do not follow through the PBL process.

Studies that aim to discover how students perceive PBL and respond to it is vital in enhancing the effectiveness of group work. Finding out if students are willing to work in groups and by monitoring outside class interactions may provide a 'window' into how groups work outside class. The question then is how do PBL practitioners' monitor PBL groups when they work outside of class?

In Krishnan, Gabb and Vale's (2011) research, it was discovered that students new to PBL and unused to not being guided closely by the facilitators "constructed their own varied understandings of what PBL required of them". They discovered three types of group working/learning culture: (1) finishing culture – focus on finishing individual tasks resulting in a team product that is a mosaic of individual contributions and finishing individual portfolios, (2) performing culture – focus on comprehensive solutions to the problem and preparing impressive individual portfolios and (3) collaborative learning culture – focus on learning collaboratively and accumulating evidence for the individual portfolio where team work is a collaborative effort. The collaborative learning culture is ideal for the success of PBL but Krishnan, Gabb and Vale's (2011) findings show that the students did not adopt the collaborative learning culture: "the real challenge for practitioners of PBL is to prepare students for group work and to monitor group processes…". They suggest that students have to be taught "how to work effectively as a team, including valuing, [and]sharing".

The aim of this exploratory study is to find out students' attitudes towards group work and also to find out if the use of self-constructed facilitation forms through the 3 stages of the PBL process will help the PBL practitioner understand how the students work as a group outside of class time akin to long distance PBL facilitation. The 3 forms will indicate how far they have gone through the process and how much they have completed. During the PBL process, students have to report and reflect upon their learning as an individual and as a group through the 3 forms.

METHOD

An open ended questionnaire was given to 58 students; however, only 37 were returned. The reason for choosing an informal questionnaire was to allow students to freely respond without restricting them to fixed statements as in a close ended questionnaire. As an exploratory study, the use of an open ended questionnaire and an interview with the group leader of a group that completed their project 3 weeks before the deadline will provide PBL practitioners with students' views about having to work in groups and the informal interview of the group leader can help PBL practitioners understand the characteristics of an effective group leader who is crucial to the success and the completion of the project.

The aims of this exploratory study are:

1. to find out students' views about having to work in groups.

2. to find out characteristics of an effective group leader.

3. to find out if self-constructed facilitation forms can help the PBL practitioner/researcher to understand how the PBL groups work outside of tutorials.

For the first research aim, the following are the 2 questions in the open ended questionnaire:

1. Do you prefer to work individually or in a group?

2. Do you think your lecturers should 'teach' you all how to work in groups so there will be fewer problems working together? What should the lecturers teach?

For the second research aim, the only question asked was: how did your group manage to finish the project 3 weeks before the deadline?

For the third research aim, which addresses the question of how PBL facilitators can monitor PBL groups when they work outside of class, 3 facilitations forms were constructed for the 3 stages which are: (1) the meeting and understanding the problem stage- Form #1; the individual stage of gathering information (Form #2); and the last stage (Form #3) where the PBL groups meet to put together their individual tasks towards the completion of the project. Forms #1 and 3 were filled in by the group leader while Form 2 was filled in by each individual student. All the forms were then collected after which feedback was provided by the researcher and the forms were returned before the students proceeded to the next stage.

RESULTS

Question: Do you prefer to work individually or in a group?

Out of 37 students, 19 (51.35%) preferred to work individually; while 11 (29.72%) preferred to work in groups and 7 (18.91%) students indicated that they can work either individually or in groups.

The following are opinions from a selected few students who prefer to work individually.

S1: *Individually. The first reason would be miscommunication. There is bound to be problems when the other person is not listening when you are talking and explaining. And when the problem occurs, quarrel ensues and people starts to blame each other. Next, is not achieving the other group members' standard. You would feel guilty and sad when you are given the cold shoulder, ignored and blamed for affecting their marks. It is very frustrating to deal with this kind of people. Sigh.*

S2: *I prefer to work individually because I am more comfortable in working at my own time and pace.*
When working in groups, I would have to work at the same time as the other group members.
Sometimes the work might not be finished on time when working in groups.

S3: I prefer to work individually as it is much easier. I don't have to stress myself dealing with sleeping partners. Sometimes in groups, people don't really want to listen to your opinion. If I work in a group, there are many different opinions that I have to deal with.

S4: *I prefer to work individually because I can work at my own pace. I don't have to ensure that my other group mates are doing their work or not. The outcome of the unfinished work is more synchronized than a work that was completed by a group. I can also make my own decisions without having to consider and compromise with others' views and opinions.*

S5: *I prefer to work individually. This is because I like to do my work at my own pace. Furthermore, I will give my all when doing my work individually because I will never jeopardize my marks. If I have to be in a group, it will make it difficult if some of the members are not very cooperative.*

The following are opinions from a selected few students who prefer to work in a group.

S6: *I prefer to work in groups because it is more fun and I can interact with people plus it enriches my ideas when doing group work as we can discuss with each other.*

S7: *It makes life easier as there is less work to do. More effective as two brains are better than one.*

S8: *I prefer to work in groups because we can help each other when we are stuck in a problem. There are also a lot of ideas can be contributed when we having discussion; therefore, variety of new information can be gained.*

The following are opinions from a selected few students who can work individually or in a group.

S9: *I can work in both, depends on the assignment. If it's theoretical and very scientific, requires a lot of reading, I prefer to do it in a group. But for creative writing, etc where I have to produce something out of creativity, I prefer to do it individually because different people have different thinking, so it would be difficult if a story is created by a few people.*

S10: *I prefer both. Working individually will allow me to use my own opinion and I can do the work anytime I want. Working in groups is also interesting because we can share a lot of information which will make the tasks easier to be done.*

S11: *I sometimes prefer to work individually and sometimes in groups because there are assignments that can be done easily in group than individual and vice versa. For me I like working in both situations.*

S12: *Both. When I work individually, I get the freedom to do things on my own and what I like to do. But when I am in a group I get to hear other people's opinion and it'll help me to learn to accept new things and ideas.*

Question: Do you think your lecturers should 'teach' you all how to work in groups so there will be fewer problems working together? What should the lecturers teach?

14 (62.16%) students responded 'yes' while 23 (37.83%) students responded 'no'.

For those who wrote 'yes', the following responses indicated reasons for their choice.

- *Yes perhaps lecturers could teach students how to work in group because from what I am experiencing, even though I am working in a group every member of the group are doing individual task. I believe when working in group, the members should help each other out by brainstorming all the ideas and points together today*

- *I think lecturer should teach us how to work in group because sometimes there are few people who are not well aware of their responsibility in group and lecturer should teach common sense to us*

- *I think what lecturer can teach is the responsibility as a member of a group. All members need to do his or her job and don't just depend on other members. We should be responsible to avoid any miscommunication and problem.*

- *YES! Because some people take group works for granted and leave all the work to certain people in the group. So it is unfair! I think everyone already knows their own job working in a group but they choose to ignore it and take the easy way out – by being the sleeping partner.*

- *Yes,…maybe during the formation of groups is the best time where the lecturers should teach us how to work in groups. The lecturers should teach and tell the roles of each member so that the works are distributed equally.*

- *Maybe the lecturers could teach us how to deal with the possible issues when working with other group mates. Usually, most students*

are having a hard time dealing with other members (specifically those who are lazy or choose not to participate), thus it would be a great help if we are given 'exposure' in dealing with them.

- *Yes, maybe if any member does not contribute anything to the group, the group should immediately report him/her to the lecturer.*

For those who wrote 'no', the following responses indicated reasons for their choice.

- *I would not say they need to teach us that but perhaps guide us or monitor us. I prefer if the lecturers ask out about our progress or how the group mates are interacting. This is so they can know who do work and who don't. Sometimes when we are grouped with problematic people, WE WISH THAT THE LECTURERS TO INTERVENE AND PROVIDE US WITH SOLUTION.*

- *There is no need as we are already matured enough to think of our responsibility when we work in groups*

- *No. I think the lecturer should allow the students to have their own problems while working together. The experience will help to make us better when they be in a group later in the future. Let them learn from themselves.*

- *No. I think the ability or skills to work in groups depend on the individual himself. One should be able to be more open towards opinions and suggestions to avoid arguments among group members. The student also need to realize that in group work, everyone needs to do or contribute something.*

- *No, I don't think so. Skills for working in groups should be acquired personally. Since students will be working with different people for different assignments, the needs for a particular group can be different compared to other groups.it depends to the assignment as well as members of the group. Hence, it should be acquired personally.*

- *I personally believe that lecturers should not teach us how to work together but perhaps if we encounter problems within the group they can open up and listen to our problems. Moreover, perhaps they should consider "critical students" to work alone when they either a)prefer to work alone or b) people do not want to work with them.*

- *No. Students actually know what to do but sometimes they choose to be less cooperative and irresponsible.*

- *I don't think it is necessary to do so. It's more to common sense and some people (no matter what) they cannot work together.*

- *I don't think so the lecturers should 'teach' us to work in a group because this is the time for students to learn and be independent by themselves as well as discover their own flaws.*

- *Not teach but guide and give advice. They can monitor our progress by asking questions and asking their students to share their experience and opinions on working in a group*

- *No. there is no clear direct way to teach how to work in groups. However, the lecturer should closely monitor and ask how things are… if there are problems, try to get more insight to know what's going on*

- *In my opinion, I don't think that lecturers should 'teach' us how to work in groups as it actually depends on us how we are going to work with other people. It all depends on out attitude and how we tolerate with each other. So, even if the lecturers teach us how to work in groups but at the end of the day, it all depends on the students' attitude*

The following section has some extracts of the monitoring of the PBL process through the forms.

One of the questions in Form #2 is where the individual group members report on their individual progress. The following question asked them to assess their own performance as a team member and report how well they worked in the group.

One student wrote*: Ok, I guess. No one else in the group had complained about me so I guess I did ok.*

The researcher wrote in his form: But you have not done much at all; what exactly have you finished?

Another student wrote: *I need to spend more time with my group mates so we can discuss this topic thoroughly*. The researcher's response: YES. DO NOT PROCRASTINATE!

The following student provided a very honest opinion of her performance:

- I can communicate well with other members
- I am able to share and accept ideas
- If necessary, I am able to lead discussions
- My progress is a little bit slow but in an acceptable pace
- My work is organized. It helps other members to keep track of things

In Form #2 the students were asked: Do you wish to change to another group? None of them wanted a change.

One student wrote: *This is my first time working with A and SY and we seem lost because the three of us are not taking this work seriously. I am not telling this in the hope that that I can change to other group but I want to make it successful despite all challenges we have now.*

The researcher's response: Please sit together and show what each has done. I have told SY that he has not made progress and he has to start working now; if not he will have to complete the project individually.

Another honest assessment: *I can accept instructions from my group leader well. But honestly I feel that my progress is quite slow. Perhaps because I have many pending assignments that sometimes I overlook this assignment especially since it is due later in the semester.*

The following is a detailed Form #2 is by a very efficient group leader. She wrote that she has completed the following tasks:

- *I have assigned specific tasks to each member*
- *I have done my research: regarding to the topic –past articles; any case study relating to the issue*
- *I have searched for information needed in carrying out the project and creating a timeframe for others (targeted task to be completed for each week)*

And she wrote about what she still needed to do:

- *find statistics of gender biasness (in Malaysia)*
- *find newspaper articles or youtube materials that could be used in the multimedia project*
- *set time and place to conduct our interview (need to be finalized with the subjects, which will be confirmed by other group member)*
- *compile all information and start editing video*

When asked to assess her own performance as a team member and how well she worked in the group, she wrote:

- *My performance is not that great, but I'm trying to work on it.*
- *I need to be more efficient and fast in completing the task in time*
- *I am still able to work it out with the help of my members*
- *We understand each other well and able to talk things out*
- *I am able to communicate with them and deliver my points with ease*
- *I am able to assign the tasks accordingly, thanks to my understanding members*

When asked if she should continue to work as she is doing now and whether things need to be done differently to help towards the completion of the project, she wrote*: I think we just need to be more efficient in completing our work. Like stated before, we need to work faster in order to complete the project in time. With academic exercise and etc it might be hard to work on the task especially at the end of the semester.*

The following is the response from the group leader's interview.

Question: how did your group manage to finish the project 3 weeks before the deadline?

The group leader said "We have the same mindset or goal; we organize our work and distribute work equally.

She gave a very clear explanation of her group's amazing performance.

- Same Mindset/Goals: *it is important for everyone to have the same goal or mindset. As an example, for my group, we have the same aim to finish this assignment as quickly as we can before we get bombarded with other assignments later on. When we have the same goal, cooperation would come very easily. There will be no arguments when we need to do last minute meeting or extend our discussion time. Besides that, when there's cooperation any issues or disagreements can be solved easily. We aimed to help one another, thus we would produce a good quality product.*

- Organization: *My group mates told me that it is very important for a group to have a strong leader, when they appointed me. As a leader, I am strict or disciplined with the timeline that I had planned for the project.my timeline usually will result in the project being done weeks before the deadline. If one of my group members asked me about the deadline, I would give them a date based on my timeline rather than the real deadline.*

- Distribution of work: *In addition to creating a timeline, a leader should also distribute the work equally among the members. It would be better if the leader knows their group members' skills or strong points as they will be more motivated in doing their work which helps in increasing their work pace.*

DISCUSSION

Regarding students' views about having to work in groups, the findings show that more than half the students do not like to work in groups; this does not augur well for PBL as working in groups is not an option. If more than half of the students in this study do not like to work in groups, the success of the completion of projects and the desired learning outcomes will be affected. Some of the students' inability to prioritize the completion

of the group project over their individual comfort and preference ruin the *esprit de corps* much needed for PBL

Regarding the characteristics of an effective group leader, it is to be noted that for the success and completion of a PBL project, leadership is very important. A strict leader working with group members equally motivated to complete the task is extremely crucial. In addition, a group leader who knows how to utilize each member's strength and distributes work equally will help the group to progress well. Lastly, when all the members relinquish their individuality and work towards the common goal, the group succeeds.

To find out if self-constructed facilitation forms can help the PBL practitioner/researcher to understand how the PBL groups work outside of class, the researcher's experience as a PBL facilitator using the 3 self-constructed forms provided a clear picture of how well the students work outside the classroom. Although the reports are contingent on the honesty of the students, the researcher had no grounds to doubt the students' honesty. Many were willing to admit 'quietly' their tardiness and the researcher's reprimands and comments helped to 'move' the groups faster towards task completion. As an example, one group arranged to meet right after class upon receiving their forms with the researcher's feedback. It can be assumed that the researcher's comments spurred the group to resume their work.

CONCLUSION

The intention to use forms to monitor the PBL learning process can be considered a success as to how well the group worked and the effort put towards the completion of the task was made possible through the reporting and reflection done by the group members. Although many students indicated that they do not like to work in groups, once they are aware that the problems they have with lazy and irresponsible members will be monitored by the PBL facilitator, they will be more willing to accept working in groups. Working in groups is not an option in PBL and facilitators have to find ways and means to make PBL groups work. Rarely does an individual work by himself or herself to complete a project in the working world. Hence, collaboration is a skill to be embraced and group members have to learn to work with others.

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A Study on the Use of Computer Based English Language Placement Tests as Measurements of English Language Proficiency among University Students

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ABSTRACT

This study reports the use of English Placement Tests (EPTs) supported by an e-engine software to test English language skills in Listening and Reading among new Universiti Teknologi MARA (UiTM) Diploma students of the November 2014-April 2015 cohort. The objective of the study was to exempt students with excellent English language proficiency from taking the University's basic English language course offered in semester one (ELC120/Integrated Language Skills: Listening). Results of the study reveal that the majority of the students (97.5%) did not meet the required scores in both Listening and Reading for exemption to be given. Challenges in the implementation of the test and the participation of the students in the pilot study are discussed. Implications of the study to the University stakeholders are highlighted.

Keywords: computer based language test, assessment, performance, EPT

INTRODUCTION

This paper is primarily concerned with the delivery of a computer based language test. It describes a pilot study of a computer based English Placement Test (CB-EPT) using an e-engine software and supported by UiTM server infrastructure to upload the CB-EPT results. Basically, CB-EPT aimed to examine efficacy of using it as an instrument to indicate the proficiency level of new UiTM Diploma students for the purpose of placement and exemption. It was proposed that the cut-off score for exemption be established at 80% and above while candidates scoring below the 80% mark would follow all the English language courses stipulated by the Academy of Language Studies in UiTM.

The CB-EPT was intended for all newly enrolled Diploma students, estimated at 10,000 students per intake and conducted during orientation week or the first week of course registration. In order to cope with this large number of students taking CB-EPT within a short period of time and test results to be generated immediately to facilitate the registration process for the University English language courses, the CB-EPT was proposed as the best solution to the laborious, costly and time-consuming task of evaluating the proficiency of these new students on an almost immediate basis.

To execute the CB-EPT, the necessary paperwork had to be first put together and endorsed. The 173th UiTM Senate Meeting, dated 9 January 2013, officially endorsed the implementation of CB-EPT by the Academy of Language Studies. The implementation of the CB-EPT at all UiTM campuses commenced in June 2013 using an e-engine software to facilitate the standardization of the test. The Academy was also requested to work with the University Information Technology department with regards to data server connectivity.

The CB-EPT was administered from December 2014 to January 2015 (a duration of two months) on new Diploma students of the November 2014 – April 2015 cohort. Since it was the first CB-EPT exercise given to all newly enrolled full time UiTM Diploma students, the tests were categorized as a pilot study. Students who sat for the tests were allowed to do so on a voluntary basis. A total of thirteen (13) UiTM campuses were involved in this pilot study namely, Sungai Petani, Jengka, Arau, Permatang

Pauh, Segamat, Seri Iskandar, Semarahan, Lendu, Dungun, Kota Kinabalu, Machang, Kuala Pilah and Shah Alam.

The CB-EPT constructed by the Academy has some distinctive features. Firstly, it is a computer based English placement test which comprised Listening, Grammar and Reading comprehension sections. The test utilized a multiple choice question format with three options to choose from. Secondly, the test was designed for new UiTM Diploma students who were mostly students who have just completed the Malaysian national examination known as the *Sijil Pelajaran Malaysia (SPM)* equivalent to O levels. Finally, the CB-EPT was intended to allow newly enrolled Diploma students to be exempted from taking the English language course, ELC120 (Integrated Language Skills: Listening) offered in the first semester of studies.

LITERATURE REVIEW

Since its introduction in the mid-80's, Computer Based Testing (CBT) has gained momentum and proliferated in use due to its efficient administration and better measurement of performance benefits. In comparison to pen and pencil tests, Christensen (1997) states that CBT are favored for their more flexible and individualized test administration, student performance tracking capabilities, immediate test feedback, test/task types variation as well as enhanced test security. Computer based tests which are tests administered by computer in either stand alone or network configuration by other technology devices linked to the Internet have evolved to adopt adaptive formats and multiple computer assisted technology applications to measure performance.

Christensen (1997) however, cautions the need to compare the pen and pencil test to computer based testing before proceeding with the rationale for the use of CBT in English as a second language test for the purpose of placement.

A study by Brantmeier and Vanderplank (2008) revealed that Self-Assessment (SA) pre-test may be used as a reliable determiner for reading placement when it is measured with criterion referenced items. The

possibility of teaming SA items with the placement test would determine the placement of advanced learners while the SA criteria could facilitate the placement of readers with marginal reading scores (readers who score on the border between intermediate and advanced). The SA element could train readers to reflect critically on their L2 reading abilities on a regular basis, and this self-evaluation should be linked with the skills they are working on. Finally, the study also shows the value of SA in predicting performance on language placement tests and performance in class. The study also states further research is needed to address the validity and reliability of self-assessment in the testing, or high-stakes, process.

Another study conducted by Choi, Kim and Boo (2003) was aimed at validating the comparability of Paper Based Language Test (PBLT) and Computer Based Language Test (CBLT) /Computer Adaptive Language Test (CALT). The overall results of construct related validation studies indicate comparability of the subjects' scores across CBLT and PBLT modes. The grammar test showed the strongest comparability, and the reading comprehension test the weakest comparability. The pattern of correlations among subtests, disattenuated correlations, and confirmatory factor analyses support, to a certain extent, that CBLT and PBLT subtests measure the same constructs, thus, justifying that paper and pencil tests can be replaced with computer based tests for language skill measurement.

The application of computer based testing to language particularly second language learning (L2) could be traced to Dunkel (1997) whose work is focused on computer assisted language learning and computer assisted technology (CAT). The issue with the second language (L2) field according to Dunkel was that it was not progressing at par with the general measurement profession. The lagging of computer based second language testing could be attributed to the fact that its testing methods are entrenched in performance based assessment. This form of assessment cannot be easily worked into a computerized administration as it can be with more traditional test formats. Hence, practitioners who intend to use CBT in English as a second language testing for placement purposes have to consider the following elements; Receptive response items - including multiple choice, true-false, and matching items - are fairly easy to adapt to the computer assisted testing medium. In today's world, there are many authoring tools that can create tests of this type. Unfortunately, the more interesting types of

language tasks (e.g., role plays, interviews, compositions, oral presentations) prove much more difficult to develop for computer assisted testing (Brown, 1997).

METHODOLOGY

The Academy of Language Studies, UiTM embarked on a pilot study of CB-EPT tests to examine the English language proficiency of new full time Diploma students from December 2014 to January 2015. The test was under the authority of the English Language Department, of the Academy at UiTM Shah Alam and administered by the Academy's departments across thirteen (13) UiTM campuses located all over Malaysia. The Coordinators in Shah Alam and Heads or campus Coordinators were responsible for administering the CB-EPT pilot tests. Participants were newly enrolled full time UiTM Diploma students, aged between 18-20 years, who were required to pass three compulsory English language courses. The CB-EPT was used to assess the English language ability and proficiency of these students as an indicator for exemption from the English language course, ELC120 (Integrated Language Skills: Listening) offered in the first semester of studies.

The pilot tests comprised two sections, Listening, and Grammar and Reading comprehension. The time given to complete the tests was 90 minutes (30 minutes for Listening, and 60 minutes for Grammar and Reading comprehension). Depending on the language ability of the students, some completed the tests in less than 90 minutes and others did not complete it within the time given. Sixty (60) sets of Listening comprehension questions were constructed and divided into Set A, Set B and Set C. The questions comprised short news reports, dialogues and talks. In the Grammar section, twelve (12) sets of cloze passages were constructed which totaled 60 questions. Reading comprehension questions were constructed in 15 sets totaling 60 questions as well. The CB-EPT tests employed the multiple choice format for time efficiency. Specifically, each question in the Listening, and Grammar and Reading comprehension tests provided three options and students were required to choose the best answer. The CB-EPT scores were counted based on the number of correct answers without any difference in weightage among the questions. All the

test questions were vetted following the Academy's quality check (SOP) for setting of examination papers. The test was computerized and questions were randomized using the e-engine software. A total of 3,986 students took the Listening Test; while, 3,963 students sat for the Grammar and Reading Comprehension Test.

As described, the main purpose of the piloted CB-EPT tests was to measure the English language proficiency of newly admitted full time Diploma students. The CB-EPT test results would be used to decide if the students could be exempted if they got a score of 80% and above on the test. Due to the large number of students, a computer based test was employed enabling the test results to be generated automatically once the test was completed. In measuring and analyzing the test results, the computer based test scores were tabulated and examined using ANOVA and Bonferroni Post Hoc test of multiple comparison.

FINDINGS

Listening Comprehension Test (LC-EPT)

Table 1 illustrates the breakdown of students' performance in the LC-EPT test. The test comprised 3 sections – Section A: Listening to five short news reports (5 marks); Section B: Listening to a talk/speech (8 marks); and Section C: Listening to an interview (7 marks). The total score for the LC-EPT test was 20. Students scored between 4 to 19 marks out of the possible 20 marks. Furthermore Table 1 shows that a total of 1,732 (43.5%) students scored between 4 marks to 9 marks out of 20. These students failed even to obtain a passing grade. A total of 2,254 (56.4%) students, on the other hand, scored between 10 marks to 19 marks. Overall, only 417 (10.5%) students managed to score 70% and above in the LC-EPT test. Their scores ranged from 14 to 19. Similarly, only 101 (2.5%) students scored 80% or more in the same test with marks ranging from 16 to 19.

Table 1: Students' Performance in the Listening Comprehension Test (LC-EPT)

Campus	4	5	6	7	8	9	10	11	12	13
Sungai Petani	4	3	13	14	28	27	33	29	23	5
Jengka	1	3	4	16	29	30	32	23	18	20
Arau	0	4	10	12	18	25	29	32	34	12
Pematang Pauh	1	3	7	9	16	12	9	10	14	3
Segamat	8	12	19	35	47	60	72	53	65	29
Seri Iskandar	1	10	22	24	41	35	47	42	28	24
Shah Alam	2	3	9	8	14	15	19	12	7	12
Semarahan	3	6	16	21	25	32	18	21	15	10
Lendu	3	10	24	62	60	85	94	86	88	59
Dungun	4	16	26	35	50	73	66	56	57	30
Kota Kinabalu	6	12	25	26	60	63	68	44	51	31
Machang	4	24	45	52	71	69	63	86	42	28
Kuala Pilah	0	0	6	16	26	22	18	25	23	22
Total Students = 3986	37	106	226	330	485	548	568	519	465	285
Percentage = 100%	0.9%	2.7%	5.7%	8.3%	12.2%	13.7%	14.2%	13.0%	11.7%	7.2%

LC-EPT Scores (continue)

Campus	14	15	16	17	18	19
Sungai Petani	7	5	6	1	0	0
Jengka	14	9	5	4	2	0
Arau	14	10	2	1	0	1
Pematang Pauh	3	3	0	0	0	0
Segamat	28	18	6	2	1	0
Seri Iskandar	8	10	8	1	0	0
Shah Alam	3	3	0	0	0	0
Semarahan	9	5	2	2	0	0
Lendu	40	18	7	4	2	0
Dungun	20	7	6	3	1	0
Kota Kinabalu	24	4	6	2	0	0
Machang	15	11	6	2	0	1
Kuala Pilah	13	15	11	4	2	0

Total Students = 3986	198	118	65	26	8	2				
Percentage = 100%	5.0%	3.0%	1.6%	0.7%	0.2%	0.1%				

Table 2 illustrates the number of students by campus and their mean ($\bar{x}=\frac{\sum fx}{\sum f}$) scores as well as the standard deviation (s). Kuala Pilah campus reported the highest students' performance in LC-EPT with the mean score of 11.1 (N=203, $\bar{x}=\frac{\sum fx}{\sum f}$= 11.1, s=2.9). Four campuses reported mean scores of 10.2 to 10.6. These campuses were Jengka (N=210, $\bar{x}=\frac{\sum fx}{\sum f}$= 10.6, s=2.8), Arau (N=204, $\bar{x}=\frac{\sum fx}{\sum f}$= 10.6, s=2.6), Lendu (N=642, $\bar{x}=\frac{\sum fx}{\sum f}$= 10.3, s=2.6), and Segamat (N=455, $\bar{x}=\frac{\sum fx}{\sum f}$= 10.2, s=2.7). All other campuses reported mean scores of less than 10.

Table 2: Number of Students by Campus, Mean ($\bar{x}=\frac{\sum fx}{\sum f}$) Scores and Standard Deviation (s)

Campus	Mean ($\bar{x}=\frac{\sum fx}{\sum f}$)	N	Std. Deviation (s)
Sungai Petani	9.8	198	2.6
Jengka	10.6	210	2.8
Arau	10.6	204	2.6
Pematang Pauh	9.5	90	2.5
Segamat	10.2	455	2.7
Seri Iskandar	9.9	301	2.7
Shah Alam	9.6	107	2.6
Semarahan	9.5	185	2.8
Lendu	10.3	642	2.6
Dungun	9.9	450	2.6
Kota Kinabalu	9.9	422	2.6
Machang	9.5	519	2.6
Kuala Pilah	11.1	203	2.9
Total	10.0	3986	2.7

An ANOVA was run to see the differences among students' performance across campuses (refer Table 3). Even though the ANOVA reported significant differences between groups, the Bonferroni Post Hoc test of multiple comparison (Table 4) showed that only the Kuala Pilah campus recorded the most significant differences across other campuses, with the exception of the Jengka and Arau campuses.

Table 3: An ANOVA Test Comparing Students' Performance in LC-EPT across Campuses

LC-EPT Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	705.9	12	58.8	8.439	.000
Within Groups	27692.4	3973	7.0		
Total	28398.2	3985			

Table 4: Bonferroni Post Hoc Test of Multiple Comparison

Dependent Variable: LC-EPT Scores Bonferroni Campuses		Mean Difference (I-J)	Std. Error	Sig.
Machang	Jengka	-1.08293*	0.22	.000
	Arau	-1.06067*	0.22	.000
	Segamat	-.69795*	0.17	.003
	Lendu	-.84942*	0.16	.000
Semarahan	Jengka	-1.05727*	0.27	.006
	Arau	-1.03500*	0.27	.009
	Lendu	-.82376*	0.22	.015

Kuala_Pilah	Sungai Petani	1.27467*	0.26	.000
	Jengka	0.55	0.26	1.000
	Arau	0.57	0.26	1.000
	Pematang Pauh	1.63426*	0.33	.000
	Segamat	.93194*	0.22	.002
	Seri Iskandar	1.20953*	0.24	.000
	Shah Alam	1.50633*	0.32	.000
	Semarahan	1.60423*	0.27	.000
	Lendu	.78047*	0.21	.019
	Dungun	1.22537*	0.22	.000
	Kota Kinabalu	1.24638*	0.23	.000
	Machang	1.62990*	0.22	.000

Grammar (Cloze Passage) and Reading Comprehension Test (CZRC-EPT)

Table 5 illustrates the breakdown of students' performance in the CZRC-EPT test. The test comprised 2 sections – Section A: Two short cloze passages (10 marks); and Section B: five short Reading Comprehension passages (20 marks). The total score for the CZRC-EPT test is 30. Students scored between 5 to 28 marks out of the possible 30 marks.

Table 5 shows that a total of 2,014 (50.8%) students scored between 5 marks to 14 marks out of 30. These students failed even to obtain a passing grade. A total of 1,949 (49.2%) students, on the other hand, scored between 15 marks to 28 marks. Overall, only 252 (6.4%) students managed to score 70% and above in the CZRC-EPT test. Their scores ranged from 22 to 28. Similarly, only 98 (2.5%) students scored 80% or more in the same test with marks ranging from 24 to 28.

Table 5: Students' Performance in the Grammar and Reading Comprehension Test (CZRC-EPT)

	CZRC-EPT Scores											
Campus	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Sungai Petani	1	0	3	2	6	11	11	25	23	19	16	29
Jengka	0	1	4	4	8	8	16	12	15	18	22	20
Arau	0	0	1	1	4	8	10	18	14	20	24	27
Pematang Pauh	0	0	2	2	5	15	16	9	11	20	6	9
Segamat	0	2	4	12	19	22	31	41	54	36	50	41
Seri Iskandar	1	1	1	1	6	16	12	23	30	31	21	20
Shah Alam	0	4	1	3	5	8	15	9	16	17	13	11
Semarahan	1	2	0	3	6	7	17	14	20	19	22	19
Lendu	0	0	5	13	22	35	53	55	76	57	67	53
Dungun	1	2	1	9	14	26	27	37	39	40	49	45
Kota Kinabalu	0	3	7	14	24	32	46	39	42	40	33	35
Machang	1	6	6	15	31	33	46	58	60	61	35	34
Kuala Pilah	0	0	1	6	6	10	9	14	17	22	18	17
Total Students = 3963	5	21	36	85	156	231	309	354	417	400	376	360
Percentage = 100%	0.1%	0.5%	0.9%	2.1%	3.9%	5.8%	7.8%	8.9%	10.5%	10.1%	9.5%	9.1%

	CZRC-EPT Scores (continued ...)												
Campus	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**Total**
Sungai Petani	13	19	11	0	7	5	1	1	2	0	0	1	206
Jengka	18	17	17	4	9	5	4	2	2	0	3	0	209
Arau	14	10	10	6	3	3	6	4	1	0	0	0	184
Pematang Pauh	5	3	4	5	0	3	3	1	0	0	1	0	120
Segamat	38	20	23	21	14	11	9	0	3	2	2	0	455
Seri Iskandar	26	14	13	12	5	5	1	2	0	1	1	0	243
Shah Alam	4	7	6	10	3	4	1	1	0	0	0	0	138
Semarahan	21	11	4	6	6	5	4	1	0	1	0	0	189
Lendu	53	43	32	27	18	14	11	4	7	4	4	0	653
Dungun	22	17	27	18	9	6	4	5	2	2	0	1	403
Kota Kinabalu	28	26	15	11	9	13	6	5	4	1	0	0	433

Machang	33	28	22	16	13	14	5	8	2	2	0	0	529
Kuala Pilah	12	12	7	7	17	8	3	7	5	0	1	2	201
Total Students = 3963	287	227	191	143	113	96	58	41	28	13	12	4	3963
Percentage = 100%	7.2%	5.7%	4.8%	3.6%	2.9%	2.4%	1.5%	1.0%	0.7%	0.3%	0.3%	0.1%	100.0%

Table 6 illustrates the number of students by campus and their mean ($\bar{x}=\frac{\sum fx}{\sum f}$) scores as well as the standard deviation (s). Again, Kuala Pilah campus reported the highest students' performance in CZRC-EPT with the mean score of 16.0 (N=201, $\bar{x}=\frac{\sum fx}{\sum f}$=16.0, s=4.6). Three campuses reported mean scores of 15.0 to 15.4. These campuses were Jengka (N=209, $\bar{x}=\frac{\sum fx}{\sum f}$=15.4, s=4.2), Arau (N=184, $\bar{x}=\frac{\sum fx}{\sum f}$=15.4, s=3.6); and Lendu (N=653, $\bar{x}=\frac{\sum fx}{\sum f}$=15.0, s=4.0), All other campuses reported mean scores of less than 15.

Table 6: Number of Students by Campus, Mean ($\bar{x}=\frac{\sum fx}{\sum f}$) Scores and Standard Deviation (s)

Campus	CZRC-EPT Scores		
	Mean ($\bar{x}=\frac{\sum fx}{\sum f}$)	N	Std. Deviation (s)
Sungai Petani	14.8	206	3.7
Jengka	15.4	209	4.2
Arau	15.4	184	3.6
Pematang Pauh	13.9	120	3.9
Segamat	14.9	455	3.9
Seri Iskandar	14.9	243	3.6
Shah Alam	14.3	138	4.0
Semarahan	14.9	189	3.7
Lendu	15.0	653	4.0
Dungun	14.8	403	3.8
Kota Kinabalu	14.2	433	4.1
Machang	14.2	529	4.0
Kuala Pilah	16.0	201	4.6
Total	14.8	3963	4.0

An ANOVA was run to see the differences among students' performance across campuses (refer Table 7). Even though, the ANOVA reported significant differences between groups, the Bonferroni Post Hoc test of multiple comparison (Table 8) shows that only the Kuala Pilah campus recorded the highest significant difference across six other campuses - Pematang Pauh, Segamat, Shah Alam, Dungun, Kota Kinabalu and Machang. Similarly, the Machang campus also indicated significant differences across 4 other campuses – Jengka, Arau, Lendu and Kuala Pilah.

Table 7: An ANOVA Test Comparing Students' Performance in CZRC-EPT across Campuses

CZRC-EPT Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	937.6	12	78.1	5.0	.000
Within Groups	61903.5	3950	15.7		
Total	62841.1	3962			

Table 8: Bonferroni Post Hoc Test of Multiple Comparison

Dependent Variable: CZRC_Scores Bonferroni				
(I) Campus		**Mean Difference (I-J)**	**Std. Error**	**Sig.**
Jengka	Kota Kinabalu	1.18499*	.33343	.030
Kota Kinabalu	Jengka	-1.18499*	.33343	.030
Machang	Jengka	-1.21010*	.32343	.014
	Arau	-1.16753*	.33882	.045
	Lendu	-.83250*	.23157	.026
	Kuala Pilah	-1.81335*	.32802	.000
Kuala Pilah	Pematang Pauh	2.11828*	.45669	.000
	Segamat	1.15501*	.33528	.045
	Shah Alam	1.69111*	.43764	.009
	Dungun	1.21839*	.34184	.029
	Kota Kinabalu	1.78824*	.33788	.000
	Machang	1.81335*	.32802	.000

* The mean difference is significant at the 0.05 level

CONCLUSION AND DISCUSSION

Several challenges were noted in the administration and implementation of the CB-EPT tests. Shortage of language labs and headphones, inadequate technical support, and low internet connectivity to upload CB-EPT test results were among the issues noted that affected the successful implementation of the pilot study. This leads to the following practical implications. The current IT facilities and infrastructure available can efficiently support the administration of CB-EPT tests for only a small number of candidates or students. The CB-EPT test scores show that a very small number of students achieve the score for exemption and the majority of the students should follow the English language curriculum stipulated by the Academy. Therefore, the Academy needs to consider diversifying and optimizing the usage of e-engine apart from CB-EPT tests, for example, using it to improve on going assessments across all languages offered by the Academy. The randomization of items by the e-engine will ensure that each student receives different questions and options. In addition, with randomization, setting of on going assessment questions will be less taxing on the lecturers. Furthermore, marking and analyzing the results can be generated automatically and immediately.

The overall findings of the pilot study also show that the validity and reliability of the CB-EPT tests are strong. In other words, the scoring of the students' performances by the test items in the CB-EPT tests is consistent with a bell-shaped curve with a significant mean of 0.000 (ANOVA and Bonferroni Post Hoc Test) for both Listening, and Grammar and Reading comprehension tests. The statistical evidence provides the basis for several implications and future directions of the utilization of CB-EPT in UiTM. First, the results of the pilot study reveals that only a very small percentage of the students who sat for the CB-EPT tests had achieved the intended score in which exemption would be given, while the majority of the students did not reach the targeted score for exemption. This is an indication that the newly enrolled Diploma students lack both receptive skills of Listening and Reading. The action taken by the Academy in introducing ELC120 (Integrated Language Skills: Listening) in semester 1 and ELC150 (Integrated Language Skills: Reading) in semester 2 is timely and appropriate in addressing this problem.

The second implication is towards return of investment (ROI) of the e-engine. With a very small percentage of students scoring 80% and above, the Academy needs to reconsider and set the target score for exemption at 70%. The CB-EPT test scores for both Listening, and Grammar and Reading comprehension reveal that only 2.5 per cent of the students achieved the targeted score for exemption; while 11% and 7% of the students achieved 70% of the targeted score in Listening, and Grammar and Reading comprehension respectively. Therefore, lowering the target score for exemption to 70 per cent may encourage students who feel that they are proficient to attempt the CB-EPT tests. The Academy should allow them to sit for the CB-EPT tests at a nominal charge and thus, ROI can be achieved. Third, it is obvious that the CB-EPT is the way forward in testing a large number of candidates or students. As supported by the literature on computer based testing, the primary advantages of computer based test delivery include shorter testing time, simultaneous score feedback, and repetitive availability. Electronic delivery (CB-EPT) is cost saving. CB-EPT delivery is less expensive than printing large quantities of testing materials. It also reduces the costs associated with invigilating, marking and entering of marks, verifying and analyzing data. Finally, the future direction for CB-EPT should be to extend the tests to all franchise colleges of UiTM. As such, the ROI will not only be achieved faster; such a move will also generate income for the Academy that can be shared across all campuses which administer the tests.

The Academy plans to conduct a second pilot study with all newly enrolled Diploma students at all UiTM campuses to verify the initial CB-EPT dataset collected. This is because, since participation in the first pilot study was on voluntary basis, there might be a difference in terms of attitude and mindset which may result in a different set of findings.

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