Factors influencing students' use a Learning Management System Portal: Perspective from Higher Education Students

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Abstract— There has been high increasing in using web portal as way to connect with students. Institutions of higher education have started developing web portal for students' use. Almost every university had its own LMS for their students use. In this study an online mathematics portal named as Portal of Learning Calculus (POLCA) is designed to provide a centralized point for students to access information during teaching and learning Calculus at the university. This study aimed to identify the factors that influencing students using POLCA in teaching and learning of Calculus at the University. We examined five factors viz-a-viz the students' technology competencies, the role of lecturers, access to POLCA and attitude towards the usage of POLCA. Findings showed that the highest mean refers to students' technology competencies (M = 3.27) followed by the design of POLCA (M=2.61), attitudes toward the usage of POLCA (M = 2.51), the role of lecturers (M = 2.44) and access to the portal (M =2.36). Research findings also showed that there was a strong relationship between the design of POLCA [r (214) = 0.547; p <.01], lecturers role [r(214)= 0.468; p <.01] and access to POLCA [r(214) = 0.327; p<.01] with the attitudes toward using POLCA. However there is no relationship between students' technology competencies with attitudes toward using the learning portal. Findings from regression analysis show that 35.5% variability of lecturers' role and the design of POLCA influences students' attitudes towards using POLCA.

Key-Words: - Learning Management System, Calculus learning, Calculus learning portal, and attitudes

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I. INTRODUCTION

In recent years, computer technology has become a new type of technology innovation with the aim to provide a strategy to improve the quality of teaching and learning. Teaching and learning are two mutually dependent elements of a teaching process [4]. From traditional up to the present forms of teaching where Information, Communication and Technology (ICT) plays an important role, the focus on the process of teaching has changed [4]. The evolution of technology and computer in teaching and learning process had opens up avenues to meet the challenges to deal with the change of speed in knowledge generation. Now ICT and Internet have become an integral part of the entire educational system as described by [13] that the use of ICT and Internet as a teaching and learning tools is rapidly expanding into educational system. The use of technology as a tool or a support for learning with others allows learners to play an active rather than a passive role of recipient of information transmitted by a lecturer, textbook or broadcast [18].

The concept of e-learning is where the process of learning can be done at anytime and anywhere by using computer. [6] defined e-learning as a medium that is used to provide instructional programmes to students who are separated by space and from the instructor. E-learning is a general term for education, training and information which emphasis on the gathering of skills and knowledge. However, e-learning is commonly referred to the intentional use of networked ICT in teaching and learning. A number of terms have been used to describe this mode of teaching such as web based learning, virtual learning, distributed learning, web based learning and others. However, all this term refers to educational processes in an online environment that utilize a learning portal to mediate asynchronous as well as synchronous in teaching and learning activities.

Portal technologies have become more prominent in recent times as its provides many benefits with the support of Internet. Innovations at most University in Malaysia were directed towards strong network infrastructures and up-to-date with a high speed internet connection. Local Area Network at the University has been provided to all offices, teaching rooms, lectures room, student residential colleges and also libraries. In addition, the wireless connection is also provided for staff and students so that an online learning environment can be implemented. According to [12], the use of e-learning in the majority of higher education institution is identified by the use of learning management system (LMS) which is a system that is focused on the delivery and support of learning opportunities. LMS are defined as a web based technology which assists in the planning, distribution and evaluation of a specific learning process [1]. Meanwhile, [15] defined LMS as software environment designed to manage user learning interventions as well as deliver learning content and resources to students. LMS refer to application that is use for tracking, managing learning and administrating system especially use in learning environment [8].

Numerous institutions are trying to provide conditions for developing necessary skills to required level so that students were able to use ICT in the process of learning according to their learning style [17]. LMS offers possibilities for changing and developing new methods in education as well as facilitating flexibility for institutions. The usage of the LMS portal has become a requirement at the University. Most of these Universities have developed their own LMS portal for the use of their own students. LMS also are one of the solutions which is useful for both students and instructor in online learning environment [3]. LMS are tools for student communication and interaction among students and lecturers. LMS will help the lecturers to provide their learning materials and also interactivity features such as thread discussions, shared files and forums. As mentioned, LMS also support management task such as delivery and tracking, examination, planning, virtual live classes and several statistical analysis [9]. This may save lecturers a lot of time and effort without making any substantial change in teaching process. However, the main focus for a LMS portal is the adaptation and implementation process and not the LMS portal [5]. In addition students' utilization of LMS is still minimal. Universities need to identify what are the factors that influence the students' usage of in an online learning environment.

There are many factors related to the success of using LMS. [16] described that an efficient and popular LMS needs to take into account the features used in the portal, user friendliness, the technical support available and the compatibility with the university systems and infrastructure. While, [14] indicated that this type of learning is new to students, who lacked the fundamental computer skills and are newcomers to the Internet. [10] also stated that one of the key issues affecting students in using LMS is the lack of computer skills. A study by [7] and [11] showed that the three main variables that influenced the effectiveness of an e-learning environment are technology, teaching and student characteristics. [22] also stated that in the analysis of 47 students who attended a management course based on e-learning in one of the Australian University found that three critical success factors (CSFs) in e-learning environment are technology (easy to access, navigation, interface design and level of interaction), instructors or teachers (instructor attitudes towards students, instructors technology competencies and interaction during the classroom) and student prior experience in the usage of technology. Another study based on the CSFs of the use of e-learning by [19] concluded that factors influencing the used of e-learning involves human factors (motivation skills, time and effort), instructor and student technical competency, constructivist thinking by the instructors and students, high level collaboration and user-friendly.

The design of the portal are also important plays a vital role in learner-interface interaction. This is because learners in online environment will use the computer to access the content and interact with other online peers and instructors [2], [21]. Therefore, the portal should be designed in a comfortable way so that users wouldn't face any difficulties while using it. In traditional classroom, interaction between instructors and learners are physically present and instructor can provide immediate feedback to their students through visual or verbal cues [20], [21]. Similar to the online environment, lecturers will interact with students through the use of electronic communication tools such as chat discussion, video conferencing, message boards and also email. [21] described when learners interact with lecturers, this can help them to illuminate the nebulous point and highlight the correct interpretation of course information. Learners will always interact with the instructors by asking questions or discussing about course activities . Lecturers are also needed to encourage students to access the portal as part of teaching and learning process. Hence, it is important to conduct research on the factors that influence the use of the LMS portal among students.

II. OBJECTIVE OF THE STUDY

This study aimed to identify the factors that influence the use of POLCA in teaching and learning of Calculus at the University. We examined five factors viz-a-viz the students' technology competencies, the design of POLCA, the role of lecturers, access to POLCA and attitude towards the usage of POLCA among students who enrolled in a basic Calculus course. A specific objective of this study is to identify students' level with respect to these factors:

(a) students' technology competency;
(b) lecturers' role in the use of POLCA;
(c) students' access to POLCA;
(d) students' attitudes towards the used of POLCA;
(e) students' perception towards the design of POLCA; and
(f) The relationship between students' technology competency, the design of POLCA, lecturers' role, access to POLCA and students' attitudes towards using POLCA.

III. RESEARCH METHODOLOGY

Participants were 215 science students enrolled in a basic Calculus course from five different classes. Parallel to this, a learning management system portal (LMS) was developed by the researchers known as the Calculus Learning Portal (POLCA). Several lecturers who taught this course were required to use POLCA during the teaching and learning of Calculus. The use of this web site will provide a two-way communication between lecturers and students or among students. Similar to other learning portals, POLCA also have applications such as interactive lectures notes, forums, quizzes, chat, online games, announcement, activities and so forth. In this study, students need to be engaged with all of the activities in the portal for 14 weeks.

Figure 1: Screenshot of POLCA Interface design

Figure 2: Screenshot Mathematics Calculus Notes

Figure 3: Screenshot of activities in POLCA

Research Instrument

For the purpose of the study, five factors had been identified which are students' technology competencies, the design of POLCA, the role of lecturer, access to POLCA and students' attitude towards using POLCA. Students are given five options to respond to each item that are used to assess utility of each factor. The options are SA (strongly agree), A (agree), DS (disagree) and SDS (Strongly disagree). The reliability index of each construct or factors were obtained. The alpha cronbach reliability measure for each factors are as follows: students' technology competency (0.903), lecturers' role (0.936), access to POLCA (0.875), the design of POLCA (0.909) and students' attitudes towards using the portal (0.638).

IV. RESEARCH FINDINGS

The discussion for these research findings are based on the five factors studied and also on the research objectives.

Overall mean

Overall mean for the four factors studied are as shown in Table 1. The highest mean obtained was related to students' technology competency (M=3.27, SD=0.502) followed by the design of POLCA (M=2.61, SD=0.522), attitudes towards the learning portal (M=2.51, SD=0.319), lecturers' role (M=2.44, SD= 0.532) and access to POLCA (M=2.36, SD=0.604).

Table 1: Overall Mean and Standard Deviation

Factors	N	Mean (M)	Standard Deviation (SD)
Students' technology competency	215	3.27	0.502
Lecturer Role	214	2.44	0.532
Attitudes toward POLCA	213	2.51	0.319
Access to POLCA	214	2.36	0.604
The design of POLCA	214	2.61	0.522

Students' Technology Competency

Students' technology competency refers to the students' belief on their ability and capability in using computers and online learning technologies in their learning process. Nine factors were used to measure this (refer Table 2). A mean score of greater than 3.0 was obtained for all items that measure students' technology competency. Items related to my ability to use ICT has the highest mean (M=3.54, SD=0.527). While the lowest mean item is related to the ability of downloading the new software if necessary (M=3.08, SD=0.763). These result indicated that student respondents were technologically competent and efficient in the used of high computer technology.

Table 2: Mean and Standard Deviation of Students' Technology Competency

	M	SD
I'm capable of learning new technology	3.24	0.559
I'm able to send and receive e-mail.	3.42	0.590
I'm able to include files (attach file) when sending	3.16	0.793
I'm capable to surf the Internet.	3.54	0.527
I'm able to use search engines and WWW to find the information that I want	3.23	0.737
I'm capable in installing web browser	3.16	0.732
I'm able to reconnect Internet.	3.11	0.725
I'm able to download new software if necessary	3.08	0.763
I'm able to copy and paste part of the documents from the internet if necessary	3.50	0.546

Lecturers' Role

Lecturers need to play an important role in encouraging students to access POLCA. In this study lecturers' role refers to the lecturers that guide students, providing feedback and also motivate students to use POLCA as part of their teaching and learning process. Detailed information on seven items used to measure these roles are as shown in Table 3.

Table 3: Mean and Standard Deviation of Lecturers Role

	M	SD
My lecturer is enthusiastic to use POLCA.	2.54	0.602
My lecturer handles activities in POLCA effectively.	2.48	0.611
My lecturer explains how to use activities in POLCA.	2.51	0.626
My lecturer gives many activities in the forum.	2.32	0.617
My lecturer motivates us to use POLCA.	2.44	0.660
My lecturer actively used POLCA while teaching this course.	2.32	0.616
My lecturers always include important information in POLCA.	2.48	0.663

Respondents gave a high response items relating to "My lecturer is enthusiastic to use POLCA" (M=2.54, SD=0.602), and "My lecturer explains how to use activities in POLCA" (M=2.51, SD=0.626). Meanwhile, item "My lecturer gives many activities in the forum" and "My lecturer actively using POLCA while teaching this course" showed the lowest mean (M=2.32). This shows that respondents felt that lecturers were committed in using POLCA but they also feel that more efforts should be taken by the lecturer to use POLCA.

Access to POLCA

Access to computers and the Internet is an important factor to be studied. Students' tendency of using POLCA depended very much on how easy they can access to the portal. To measure this factor, seven items were used (Refer Table 4).

Table 4: Mean and Standard Deviation for Access Factor to POLCA

	M	SD
It's easy to access POLCA while on campus.	2.34	0.806
POLCA can be accessed quickly when in the campus	2.38	0.818
The stability of the computer network in the campus is reliable	2.33	0.786
I can use any computer lab on campus to access POLCA	2.64	0.717
I do not have to wait long to access POLCA	2.35	0.791
I can access POLCA although I am at home	2.49	0.756
Internet speed on campus is sufficient.	2.07	0.853

Respondents said that they can use the computer lab on campus (M=2.64, SD=0.717) and also at home (M=2.49, SD=0.756). However, they doubted the stability of the computer network on campus (M=2.33, SD=0.876) and the speed of the Internet to access POLCA (M=2.35, SD=0.791). Respondents felt that they have no problem to access POLCA but they are concerned that longer time is required to access the portal.

The Design of POLCA

The design factor of a learning portal is important to attract students to use it. This is because students will not access to a portal, if it does not interest them. In this study, the design refers to the interface design, graphics, and the ability of POLCA to function without any problems. Seven items were used to measure the system design of POLCA (see Table 5).

Table 5: Mean and Standard Deviation for the Design of POLCA

	M	SD
It is easy for me to understand every activity provided in POLCA	2.61	0.632
I could understand the structure of the activity in POLCA.	2.66	0.643
POLCA is user friendly	2.73	0.636
Activities in POLCA are useful to me.	2.75	0.598
I can interact with my classmates through POLCA.	2.40	0.684
I can communicate with my lecturer through POLCA easily.	2.40	0.691
Overall, POLCA is a well design learning portal.	2.72	0.661

Students responded positively to each items used to measure the system design. Item with the highest mean refers to "Activities in POLCA are useful to me." (M=2.75, SD= 0.598), followed by item "POLCA is user friendly" (M=2.73, SP=0.636). Meanwhile, two lowest mean refers to "I can communicate with my lecturer through POLCA easily" (M=2.40, SD=0.684) and "It is easy for me to communicate with my lecturer through POLCA" (M=2.40, SP=0.691). The findings indicate that students felt that the design of POLCA helps them to use all the activity provided and user friendly but the design need to be improved in term of helping students to communicate with their classmates and also lecturers. However, respondents felt that POLCA is a well design learning factor (M=2.72, SD=0.661)

Attitude towards the used of POLCA

Students' attitude will affect the effectiveness of the used of a learning portal. Students who do not show interest or not taking into account on the used of the portal will be a hindrance to effective use. Eight items were use to measure these attitudes whereby three items were negative items (See Table 6).

Table 6: Mean and Standard Deviation for Attitudes towards POLCA

	M	SD
I love to use POLCA	2.49	0.684
*I feel bored when using POLCA	2.31	0.641
I encourage my colleagues to use POLCA.	2.45	0.711
I often use POLCA when learning calculus.	2.19	0.616
POLCA contribute a great time for me to learn calculus.	2.49	0.705
I can use POLCA independently, without help from others	2.59	0.739
*When using POLCA, I'm not so sure what I should do	2.22	0.622
*I only use POLCA when directed to do so	2.77	0.667

*Negative item

Overall, respondents showed a moderate attitude towards the use of POLCA with most items have a value around two (M=2.00). Respondents described that they only use POLCA when instructed or directed (M=2.77, SD=0.667). However, respondents stated that they can use POLCA without the help from others (M = 2.59, SD = 0.739) and contribute a great time to learn calculus (M=2.49, SD = 0.705). These findings show that students do prefer to use POLCA but has not yet reach levels where they really like to continue to use it without being instructed.

V. The relationship between the examined factors with students' attitude towards POLCA

Further analysis was conducted to identify the factors contributing towards students' attitude towards the used of POLCA. Hence, the Pearson correlation test was done to determine the relationship between the four factors with students' attitude towards the used of POLCA (see Table 7).

Table 7: Correlation Between the Studied Factors with Students' Attitude Towards Using POLCA.

	Attitude towards using POLCA.
Students' technology competency	0.069
Lecturers role	0.468**
Access to POLCA	0.327**
The Design of POLCA	0.547**

Research findings shows that there was a strong and positive relationship between the design of POLCA [r(214)=0.547; p>0.01], lecturers role as a factor [r(214)=0.468; p >.01] and access to POLCA [r(214)=0.327; p > .01] with the students' attitude towards using the portal. However there was no relationship between students' technology competencies with students' attitude towards using POLCA. Finding indicated that lecturers' factor and access to POLCA mostly influence students' attitude towards using POLCA.

VI. Factors that influence students attitudes towards using POLCA

Multiple linear regressions were used to determine the influence of asses polka, lecturer role, design and students competency towards students' attitudes toward students' POLCA. Lecturers' role and the design of POLCA are two significances variables that predicted students' attitude towards using POLCA. The finding shows that 35.5% of lecturers role and the design of POLCA contributes in the variability in attitudes towards POLCA; $R^2 = .355$, $F(2,208) = 57.28$; $P < .05$. The regression equation is as follows:

$$Y = Bo + B_1X_1 + B_2X_2$$
$$Y = 10.370 + 2.30 \text{ (the design of POLCA)} + 1.46 \text{ (Lecturers role).}$$

VII. Discussion

The used of the LMS portal is not something new, especially among students in higher learning institutions. Various forms of such portals can be accessed through either using the official University LMS or through specifically self-developed portals by the lecturers. However, the existence of these types of learning does not guarantee the effectiveness learning and of effective utilization of the portal. Hence, it is important that this study be conducted to identify the factors that influence the used of POLCA. This study examined the four factors, namely technology competencies of students, the role of lecturers, accessibility and students' attitude.

On the whole, the mean responses for the four factors studied were favourable and indicating positive responses. These showed that all factors studied had an impact on the usage of POLCA among students. These findings showed that students who used POLCA have a good level of technology competency. Studies by [11], [14] and [16] also found that computer skills are an important factor in the technological environment. Respondents also feel that lecturers play an important role to initiate and motivate them to continue using the portal. This finding is consistent with other research findings by [22] that also showed that instructors or teachers are one of the main factors in an e-learning environment. Furthermore, students also feel that the facilities to access POLCA is adequate but improvement need to be made in terms of network speed and stability. Findings by [7], [11] and [22] also showed that an e-learning environment technology such as easy to access, navigation, interface design and level of interaction is important factors in an e-learning environment. However student attitudes' towards using POLCA has the lowest mean among all the factors studied. This study also showed that there was a strong relationship between the lecturers' role and access to POLCA with students' attitude towards the used of the portal. This also indicated that lecturers play an important role in encouraging students to continue using the portal. Findings from regression analysis show that 35.5% variability of lecturers' role and the design of POLCA influences students' attitudes towards using POLCA. This shows that lecturers and the design of an online portal play a vital role in order to ensure that students have positive attitudes to such portal. Lecturers who uploaded notes or tutorials frequently and put the latest information feedback through forum quickly seemed to attract students to use the learning portal. A portal with good design will help users to browse it without having any problems.

This finding warrants for further investigation since attitude is the most important factor in determining the effectiveness of using the LMS portal. However, fast and easy accessibility to POLCA will attract them to use learning portal more often. However, further studies need to be done to identify other factors related to the use of LMS portal in general and specifically in using POLCA for improvement of learning calculus among university students.

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