Student Engagement using Learning Management System in Computer Science Education

Nurazlina Md Sanusi, Massila Kamalrudin , Syahida Mohtar

Abstract— Combined learning among the world's top universities including Malaysia was commonly recognized. Many educational organizations, like Blackboard, WebCT and Moodle, have introduced Learning Management Systems (LMSs) or Course Management Systems (CMSs), depending on the capabilities and needs of the institutions ' programmes. The aim of this paper is to report the results of implementation of learning management system (LMS) using Moodle on student engagement in Computer Science (CS) classroom for two semesters. Furthermore, we also investigating the parameters that influence student engagement and how these scales relate to each stage of learning process to produce better learning performance. The respondents for this work are students who enrolled CS courses regardless of any year. The survey conducted using online and distributed to various type of subject taught in CS for the semester to confirm the students' learning preferences using blended learning style. From the survey results, we examine the significance correlation of learning preference style with student engagement in campus-based learning. The results show that there is an impact of LMS usage on teaching, learning and assessment based on students' learning preferences may show better learning engagement amongst students

*Keywords: learning management system; student engagement; better learning outcome; student learning preferences.***I.**

I. INTRODUCTION

Blended learning is a combination of internet learning with face-to-face learning and the use of education technology when carrying out class-based learning, learning and evaluation operations (De Leng et al, 2010). The blended learning idea of higher education organizations has been commonly recognized in Malaysia. Many of them have implemented LMSs or CMSs, for example Blackboard, WebCT and Moodle, for their daily experience of campus-based teaching and learning (Sharma & Vatta 2013).

Universiti Teknikal Malaysia Melaka (UTeM) has developed the Moodle LMS called ULearn, which offers learners and lecturers the flexibility to better access their learning resources and to improve the learning environment. In fact, CS learners seem to appreciate the choice to learn

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from ULearn. The methods for teaching CS have gradually changed with the emerging educational technologies. There are number of Information, Communications and Technologies (ICTs) platforms and materials offer students and lecturers more opportunities and promises the effectiveness of teaching and learning to promote self-directed or self-regulated learning (Wu 2008). However, the concern of the effective use of ICTs to improving the CS student's learning still remains as central issues for both lecturers and educators.

In the literature review of CS education research area, these linkage approaches were demonstrated primarily by studies of approaches and techniques involving innovative educational technology incorporated into teaching pedagogy such as gaming; pedagogic methods; (Joy et al 2009). The primary drawback of these approaches was the teaching delivery and student's learning assessment. In previous years, the students' performance was only assessed by the usage of learning tools such as uploading lecture slides onto LMSs, using clickers in a classroom, online assessment, etc. These adoption issues influenced the overall students' performance and the inconsistent results on the impact of learning tools. It also has revealed the need for greater understanding and effective use of ICTs to be further research theoretically in order to assess its potential towards improving student's learning in the classroom (Rossling et al, 2008; Holley & Oliver 2010).

Research on enhancing student engagement has been mixed (Lai, Sanusi 2013). In the CS education literature, investigation of the enhancement of student engagement has been conducted by some researchers. A research carried out by Sheard, Carbone and Hurst (2010) discovered that lecturers must explore new methods of getting learners to learn and help them discover the early signs of disinterest. Pears (2010) who proposed a research-based course in introductory of programming course found that the practices have promoted to student engagement and linked with the improving of learning outcomes. Researchers also stated that engagement has become an indicator of teaching and learning qualities in university education (Lai & Sanusi, 2013).

Therefore, our research group has studied this issue and from the scholars' work in the past, we would like to examine if there is a linkage between instructional delivery pedagogy with the student learning engagement in the classroom using

LMSs (Kirkwood and Price 2014). The main objective of our research is to produce new approach of blended pedagogy with the use of ICTs and Constructive Alignment (CA) by Biggs (1999) for a classroom-based practice and provide, if any, evidence of effective ways that influencing the better of blended learning practices. This research will also develop a scale or scales that measure student engagement, and their learning experiences in classroom-based practices. The need of developing scales that measure students' engagement in CS education area, calls for theory generation through both quantitative and qualitative research methods such as grounded theory. Using a grounded theory as one of the research approaches, we hope this research will develop initial theories of blended learning engagement.

Online engagement of learners in their learning, involvement and academic results after studying the course, in a combined learning setting consisting of teaching using the learning management system (LMS). The relationship between the involvement of the students and the use of LMS was discovered to be positive. The existence of different LMS modules in a course and the use of LMSs by learners outside the campus were also shown to be a significant beneficial correlation.

II. THEORY TO PRACTICE

The theories of learning using emerging educational technologies are often discussed. However, very few scientists have concentrated on ways to manage changes in the learning type using these techniques. Our work is designed to enhance some pedagogical teaching by using Moodle to involve learners with the development of alignment theory.

We would like to discuss about the use of a LMS method-ULearn, based on basic learning theories as Biggs ' Constructive Allignment (CA) (1999), and a Shulman's Learning Table (2000), and share with you our teaching experience. This integration is traced from the expected learning results, the active participation of students in a variety of learning and assessment tasks, and assessment by criteria referenced norms of student learning results.

III. RESEARCH METHODOLOGY & RESULTS

Based on the literature review the research framework incorporated CA (Biggs, 1999) as shown in Figure 1.
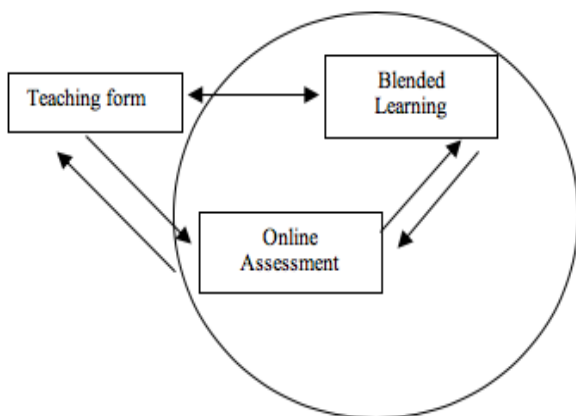

Figure 1: An aligned of the course using CA through ULearn

From the diagram illustrated in Fig.1, the teaching form is derived from the learning style theory where teaching delivery is designed according to the learner's style of preferences. On the other end, the blended learning which is in this context using ULearn will give lecturers a mixture of teaching style that can be possibly match to the students' learning preferences. The online assessment allows students, lecturers to incorporate the systematic techniques to assess student performance and level of understanding and knowledge in learning the subject taught in the classroom.

3.1 Participants

For two consecutive semesters, students are taken from FTMK Software Engineering Course. Three topics were selected: (1) DITP 2213–Data Structuring & Algorithm, (2) BITP 2223–Software Requirement, and Design (BITD) 3). We set our goals for studying results using SOLO taxonomy in the teaching plans in the first stage of our research methodology. The educational delivery of the lecturer shall be guidelines at this point. We introduced some principles of pedagogy as illustrated in Table 2 for this job.

Table 2: Some principles of good pedagogy used in the practice with Moodle

Principles	Description	Application
Individualization	Learning tailored to the needs of the individual	Sending online survey for learning preferences of the subject taught.
Motivation	Students are motivated when presented with meaningful and rewarding activities	Students are rewarded with marks not more than 5 per cent for participating in online discussion.
Social	Learning is a social and participating process.	Apply online peer learning assessments.
Self-Assessment	Individuals have the opportunity to assess their own learning and/or compare it to that of others.	Giving sample of best answer done by other students as a reference.
Active Learning	Learning should engage the learner inactive discovery and construction of new knowledge.	Encourage student to find their own case study related to the knowledge of the subject taught.

3.2 Practice in the Classroom

Online questionnaires were sent to learners through ULearn in the first week of the semester. The reason for sending the questionnaires at the start of the semester was because the student wanted to learn the topic. The findings of

the questionnaire analyze support lecturers to align the teaching experience and set up teaching preferences that are connected to the student's learning profile (Table 3–Sample from latest BITP2223–Software Requirement & Design results).

At the second week of a semester, we used a negotiation style to align the teaching form and syllabus of the subject taught. We gave a brief description for each week lecture contents as an introduction of the course. This approach is to create a better understanding of the course content to the students. In this case study, we asked students to vote for their preferred approaches to be implemented for the subject taught in the classroom. The assessment of approaches to learning was given via ULearn in the multiple choice question formats. With this information, we analyzed the preference student learning approaches and aligned the delivery instruction to fit the context.

To align the teaching and blended learning with assessment, students were given an opportunity to negotiate their assignments dateline preferences. The negotiation style helps to improve communication amongst students with lecturers. It is a win-win situation where the datelines are agreed upon the mutual understanding developed in the classroom. The students also agreed to have online assessments to be done in ULearn for the semester.

IV. RESULTS

4.1 Student learning preferences

The survey conducted at the beginning of semester to determine students learning preferences of the subject taught is the important steps in CA implementation of the case study. The results are presented in Table 3 is the survey for BITP 2223 – Software Requirement & Design, as one of the sample from three subjects taught for the semester. We analyzed the survey results (Table 3) the preferences of student learning approach and aligned the delivery instruction in the classroom.

All of 54 computer science students who enrolled this subject responded to the survey. According to the survey, 62% of the students' wanted their assignments to be relevant to real-life problems with the use of learning support tools and assignments have to be clearly explained by the lecturers. They also claimed that they are engaged (62%) when they are guided in details in doing the assignments by lecturers. This showed that students are more engaged when learning are supported with tools and when they received clearly instructions of the assignments given.

As for the LMS with ULearn, 57% are engaged to learning as they can easily have accessed the learning platform at anywhere and anytime as long as there is an internet connection. They also wanted the teaching materials to use language that is easily to be understood and 53% responded that they would engaged if the lecturer gives details the expected answers for the assignments. 52% students responded that they engaged in learning when lecturer has a systematic way managing the subject in ULearn. 50% students wanted assessment methods to be clearly spelt out and 55% interested if lecturers could relate the knowledge taught with the current issues. 47% students responded that

they are engaged to learning when asked about doing a pair work and 45% voted for detailed feedback given by lecturers.

However, for peer assessment activity only 24% students responded that they are engaged. From our analysis, the respondents from this particular course were not keen doing the activity because they are not confident with their peers' evaluation. Regarding LMSs tools to help students analyzing the practical problems, the percentage of students responded they will engage in learning is below 30%.

Table 3: Summary of students' responses to learning preferences survey

Questions (1-28): I would engage and motivate to come to class when:	Responses (%) n=54
The lecturer taught the subject sessions in an organized way with learning management system. (Example- give announcements send early notifications etc).	52
The lecturer explained clearly the subject topics of teaching as stated in the teaching plan and its requirements in the classroom.	47
The lecturers discuss or work through course material using the learning management system in the class on how to answer the exam questions.	48
The lecturer use learning support tools (clickers, interactive web, video games, you tube etc) to connect the learning with real life problems or issues.	62
The lecturer taught the subject topics that are relevant with the real-life problems.	60
The lecturer guiding me in details through course materials on how to do the assignments.	62
The lecture can involve all students to be participated in all learning activities done using learning management system in the classroom.	29
The subjects taught uploaded in the learning management system is related with the level of knowledge that I have for some topics in the course.	36
The lecturer provides detailed feedback using the learning management system on my submitted assignments and exam papers.	45
The lecturer tried to better understand my point of views as a student by imagining how an issue can be solved from my perspective.	29
The topics of subject taught do a lot of practical hands on with the help of learning management system rather than learning theoretical facts.	33
The course materials uploaded in learning management system - PowerPoint slides notes are using language that can be easily understand.	57
The lecturer uses his/her knowledge in real-industry to relate with the current issues with the topics of subject taught.	55

I could access and learned the subjects I enrolled in learning management system at anywhere and anytime.	57
The assignment instructions given in the learning management system are clearly explained by the lecturer.	62
There is a group work features in the learning management system rather than worked alone doing the assignments given.	43
There is a pair work involved rather than worked alone doing the assignments given.	47
The assessment method and marks uploaded in learning management system is clearly defined and explained by the lecturer.	50
The assessment exercise given is based on the topics of the subject that has been taught by the lecturer.	45
There is a peer assessment activity provided in the learning management system to be done in the classroom.	24
The assessment type in the learning management system has features that could determine my strength and weakness in certain topics of the subject taught.	47
The learning management system allows lecturer to give feedback in details on how to answer the assignments given correctly.	53
The assessment method is an online forms rather than pen and paper.	26
I am supported with the learning management system tools to do my assignments.	29
There is a tool in the classroom to connect with the real problems or issues with the topics of subject taught.	31
The learning management system tools can connect the ideas from the topics of the subject taught prior with my experience and knowledge.	28
The learning management system tools can help me analyze my ideas to evaluate the practical problems in the assignment given.	28
The tools can help to automate the process of analyzing the output.	24

4.2 Assessing student engagement

In Table of Learning (Shulman, 2000), it has described 5 stages which derived from Bloom taxonomy. Based on the 5 stages 1) Engagement & Motivation; 2) Knowledge & Understanding; 3) Performance & Action; 4) Reflection & Critique; 5) Judgment & Design, we designed our approach in assessing student engagement. Firstly, each semester which has 14 weeks are been assigned with contents that fit with students' profile. Then for every 2-3 weeks, lecturer would divide the course content according to the stages in Table of Learning.

For each of the stage, the teaching, learning and assessment activities are aligned as in CA principle. For the first three (3) weeks, lecturer tasks were to assess students for Stage 1 where teaching and learning activities given in the classroom are aimed to engage and motivate students to learning the subject taught. The following three (3) weeks in

Stage 2, lecturer would give assessments to test students' understanding of the subject taught. Self-quiz is given based on the lecture conducted. In next three (3) weeks for Stage 3, lecturer would have to give an extra level of difficulties assessments to students to determine whether they can perform and show some action of good progress. Forum and workshop are given based on the weekly topics as in the teaching plan for additional help in solving the assessments. For the next two (2) weeks, lecturer had to align course content and assessments to meet with the Stage 4 in the Table of Learning by having activities that related with reflection and critique for the subject taught.

4.3 Evidence of student engagement

As in this work, by interviewing the student engagement we validated the suggested combined pedagogy. At the end of the semester, each subject taught the interview session with the participants. As this study is still underway, we have shared the results of the completed and concluded study phase.

The response from the interview for student engagement in combined exercise was coded and classified using NVIVO. Different responses to the interview have led to the involvement factors. In short, the innovative practice provided by all the learners was introduced in ULearn by all of the responses, including the following:

1) Promoting interest in learning
2) Personal thought
3) Organizing study better
4) Promoting answering skills
5) Promoting communications
6) Promoting better understanding
7) System flexibility
8) Promoting higher order thinking skills
9) Prompt feedback

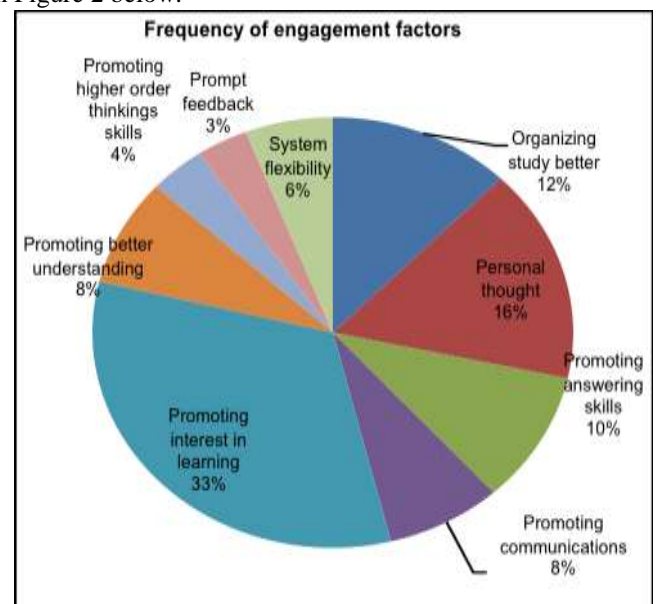The summary of factors on students' engagement is shown in Figure 2 below.

Figure 2: Factors on students' engagement using Moodle

V. DISCUSSIONS

The results show that ULearn benefits the student participation in the classroom. The findings showed. The primary reason for this may be that ULearn's system and creative practice using CA in the delivery of instructions use the Learning Table as a measurement unit. Students are more confidence in their learning when they know what they are learning and how they can relate with the knowledge they have to solve problems. Thus, interest in learning are promoted and learning performance also can be increased.

The ULearn as a medium of teaching delivery plays an important role on the making the learning more engaging compared to traditional classroom practice. Students are more focused and developed their personal thought in a positive way. Having a good personal thought on self-performance would boost student's confidence and motivation on learning the subject. Easy access to ULearn also gave students' flexibility in organizing their study. They can make early preparation before attending class. With the help of announcements made and notifications in ULearn, communications are promoted amongst the students who taking the course.

Lecturers also have options on deliver their teaching materials. With ULearn, lecturers can promote on answering skills to the students by giving feedback and uploading the sample of good answer. Feedback that is included in the system, make the definition of promoting higher order thinking skills applicable in describing the learning experience in the classroom.

VI. CONCLUSION

We have discussed the use and impacts of blended learning especially by adopting LMS in Computer science education. However, with ULearn as a teaching medium, students can participate in teaching every time and everywhere but the applications of this innovative practice in CS only involved theoretical subjects. Hands on subjects such as Programming Techniques is not yet implemented.

Furthermore, the current LMS - ULearn can be improved to be more flexible for example supports the social media for more various teaching and learning styles. The future work will concentrate on the application on the innovative practice using ULearn to the hands on subjects.

VII. ACKNOWLEDGMENT

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