

## Enhancing Student Interaction and Engagement in Blended Learning

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**Abstract.** The teaching and learning (T&L) environment has changed considerably with the advancement of Internet and web-based resources in networked environments. In blended learning, students are given the opportunity to learn through online delivery of content and instruction. They have some control over time, place and pace of their learning process. Active learning refers to T&L techniques such that the students will be given the responsibility of learning. In blended learning, part of T&L may be done through the use of a learning management system (LMS). It allows asynchronous out-of-classroom activities. Thus, this may contribute to lack of student active learning. This paper describes the use of LMS with the push-pull method to enhance the student interactions in the system to enhance student interaction with LMS. It also describes the use of the LMS with an approach called Just-in-Time Teaching (JiTT) to enhance engagement of students in the classroom and their interaction with the lecturers. It blends web-based preparatory activities such as assignments and quizzes with classroom learning. It also provides immediate feedback of the learning of students. It is found that, when the push-pull and JiTT are employed, the students become more active in accessing the LMS and respond promptly to the instructions given by the lecturers.

### 1. Introduction

Learning is defined as a process that brings together cognitive, emotional, and environmental influences and experiences for acquiring, enhancing, or making changes in one's knowledge, skills values and world views [1]. It involves the acquisition and modification of knowledge, skills, strategies, beliefs, attitudes, and behaviors. It also involves cognitive, linguistic, motor and social skills and can take many forms. In e-learning (EL), T&L is done using computers [2,3]. A learning management system (LMS) manages online teaching and learning (T&L) [4]. It helps to record and monitor students' progress throughout their learning period. It also provides an asynchronous communication between students and their lecturers. Teaching materials can be delivered at the appropriate configured time using the various communication tools such as emails, SMS and any Web2.0 tools [5,6]. A digital library maintains a repository of T&L materials [7,8]. The role of digital libraries in e-learning environments has been recognized as a core component in supporting effective T&L.

Active learning (AL) refers to teaching and learning techniques such that the students will be given

the responsibility of learning [9]. Some AL activities include class discussions, student debate sessions, class quizzes or class games. AL can be supported by technology while maintaining the pedagogy that used in learning. Table 1 shows some activities for AL.

Table 1: Activities for Active Learning [9]

Learning Domain	Domain Definition	Sample Topics	Suggested Formats
Informational Domain	Involves technical and factual content	<ul style="list-style-type: none"> <li>• The information superhighway</li> <li>• The Americans With Disabilities Act</li> <li>• Chemistry of common household cleaners</li> <li>• A brief history of our organization</li> </ul>	<ul style="list-style-type: none"> <li>• Best Summaries</li> <li>• Bingo</li> <li>• Crossword</li> <li>• Essence</li> <li>• Frequently Asked Questions (FAQs) and Fakes</li> <li>• Intelligent Interruptions</li> <li>• Press Conference</li> <li>• Selected Questions</li> <li>• Team Quiz</li> <li>• Thirty-Five</li> <li>• Twos and Threes</li> <li>• Words and Pictures</li> </ul>
Procedural Domain	Involves step-by-step activities	<ul style="list-style-type: none"> <li>• How to deal with senior-citizen customers</li> <li>• Financial planning</li> <li>• Retirement planning</li> <li>• Poster design</li> </ul>	<ul style="list-style-type: none"> <li>• Fishbowl</li> <li>• Item List</li> <li>• Job Aids</li> <li>• Multilevel Coaching</li> <li>• Team Teaching</li> <li>• Thirty-Five</li> </ul>
Conceptual Domain	Involves categories, definitions, and examples	<ul style="list-style-type: none"> <li>• Types of interview questions</li> <li>• Causes of performance problems</li> <li>• Organizational climate variables</li> <li>• Cultural factors</li> </ul>	<ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• Confusion</li> <li>• Egg Hunt</li> <li>• Idea Map</li> <li>• Questionnaire Analysis</li> <li>• Superlatives</li> </ul>
Principles Domain	Involves the use of rules and relationships among different concepts	<ul style="list-style-type: none"> <li>• Sexual discrimination</li> <li>• Soccer rules</li> <li>• Leadership styles</li> <li>• Basic principles of message design</li> </ul>	<ul style="list-style-type: none"> <li>• Idea Map</li> <li>• Item List</li> <li>• Questionnaire Analysis</li> </ul>
Interpersonal Domain	Involves concepts, procedures, and principles related to interpersonal interactions	<ul style="list-style-type: none"> <li>• Impact of management styles</li> <li>• Cross-cultural communication</li> <li>• Methods for conducting a workshop</li> <li>• Ways of handling sexual harassment</li> </ul>	<ul style="list-style-type: none"> <li>• Fishbowl</li> <li>• Questionnaire Analysis</li> <li>• Role Plays</li> <li>• Shouting Match</li> <li>• Items List</li> <li>• Interactive Story</li> </ul>
Affective Domain	Involves attitudes, values, and beliefs	<ul style="list-style-type: none"> <li>• Affirmative action</li> <li>• Gun control</li> <li>• Conflict resolution</li> <li>• Cultural values</li> </ul>	<ul style="list-style-type: none"> <li>• Shouting Match</li> <li>• Interactive Story</li> <li>• Debrief</li> </ul>

In blended learning, part of T&L may be done through the use of a learning management system (LMS) [10,11]. It allows asynchronous out-of-classroom activities. It helps to record and monitor students' progress throughout their learning period. Teaching materials can be delivered at the appropriate configured time using the various communication tools such as emails, SMS and any Web2.0 tools [5,6]. With the availability of a digital library, resources are always available and students are in control of their learning pace and time. A structure for a standard LMS is shown in Figure 1 [4]. A comparative study of several LMSs can be found in [13].

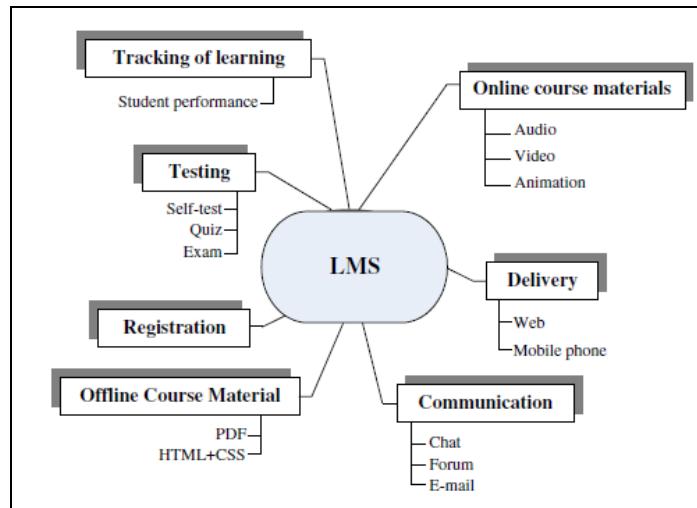


Figure 1: LMS Structure [4]

This paper describes the use of LMS with the push-pull method to enhance the student interactions in the system to enhance student interaction with LMS. It also describes the use of the LMS with an approach called Just-in-Time Teaching (JiTT) [10] to enhance engagement of students in the classroom and their interaction with the lecturers. The application of the push-pull mechanism (PP) [12] to enhance student access to an LMS is outlined in this paper. This mechanism delivers the appropriate learning materials to the students at the appropriate configured time using the various communication tools.

## 2. Blended Learning

Blended learning offers an attractive education program by combining the T&L activities through the use of information technology. In this mechanism, a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path or pace [10,11]. In blended learning, a form of learning called flipped classroom is perceived to be a suitable technique for T&L [10,11]. This method of T&L may also be described as JiTT. Students will have to complete certain preparatory tasks before coming to class. The lecturers will discuss those answers and comments in the classroom. With the aid of an LMS, students may perform their learning through the online contents. They may take an online quiz, do an assignment and submit it online or watch video lectures before coming to class. In the face-to-face classroom with the presence of the lecturer, the solutions of the assigned problems may then be discussed. This offers a more personalized guidance and interaction with students, instead of lecturing. Thus, the students come to class more prepared and motivated to learn. Thus, the lecturers spend more time on difficult topics or common misconceptions.

## 3. Enhancing Interactions in Blended Learning

In this paper the use of LMS with the push-pull (PP) method to enhance the student interactions in the system is outlined. This paper also describes the use of the LMS with an approach called Just-in-Time Teaching (JiTT) to enhance engagement of students in the classroom and their interaction with the lecturers. It blends web-based preparatory activities such as assignments with classroom learning. It also provides immediate feedback of the learning of students.

### 3.1 Push-pull mechanism in LMS

In classrooms, AL activities will engage students in their T&L. They will have time and opportunity to interact with their lecturers during their face-to-face lecture. However, in an EL environment, this normally does not happen as activities in EL are mostly done asynchronously. It has been observed that lecturers will upload their teaching materials onto the LMS at the beginning of the semester. The students on the other hand, will download those materials for their own readings. This is known as *refrigerator syndrome* of the LMS [14]. One scenario for this problem, extracted from Universiti Malaysia Terengganu in 2012, is shown in Figure 2.

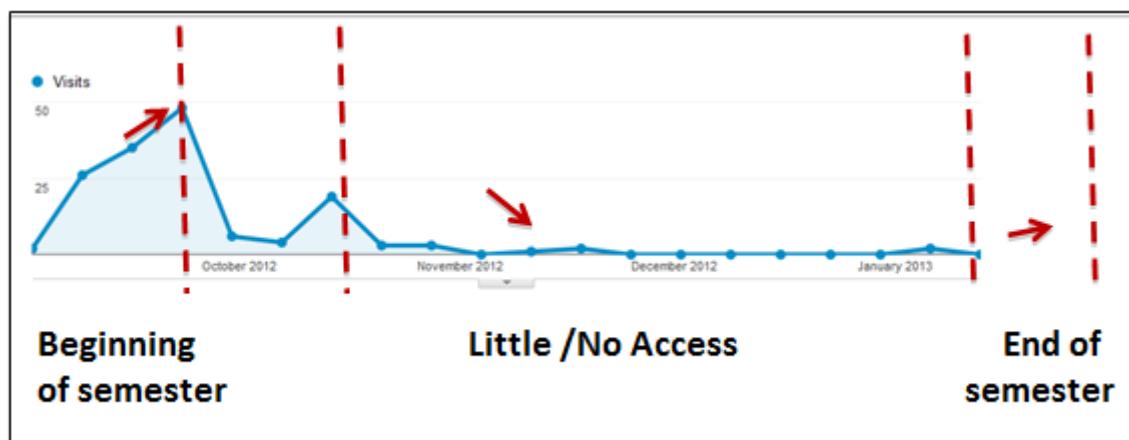


Figure 2 : Refrigerator Syndrome in LMS

To increase the use of the LMS, T&L materials and tasks may be planned to be delivered on certain times automatically [12]. This facilitates the regular access to the LMS. The LMS provides the content repository of T&L. The push function will deliver the appropriate learning materials at the appropriate configured time to various communication devices such as emails, SMS and any web 2.0 Tools. Once the information is delivered, a student may actively act directly to the tasks received by performing the pull function on the materials. The details of push and pull times are recorded by the LMS. The system may generate various reports on the student activities for their course materials. With the rapid development of mobile technology and content development, mobile learning has become a new trend to e-learning. To support mobile learning three types of media mechanisms have been identified [15]. They are Short Message Service (SMS), Email, and Really Simple Syndicate (RSS). RSS has been shown to have a better performance than SMS and email on content accuracy and adaptability.

The use of LMS with the push-pull method has been implemented to enhance student interactions in the T&L. This mechanism is shown in Figure 3. In the push technique, the learning contents are delivered (or pushed) to learners without them having to find and pull the contents. In the pull methodology on the other hand, the contents are delivered when the students make the effort to get them i.e., pulling the contents. The activities of students are tracked and analysed. Temporal analysis is performed on the access times done by the students. The students may then be clustered into groups of active and less active learners. This is computed using the k-mean analysis. Based on the clustering results, appropriate actions can then be taken to improve the interactions.

### 3.2 Just-in-Time Teaching

As mentioned earlier, to increase the engagement and interaction between the students and the

lecturers in the classroom an approach called just-in-time teaching (JiTT) has been adapted and practised by many academic institutions [10,11]. It blends web-based preparatory activities such as assignments with classroom learning. JiTT provides immediate feedback of the learning of students. This is a critical component of JiTT. This technique has shown to give positive results. Increase in student attendance in class and decreased attrition have been observed.

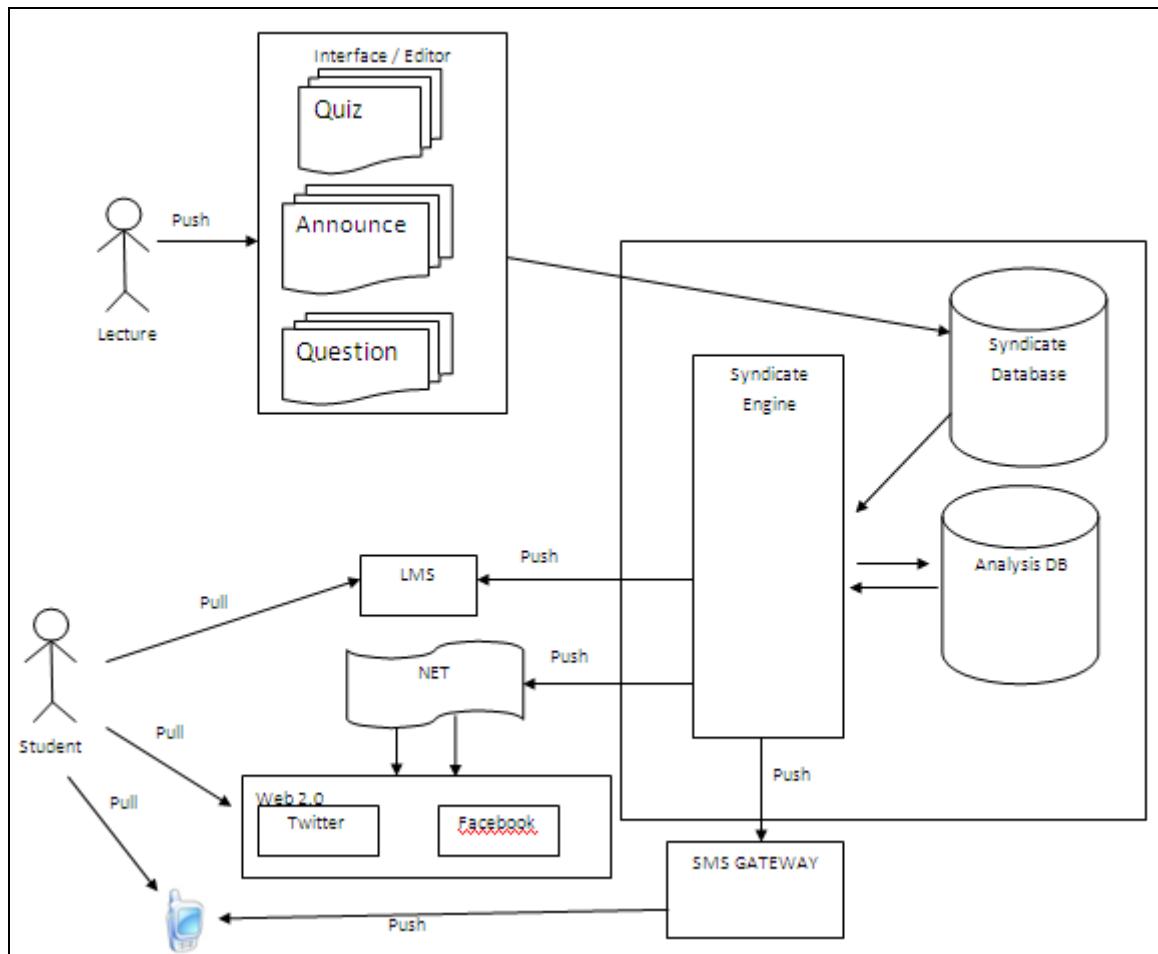


Figure 3 : Push-Pull mechanism in T&L system

To employ JiTT, the lecturers will have to furnish tasks related to the topics of the lectures that students have to complete before coming to the classroom. In blended learning, these preparatory assignments or tasks may be given in an LMS and pushed to the students. The students may encounter problems and difficulties in understanding those preparatory materials. However, they have the time and may ask for help from their peers to search for more answers. Thus, the students will come to class with a well-prepared knowledge and motivation to learn. The lecturers, on the other hand, may spend more time on common problems and misconceptions. They do not spend time on material students have shown they have easily understood.

As mentioned earlier, in an EL environment, an LMS offers several interactive tools for students to participate in learning. Some of the tools available include quizzes, forums and video conferencing facilities. They offer an easy method to perform JiTT. For the quizzes, students take them online and submit their solution before class begins [10]. Apart from the subjective or essay-type questions, those types of questions such as the multiple-choice questions and the fill-in-the-blank questions provide instant grading. This may enhance their learning motivation. In the classroom, the lecturer reviews the answers and responses just in time for class discussions. Students engagements in

discussions can be readily established as some may put arguments of their Misconceptions on the topics can be corrected. This can improve active learning strategies in the classroom. The students come to class in a prepared manner and are already engaged in the materials.

JiTT has its own benefits and limitations. This technique demands more preparation time for the lecturers. But, it has been shown that it increases student interaction with their lecturers [10]. Their confidence also increases as their answers are discussed in classrooms, especially those that involve misconception. It also increases in-class discussions as feedbacks by students are provided. Allowing students to redo to improve their assignments is also beneficial. However, one of the common problems encountered in this T&L method is that the lack of motivation for students to perform the preparatory assignments. The connectivity of computers and the servers presents one problem that can reduce motivation in doing their preparatory tasks. This is particularly true for tasks that involve watching videos with long durations. Some students are more inclined to come and just listen to the lectures without doing any tasks. The challenges here are how to create relatively short and engaging videos [16].

#### 4. Case Study & Results

A case study on the use of PP and JiTT has been carried out. It involves a group of 100 Bachelor of Computer Science students in Universiti Malaysia Terengganu. The study tracks the activities of the students accessing based on the PP technique. In Figure 4 the tracking of active students in LMS is shown. The reduction of refrigerator syndrome in LMS is given in Figure 5. As mentioned above, one simple way to perform JiTT is to perform quizzes. For the videos, to ensure the students watch the materials until the end of its length, quizzes are embedded in the videos. Some video editing tools such as Camtasia [17] allow the video developers to easily perform this task. Figure 6 shows one example given in the case study.

#	Instruction	Time Push
1	<a href="#">Final Exam</a>	2012-12-30 05:19:06
2	<a href="#">Week #14 - Group Presentation</a>	2012-12-17 03:17:50
3	<a href="#">Week#13 - Test #2 Online opened Fri 8am - Sat 1pm (60 min)</a>	2012-12-11 03:16:29
4	<a href="#">Week #13 - Class</a>	2012-12-09 03:18:40
5	<a href="#">Week #12 - On Binary Search Trees, AVL Trees, B Trees, Tries, Red Black Tress &amp; Splay Trees.</a>	2012-12-02 01:05:07
6	<a href="#">Week #11 - Online Quiz</a>	2012-11-27 08:00:48
7	<a href="#">Week #11 - Register your Project GroupResource</a>	2012-11-26 09:00:07
8	<a href="#">Week #11 - Lab Work</a>	2012-11-26 08:00:21
9	<a href="#">Week #11 - Things to do Week</a>	2012-11-25 09:00:56

Figure 4 : Tracking of Active Students in LMS

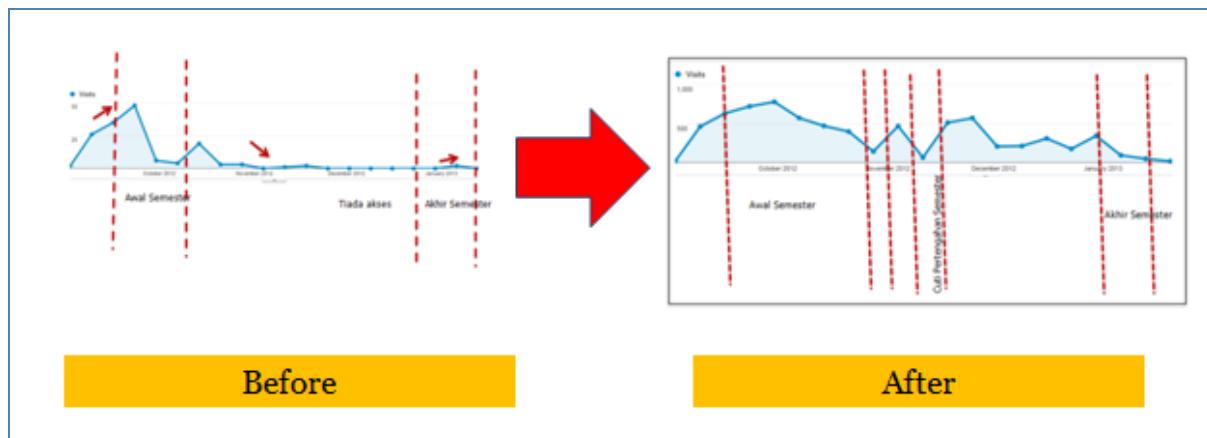


Figure 5: Reduction of Refrigerator Syndrome in LMS



Figure 6 : Video with embedded quiz

## 5. Conclusion

The prospects of elearning learning and blended learning is tremendous particularly in a developing countries such in Malaysia. The challenge is how to increase the motivation of the students and how to perform active learning. This is particularly important in the usability of e-learning technologies to maintain a good interaction between students and lecturers. In this study, it is found that, when the push-pull and JiTT are employed, the students become more active in accessing the LMS and responding to the instructions by the lecturers. The students are more engaged in the class and are quite well prepared to discuss the course material. They also perform better in their studies. Favourable feedbacks have also been gathered from the students when the push-pull and JiTT approaches are applied in their learning.

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