MOODLE-LMS AS AN INNOVATIVE AND COST EFFECTIVE E-LEARNING TOOL FOR OPEN AND DISTANCE LEARNING

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1. INTRODUCTION
The most critical issue facing Higher Education (HE) today is how to provide access to instruction and services that will enable many more students to fulfill their postsecondary aspirations (Schroeder, 2011). The raison d’etre for Open Distance Learning (ODL) is to extend HE to non-traditional learners by adopting an open, flexible and relatively inexpensive approach that is relevant and need-based. This inclusiveness is aimed at those who are at a disadvantage in the conventional system with respect to age, gender, distances and socio-economic background. A Learning Management System (LMS) is a software package that enables the management and delivery of online content to learners (Coates, 2005). Due to the fast improvements of distance-learning, the use of open source software (OSS) provides development of learning tools and educational quality. Also, cost, which is the biggest advantage of e-learning rather than traditional learning environments, is removed by the use of open source e-learning tools (Aydin & Tirkes, 2010).

One of the most direct and pressing applications, however, is in terms of understanding how online LMSs might be used to enhance overall student engagement in ODL. Motivation has been considered an important factor in students’ decisions to devote quantitative time-on-task. Student engagement is generally understood to be the primary mechanism that enables motivational processes to contribute to learning and development (Furrer, & Skinner, 2003).

This paper discusses the effectiveness of MOODLE (Modular Object Oriented Dynamic Learning Environment) as an LMS on student engagement, motivation and academic performance, with the help of tools and scales prepared by the researcher to assess the same. Understanding this relationship will guide stakeholders in the ODL environment to use this LMS environment to enhance the learning experience of ODL.

2. REVIEW OF LITERATURE
Students heavily immersed in Web 2.0 technologies are crafting on-line lives that seamlessly meld with their off-line world. Internet is playing an increasingly important role in not only students’ social life, but also academic (Munoz, & Towner, 2012). LMS like MOODLE provides collaborative tools like email, chat and discussion forums that assist students as they construct knowledge. The aim is to create learning environments centered on students as learners and to offer new learning opportunities all at one place. MOODLE was designed as an LMS to support and promote users interested in developing constructivist, student-centered learning environments. It is based on the constructivist pedagogy wherein knowledge is actively constructed by the learner, not passively received from the environment (Dougiamas, & Taylor, 2003). It has three main functions: authoring, administrative and a means of communication (Peter, 2004). Open source LMSs were analyzed and it was observed that MOODLE among other LMSs offers a clear advantage over other LMSs, besides having many needed tools, included features that not only improved pedagogical quality, but also scored high with regards to modular design, interface, and authentication issues (Aydin & Tirkes, 2010).

Student engagement results provide educators across a variety of campus programs and departments, information to consider in their efforts to understand the student experience and to collaborate in the design of educationally productive activities and programs (NSSE, 2011). MOODLE-LMS provides an environment that enables learning, as learners work individually on assigned materials and decide when
they would engage. Learners can assess the outcomes of their engagement by how successful they were progressing through the materials with the help of assessment features like Quiz, Assignment, etc. all built into the LMS (Peter, 2004). Several studies (Chapman, 2003; Ethan, 2006; Kuh, 2007) have highlighted the significant role that such factors can play in the learning process, laying particular emphasis on those associated with student engagement levels.

Studies have indicated that successful distance learners must possess certain attributes like time management, self-motivation and communication (Simonson, Smaldino, Albright, & Zvacek, 2009); more the students are motivated to learn, more likely it is that they will be successful in their efforts (Singh, Granville, & Dika, 2002; Hershkovitz, & Nachmias, 2008).

The plethora of features offered in MOODLE-LMS along with the embedded cognitive strategies like a feedback feature makes it an LMS that provides students with a learning advantage.

3. OBJECTIVES OF THE STUDY
   1. To study the effectiveness of MOODLE-LMS for student Engagement, Motivation and Performance.
   2. To study which features of MOODLE-LMS affect student Engagement, Motivation and Performance.

4. RESEARCH DESIGN AND METHODOLOGY
The Research Design used for this study was the ‘Experimental method’ with ‘post-test only’ design.

4.1 Sample
The number of students in the experimental and control group were 13 each respectively. They were enrolled in a compulsory course titled Software Engineering during the last (sixth) semester (in a six semester B.Sc. Computer Science, Undergraduate degree programme offered by Goa University, India) for the academic year 2012–2013. There are a limited number of seats (20 only) for this course and admission is done on first cum first serve basis. During the initial months of course commencement, some students leave the course to pursue professional degrees. Hence, when the experiment was conducted there were only 13 students each left in the two groups. The total size of sample selected for the final study was 26 (all students i.e. the entire population admitted to the class were part of the study). Both groups were taught the course in the conventional environment, with the only difference being that only students from the experimental group had access to MOODLE-LMS.

4.2 Tools
Kuh (2001) defines engagement as the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes. Stovall (2003) suggests that engagement is defined by a combination of student's time on task and their willingness to participate in activities. Additionally, Chen, Gonyea and Kuh (2008) say that engagement is the degree to which learners are engaged with their educational activities and that engagement is positively linked to a host of desired outcomes, including high grades, student satisfaction, and perseverance. Engagement implies the use of three interrelated criteria namely, Cognitive, Affective and Behavioral to assess student engagement levels (Chapman, 2003). Keeping the above studies in mind, the researcher developed an Engagement Scale using a four-point rating scale with 21 items, with an objective to study the cognitive, affective and behavioral aspects of engagement.

In general terms, student motivation refers to a student's willingness, need, desire and compulsion to participate in, and be successful in the learning process (Martin, 2003). John Keller (1983) proposed four conditions (ARCS) that must be met for a learner to be motivated to learn; they are Attention, Relevance, Confidence and Satisfaction. A Motivation Scale was developed by the researcher by suitably modifying and adapting Keller ARCS motivation scale to this study. The scale was developed using a five-point
rating scale with 24 items, with an objective to study the attention, relevance, confidence and satisfaction aspects of motivation.

The Performance Test was an achievement test with a maximum score of 25 marks. Once the learning objectives were finalized, the blue-print was prepared covering all levels of Bloom’s Taxonomy. Items at these levels were prepared on all the content-points of the modules that were covered during the treatment period.

All the above tools were constructed by the researcher and validated by experts before administering them as post-tests to both the groups.

Besides these tools an Evaluation Rubric (ER) was also constructed to help determine the extent to which MOODLE-LMS features namely Chat, Discussion Forum, Glossary, Assignment and Quiz actively promote student engagement and participation. The scores obtained from the rubric helped determine whether such activities appeal to the learners, thereby increasing their engagement, motivation and interaction. The criteria in the ER were designed keeping in mind the objectives of the study with an additional focus being to understand the quality of interactions that was taking place through the various activities and resources that the MOODLE-LMS offers. An attempt was made to know a student’s willingness, need, desire and compulsion to participate in, and be successful in the learning process by offering the student various LMS features which in turn are expected to affect their engagement, motivation and performance.

4.3 Treatment
A regular term paper (in this case Software Engineering) that was offered to students in both the colleges was selected for this study. A semester consists of 60 lectures with each lecture being of 45 minutes duration. The treatment was administered for around two months (approximately 25 lectures). Two modules were selected from the syllabus. The weightage of the syllabus for these topics was 40%.

The treatment for the experimental group comprised of resources and activities made available to the participants through MOODLE-LMS. The faculty for the treatment group made available resources like lecture slides and website links to the students. Activities related to their coursework like Assignments (for submitting), Forums (for participating and sharing views on topics/content related to the module), Quiz (to test the extent of the matter taught), Chat sessions (to discuss topics and difficulties), etc were all made available through MOODLE-LMS. The participants were encouraged to build a Glossary for the modules. All the activities were related to the topics covered in the modules. The students were expected to access and participate in all the activities that the faculty made available to them via the MOODLE-LMS from time-to-time. At all times, for all their activities students were able to regulate their time-on-task between the start of the task and the deadlines (if any) for submission, as these were displayed in their work area, through the Calendar utility provided in MOODLE.
5. FINDINGS AND DISCUSSIONS OF THE STUDY

In order to examine whether MOODLE-LMS is effective to student learning, the difference between post-test scores of the learners in the experimental and control group using the t-ratio was computed and Table 1 presents the relevant statistics.

Table 1: Comparison of the means of post-tests of the Experimental and Control group post-tests on Engagement, Motivation and Academic Performance.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>t-value</th>
<th>Level of significance (df=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Engagement</td>
<td>43.15</td>
<td>8.46</td>
<td>34.69</td>
<td>9.98</td>
</tr>
<tr>
<td>Motivation</td>
<td>91.53</td>
<td>13.59</td>
<td>76.46</td>
<td>12.25</td>
</tr>
<tr>
<td>Academic Performance</td>
<td>18.80</td>
<td>3.69</td>
<td>7.84</td>
<td>3.21</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

The Table 1 shows that the students from the experimental group reported a higher mean score on all parameters of the study as compared to students from the control group. The finding that students who use MOODLE-LMS have significantly higher degree of academic performance vis-à-vis the control group students, is in congruence with studies done by Bulger, Mayer, Almeroth & Blau (2008), wherein a positive correlation was found between MOODLE use and academic performance for high-support courses. The t-values indicate a significant difference in engagement, motivation and academic performance of the students in the experimental group over the control group. The data from the table 1 indicates that the LMS-MOODLE plays a significant role in engagement, motivation and academic performance of students in the experimental group. Therefore there is a need to study, what features available in the LMS are responsible for affecting these three parameters. An analysis of the ER indicates the extent to which the features in MOODLE-LMS were used by the students as indicated in Table 2.

Table 2: Results of the correlation between LMS features used vis-à-vis Engagement, Motivation and Academic Performance in the Experimental Group.

<table>
<thead>
<tr>
<th>Features---&gt;</th>
<th>ER^</th>
<th>Chat^</th>
<th>Forum^</th>
<th>Glossary^</th>
<th>Assignment^</th>
<th>Quiz^</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement</td>
<td>0.578*</td>
<td>0.279</td>
<td>0.596*</td>
<td>0.083</td>
<td>0.566*</td>
<td>0.425</td>
</tr>
<tr>
<td>Motivation</td>
<td>0.668*</td>
<td>0.514</td>
<td>0.582*</td>
<td>0.034</td>
<td>0.760**</td>
<td>0.845**</td>
</tr>
<tr>
<td>Academic Performance</td>
<td>0.913**</td>
<td>0.608*</td>
<td>0.918**</td>
<td>0.317</td>
<td>0.728**</td>
<td>0.563*</td>
</tr>
</tbody>
</table>

^figures mentioned in these columns are r values
* Significant at 0.05 level
** Significant at 0.01 level

Table 2 shows that there is a correlation between overall LMS features and student engagement, motivation and academic performance. There is a positive relationship between features like Chat, Forum, Assignment, Quiz and academic performance. There is also a positive relationship between features like Forum, Assignment, Quiz and motivation. However, Table 2 also indicates that among all the mentioned features it is the Forum and Assignment that are very significant to all three parameters. It implies that these two features of LMS are very significant to student learning. A further analysis of Forum and Assignment indicated that participation in forum significantly helps development of ideas, understanding and knowledge, whereas the assignment feature has significantly contributed to understanding.
The results from Tables 1 and 2, show that the perceived richness of online discussion forum has a significant positive effect on student participation, interaction and learning, when used along with traditional classroom lecture. Interaction and quality of interaction among the students and instructor are considered as an essential part of the academic progress. Online discussion forums offer many pedagogical advantages, while the asynchronous text-based nature of online forums can encourage reflection, analysis and high order thinking (Richards, 2009).

The findings of the study can be applied to an ODL environment wherein students are expected to use quality time both for their individual and collaborative activities without any face-to-face contact with faculty. Communication has a critical role to play in ODL system due to the distributed nature of program delivery and student support services. For a distance learner waiting for crucial information at various stages of study, the information must be made available at the earliest and with clarity. Lack of appropriate communication has been cited as one of the reasons for student attritions (Fozdar, Kumar, & Kannan, 2006). Having a MOODLE-LMS will prove to be advantageous as the entire course related resources, activities and communication are accessible at one single place.

6. CONCLUSION AND SUGGESTIONS

The biggest challenge faced in higher education in developing countries is the provision of quality higher education (HE) to the greatest number at the lowest possible cost. LMSs are at the forefront of online technologies making a serious impression on patterns of learning and teaching in higher education (Coates, 2006). The seamless access, flexible schedules, quality content and inclusive delivery mechanisms provided in MOODLE-LMS have enormous potential not only to empower the learner but to increase the scale of access and, in that process, bring down the cost of higher education for the individual learner.

The findings from this study, can be used as an initial exploration to conclude that if MOODLE-LMS does contribute positively towards improving student learning outcomes in a classroom-like situation it could likewise be an efficient as well as cost-effective option vis-à-vis HE (through ODL) in a developing country like India with scarcity of infrastructure and trained faculty, and high drop-out rates contributed by factors like long distances, high cost in terms of fees, need for seeking remunerative employment at an earlier age etc. The General Enrollment Ratio (GER) pertaining to higher education in India is currently about 15 percent (Suneja, 2012). Thus, besides improving education directly through enhancement of academic performance, motivation and engagement, MOODLE-LMS could facilitate the expansion of HE sector itself, by providing access and effective learning opportunities for those deprived from HE. The fact that MOODLE-LMS has no geographical barriers and can be accessed anytime, anywhere, and with faculty not being required to be in one geographical location, makes it all the more valuable for students as well as for the government (as service provider). Additionally, MOODLE-LMS besides passing the benefits of HE to a larger number of individuals can provide better inputs to students through the contribution of expert faculties from even across the world, at no additional cost to students, thereby further enhancing quality education and transforming HE.
REFERENCES


Fozdar, B., Kumar, L., & Kannan, S. (2006). A survey of a study on the reasons responsible for student dropouts from the bachelor of science programme at Indira Gandhi national open university, *The International Review of Research in Open and Distance Learning (IRRODL)*, Vol.7 No. 3.


