Analysis of Developing Proper Design of Learning Management System

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Abstract—This paper presents experimental analysis of log data for developing effective usage of LMS. Learning Management Systems collect large amount of data. We highlighted next three issues: to control student's learning process, to evaluate teacher's work during online learning, to evaluate learning materials available on Learning Management System. Learning Management System's log data can provide enough information for improving whole systems development also learning quality. The data were processed from two undergraduate courses that differ in terms of learning activity design and were resulting from the User Activity functions on open source learning management system, which report the number of student hits across the LMS tools. The research identifies advantages using learning management system's log data for controlling students' and teachers' learning activities and obstacles encountered when using log data. This outcome is mainly related given the correlation between LMS interaction and student results reported in other studies. The research confirms the potential of log data to support inform blended learning and online teaching practice, highlights some of experiments involved and outlines possibilities for future.

Keywords—Learning Management System LMS, log data, learning outcomes, SCORM data

I. Introduction

According with the development and growth of the Internet, there has been a dramatic increase in the application of the Learning Management Systems (LMS) in higher education. With the development of learning technologies, learning management systems (LMS) have become an important component in the education field. One of the most important features of an LMS is to provide an environment for learning and teaching without the restrictions of time or distance (Epping, 2010).

LMSs helps instructors and learners discuss the course content by posting and responding to each other, maintaining student learning tracks, and managing learning activities in an online environment (Falvo & Johnson, 2007). Currently, LMSs improve instructor teaching and student performance across various fields of study (Boggs, Shore, & Shore, 2004).

Each LMS offers specific functions and management approaches, so choosing the appropriate system becomes an important concern for educational institutions. In addition, an LMS does not offer enough finalized functions to satisfy the demands of the institutions. As a result, institutions must spend valuable time and effort comparing each LMS system individually to ensure that the one chosen meets their demands. Although LMSs have become increasingly popular, several drawbacks and limitations exist. There is a lack of social interaction and processing useful data for teachers and administrators. [1]

They allow instructors to deliver assignments to the students, produce and publish educational material, prepare assessments and tests, tutor distant classes and activate archive storage, news feeds and students' interaction with multimedia. They also enhance collaborative learning with discussion forums, chats and wikis (Romero et al., 2008a).

Due to the volume of data, one of the main problems of any LMS is the lack of exploitation of the acquired information. Most of the times, these systems produce reports with statistical data, which, however, don't help instructors to draw useful conclusions either about the course or about the students; they are useful only for administrative purposes of each platform. Moreover, the existing e-learning platforms do not offer concrete tools for the assessment of user actions and course educational content. [2]

The weaknesses of these systems are that they give too much attention to online administration and too little attention to pedagogical concerns and process of useful data for evaluation (Britain & Liber, 2004). The aim of this paper is to introduce the results of an experiment improving learning environment, provide opportunity to conduct training suitable for learners' learning style, evaluate teachers' work using information technology achievements.

Most learning management systems provide tools such as report, grade to capture data in an e-learning courseware. These tools can be used by teachers, content experts to evaluate learners' activities and

identify online behaviors and interaction patterns in a virtual learning environment.

Statistical results provided by these reports can to be used for motivating students and building more effective interactive content for e-learning courses, hosted in a LMS.

All Learning Management Systems are useful in outcomes-based learning environments that could be continuously improved by analyzing the captured data included in the Reports of a courseware hosted on the system. The research identifies obstacles encountered when using log data.

For this study a sample of two fundamental courses of a bachelor degree program and the data derived from their "Reports" is used to evaluate the level of interactivity.

The growing use of Learning Management Systems (LMS), many of which automatically keep logs of student activity, presents an exciting means of narrowing this gap. We explore whether students' perceptions of community can be measured via logs of student activity within graduate level online courses. [3],[4],[5]

With the growing use of learning management systems (LMS) in online education (Weaver, Spratt & Nair, 2008) an apparent correlation between level of LMS student interaction and the assessment grade achieved has been inferred by some researchers using log-in statistics (Beer et al., 2009; Macfadyen & Dawson, 2010). Log data provide an indicator of user interaction with the LMS and have the advantage of being non-intrusive, readily available and free. However, the downsides include the time it takes to prepare the data into a format ready for appropriate analysis (Black et al., 2008), as well as the fact that log data never fully describe how users interact with the LMS, nor reveal insights into the users experience, both of which may influence the depth and quality of interaction with the learning site (Beer et al. 2008) [6]. Furthermore log data do not necessarily track frequency of reading / interacting with learning materials since some students, perhaps those with connection problems or those who prefer paper, may work with downloaded materials. While few institutions have used student access data obtained from the LMS system logs to inform decision making (Beer et al., 2009), the potential for extracting pedagogically meaningful data is becoming more widely recognized (Macfadyen & Dawson, 2010; Yang et al., 2010). [8],[9],[10]

II. Scope and purpose

This article provides information about best practices of LMS usage for blended learning courses and barriers to a wider utilization of LMSs in higher education. Results obtained in 2012 and 2013 are used to investigate to what extent the lecturers' attitudes can explain the pattern of use of a LMS, and control possibilities of students learning process. The specific reluctance to use interactive tools in the LMS is analyzed.

The investigation covers three areas of interest: Firstly, the lecturers' opinions about the evaluation process and support for the new LMS. Secondly, if, and to what extent, the lecturers' expectations about the future impact of the LMS from 2012 have been fulfilled. Thirdly, changes in the lecturers' attitudes about the use of the LMS between 2012 and 2013.

The investigation was conducted at an E-Open school in Mongolia where both lecturers and students have ample Internet and computer access but where the use of most of the tools in the LMS is not mandated. A similar situation is seen at many institutions of higher education in developed countries (Carvalho, Areal & Silva, 2011; Limniou & Smith, 2010; Zhou & Xu, 2007) and hence the results should be widely applicable.

III. METHOD

The research confirms the potential of log data to inform online teaching practice and highlights some of challenges involved and outlines avenues for future research.

We used an open source learning management system for 3 semesters. First semester's data for this study were collected from 40 students, Power engineering school – 28, School of civil engineering and architecture – 4, School of Geology and Petroleum – 11, School of Mining Engineering – 7, other 3 school - 7. Overall 1376 students used open source learning management system, application program I – 762, Application program II – 414 and 12 teachers who teach same subject. All participants didn't have previous experience with online courses; on average, learners had taken 2.1 (SD = 1.6) online courses prior to participation in the study. Application program II concludes 8 lectures, 16 laboratory works and teaches MS Access, MS Outlook and Communication skills. The lecture was prepared through SCORM standard and self-test, additional materials are available. The teacher contribute for chat twice a month, forums are discussed every day. They had 5 assignments and sent it to the teacher by e-mail. The third semester's 1995 students were enrolled in Application program I and took 3 midterm exam, 10 teachers participated these courses.

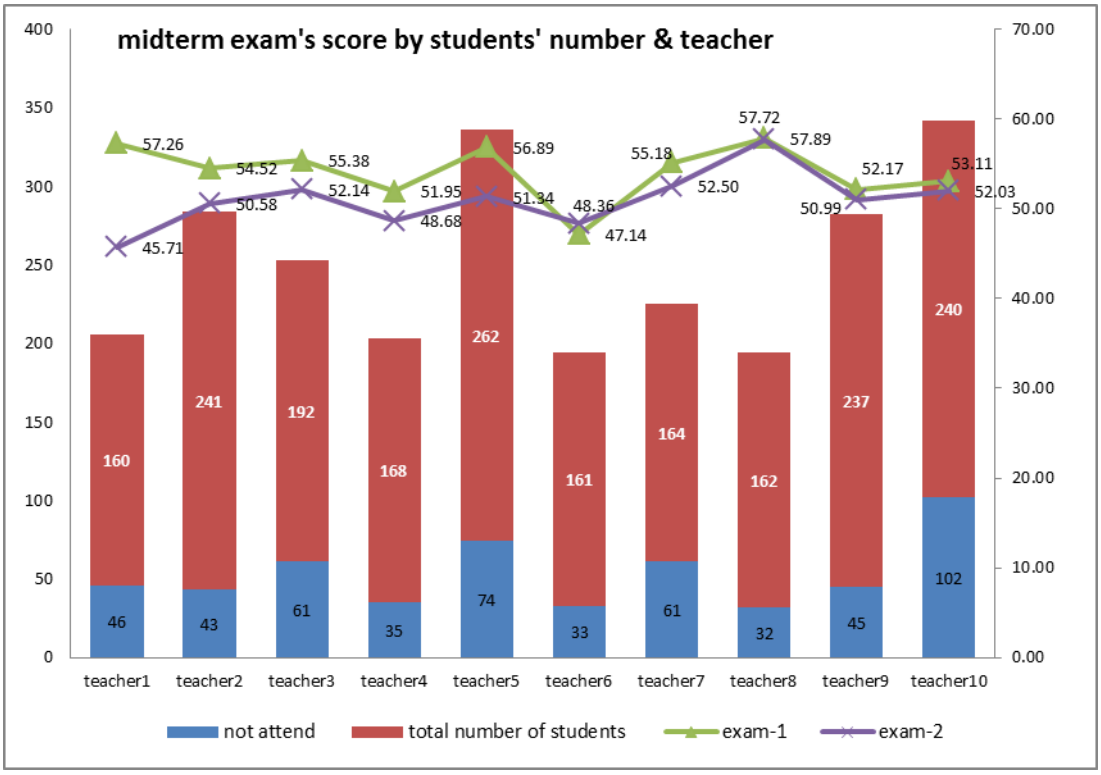
We conducted the survey after finishing the courses.

Our research aim is to collect data need for improving learning quality and the possibility to control students' learning processes using LMS during the semester and review the students' evaluation

system. Now teachers assess the students' by 70 point scale during the semester. This scale consists of independent work - 30, midterm exam -30, lesson activity -10. Teachers can control students' access using the open source LMS. Students using collaborative tools have been more successful than traditional training. We are trying to calculate which one is most effective tool and involve the result of these activities into course the evaluation for the whole semester. Students are classified as using either synchronous or asynchronous activities. The log data downloaded from Moodle enable the mean number of hits per student to be calculated for each of the selected tools. Although our study was interested only in the cumulative number of data logs, Moodle sorts logs by type as well, including the number of pages within the LMS visited, messages read in discussions, posts in discussion and the utilization of LMS communication (email, chat). A teacher or administrator can access the reporting feature and view or download (in Excel or text format) multiple reports based on their preferences. For example, reports can be generated for individual students, multiple students, and specific assignments or for a specified time period. Through this method a cumulative number of logs for each student were obtained; also, a summary of the students' activities in the LMS was obtained allowing for future analysis of specific types of events (e.g. content views, new postings, and replies to existing postings). Collective logs were combined with scores for each participant; linear regression procedures were then performed upon the data set to separate the relationships between the independent variables (sense of community, connectedness and learning) and the dependent variable (data log events). Finally, analysis of modification procedures was utilized to explore differences between the studied courses.

IV. RESULT

The availability of internet connection was highlighted as a contributing factor by 67% of the student participants and 98% able to use computer at home.



61% of overall students used the learning management system. Logs can record many different actions, each of which can and does have a variety of different causes

Results of the experiment:

1. We uploaded lesson content using SCORM. It was really helpful to evaluate lesson's content attempt using Moodle. The SCORM data model elements facilitate the collection of learner information as learners progress through a SCO. This method should work in all LMSs.
2. SCORM's data model explains storing and retrieving data about learner performance from and to the Learning Management System (LMS). Understanding the types of data that can be communicated via the SCORM data model enables you to discuss with your instructional system designer (ISD) what information you can retrieve from or store in the LMS.
3. We assessed students' independent work by result number of lecture view, participation of the chat,

forum, new posting, and replies of existing postings. Students' scores were increased comparatively with other students who didn't use online learning tools. The research identifies obstacles encountered when using log data. Moodle grading result algorithm was unable to calculate the time of lecture view.

4. All lectures available on the system were prepared by SCORM standard. Also they were prepared power point format and published by Ispring presenter, so it could not be copied. Students can read when they are online. Teachers were released to prepare lesson content using operable software. In this way content could also be protected from illegal usage.
5. Studies examining how teachers spent their time in online tools combining multiple sources of data to understand system log data. For example, we examined the amount of time teachers spent on all learning tools, result of midterm exam by the teachers and these data result can be used to evaluate teachers' work in virtual environment.

Grades can be uploaded from a spreadsheet by both instructors and administrative staff directly to the grade roster. Instructors or departmental administrators can upload grades from a spreadsheet to the grade roster. It is highly recommended that we commit to a grade markup totaling 100% and e-mail total course percentages to be formularized. When creating all the on-line graded assignments that the "out-of marks" allowed in the individual assignment settings can be different from the final percentage weighting of the course. We can get lots of grade result, lesson activity and other. It was very helpful to control the students' learning process.

We found that student's log into learning content result was incorrect. Lesson materials was 68 slides but students just press the button until whole slide displayed on the screen and they get 100 scores.

Students' scores whose use online learning tool like forum, chat, was increasing during the lesson. Collaboration tool was also helpful to evaluate students' knowledge. Teachers evaluated some of students' perception by result of self-test. Fig 1. Evaluation report of the teachers' work

We collected the surveys at the end of the lesson. Students' scores whose use online learning tool like forum, chat, were increasing during the lesson. Because several students had some problems using online learning tool. They had to check their understanding of the lesson after every topic. We consider that if the students use other learning materials like book, printable materials, their self-test; midterm test results will show the learners' knowledge rate. To measure various opportunities and their impact on student learning, researchers must address, at a minimum, four factors: (1) the tools complete availability to users, (2) the degree to which tools are essentially used, (3) how those tools are appropriated or redeveloped by users, and (4) how the use of any tool fits within the overall environment.

V. CONCLUSION

Whereas the overall number of students studying the units examined in this research is large, the sample of different courses involved is narrow. Nevertheless, the log data analysis supports the hypothesis that course activity design in the virtual learning environment has a strong influence on how students interact with the learning management system. Furthermore, it appears that units with more asynchronous learning activities may correspond with greater levels of interaction. This increased access appears to occur not only with the interactive areas of the LMS but across all application areas. Given that others studies confirm links between level of LMS interaction and results, this finding could have important implications for teaching practitioners wishing to design courses that encourage maximum student interaction with the LMS, and thereby contributes to the ongoing debate on online education surrounding synchronous versus asynchronous delivery. This study is specific to one LMS, but underlines the potential for, as well as some of the challenges of using Moodle log data to inform teaching practice. The study may therefore assist e-learning teachers, as well as LMS service providers in terms of ranking the development of more effective log data reporting capabilities.

Further research involving a larger sample of units, as well as using other LMS platforms such as Moodle, might seek to confirm the otherwise tentative findings and patterns discussed in this exploratory study.

Data from LMS, on the other hand, with its inherent capability to collect and report student actions, interactions and testing data, have potential to qualitatively change teaching and learning. Instead of relying on often-fallible intuitions based on an impoverished data stream, future e-learning instructors may well take advantage of what computers are good at—gathering and sorting data—to build representations of online students that are in many ways richer and more accurate than they'd have had in the classroom. At higher levels, administrators and course designers will be able to embed features and dynamic content that encourage a deeper exploration of content. Current research attempting to identify indicators of student attitudes like sense of community brings us closer to such a reality.

Students using advanced collaborative tool have been more successful than those using the standard collaborative tool group. One of the reasons for this is

that advanced collaborative tool offers compile and run utilities.

As a result of this experimental study we can say by confidence that an LMS system with an integrated advanced collaborative tool can improve the success rates of students considerably during the teaching of database management system in a Web-based environment.

The results of the experimental study showed that a Learning Management System can be made more efficient if it is enhanced by an advanced collaborative learning tool. In this article we have used the Moodle.

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