

Evaluating Interactivity of eLearning Resources in A Learning Management System (LMS)- A Case Study of MOODLE, An Open Source Platform

Kuldeep Nagi, Dr. Poonphon Suesawaluk, Dr. Poonsri Vate U-Lan

College of Internet Distance Education
Assumption University, Thailand
knagi@au.edu, poonphon@gmail.com, poonsrivtl@au.edu

Abstract

Interactivity in a virtual learning environment is the art of instigating interactions and facilitating communication between leaning objects (LOs) and learners. In order to investigate the level of usage of various learning objects (LOs) all data must be recorded after a student logs-on to the system. All Learning Management Systems (LMSs), whether open-source or proprietary, provide tools such as “Reports” or similar options to capture the conference data in a eLearning courseware. These tools can be used by instructors and content experts to evaluate learner’s activities and identify online behaviors and interaction patterns in a virtual learning environment. For this preliminary study a purposive sample of two ICT eLearning courses and the data derived from their “Reports” will be used to gauge the level of interactivity. Statistical results provided by these “Reports” can be used for motivating students and building more robust and interactive content for eLearning courseware hosted in a Learning Management System (LMS).

Keywords: Interactivity, Learning Objects (LOs), Learning Management System (LMS), Open-Source, Posts, Views and Reports

1. Introduction: A Learning Management System (LMS)

In the increasing market of eLearning there are many Learning Management Systems (LMSs), some are open source products, others are commercial solutions. Angel, Blackboard, Moodle, Sakai and WebCT, and are few examples of popular Learning Management Systems (LMS) being used by thousands of organizations, businesses and universities worldwide.

MOODLE is one of the license free open-source software platform widely used by the universities. MOODLE is an acronym for Modular Object-Oriented Dynamic Learning Environment. Those involved with eLearning also call it as a Virtual Learning Environment (VLE)). Learning Management System (LMS) are designed to help instructors, educators and content experts and business trainers to create online learning material with opportunities for rich interaction [1]. Its modular design allows the users to design and add their own learning components to enhance eLearning strategies. Development of this open-source software application platform is undertaken by a globally diffused network of commercial and non-commercial users, spearheaded by the company based in Perth, Western Australia. Learning Management System (LMS)'s development has also been assisted by the work of open source programmer community. This has contributed towards its rapid growth, development and adoption worldwide.

A Learning Management System (LMS)'s infrastructure supports many types

of plug-ins such as Activities, Resource types, Question types, Data field types (for the database activity), Graphical themes, Authentication methods, Enrollment methods, Content Filters and Reports. Many third-party solutions are also available for making use of its open infrastructure. All Learning Management Systems (LMSs) 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.

2. Learning Objects (LOs) in a Virtual learning environment (VLE)

Virtual Learning Environments (VLE) are defined as computer-based environments that are relatively open systems, allowing interactions and knowledge sharing with other participants and instructors and provide access to a wide range of resources hosted on the system. The value of a VLE is to fully enable "learning anywhere at any time" by providing an array of resources, opportunities for active participation, mastering content and self learning.

A learning object (LO) in a virtual learning environment is usually defined as any entity, digital or non-digital that may be used for education and learning. It is also called as web-based interactive chunks or parts of eLearning courseware designed to explain a stand-alone learning objective. In an eLearning environment a digitized entity can be used, reused or referenced many times during the learning process [2]. However, there is general consensus that a learning object (LO) should be:

- **reusable**- can be modified and versioned for different courses,
- **accessible**- indexed and retrieved using metadata
- **interoperable/ portable**- operate across different hard/software

- **durable**- remain intact across upgrades of hard/software

As a complement, the learning object (LO) should also have a *measurable* component of information which helps its identification, storage, and recovery through a database. For this research the weekly "Reports" available on the MOODLE, an open source application are identified as a learning object (LO) and data contained in these "Reports" is at the core of this research.

3. Research Method

Interactivity in a Virtual learning environment (VLE) is the art of instigating and facilitating communication between learners and various learning objects (LOs) in an eLearning courseware. In order to investigate the level of interactions all on-line activities after a students log-on are recorded into the Learning Management System (LMS) database [3]. For this study "Reports", a tool available in the menu of MOODLE, is used to collect data for two eLearning courses chosen for this research.

3.1 What are "Reports?"

As mentioned above, one of the main objectives of this research is to describe the use of an automated, static, multi-browser, visualization tool called "Reports", which depicts the pattern of the interaction between the students and various learning objects (LOs) of an eLearning courseware in an asynchronous conference.

Statistics provided by the "Reports" can be used for motivating students and building more robust and interactive content in a courseware. The two main variable of the Report consists of "view" and "post" whose individual properties are described below.

For "views" and "posts", the 'views' means that the data about access to an object doesn't get saved into the database, An example of "view" is that a student logs on to the system and watches an online video for a particular chapter or just views the

power-point slides for a chapter. Whereas all data about the 'posts' means anything new that is created and uploaded does (forum posts, assessment uploads, etc.) get saved in the database. An example of "post" will be that a student submitted or uploaded an assignment or a quiz.

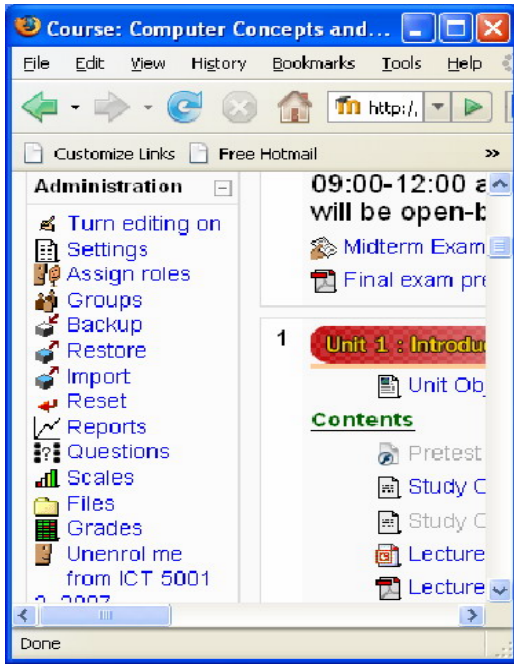


Figure-1 Reports in the LMS Menu

3.2 Accessing Reports

The Learning Management System (LMS) in its menu provides a set of tools to evaluate the progress of an eLearning course. In case of MOODLE, the browser interface as shown in Figure-1 provides a list of tools in its menu given on the left. Clicking on the "Reports" takes the instructor to a menu shown in Figure-2. Clicking "Under the Reports Type" drop-down menu gives the following five options:

- All activity (All roles)
- All activity (views and posts) Students**
- All activity (views and posts) Teacher
- Views (all roles)
- Posts (all roles)

After selecting "All activity (views and posts) Students" an instructor is taken to the

next page where he or she can access all the data about the course.

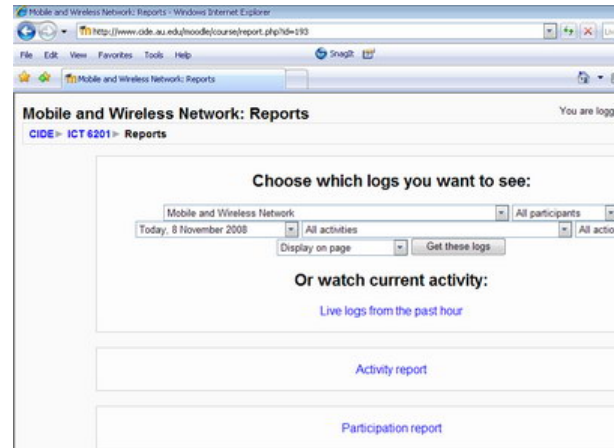


Figure-2 LMS Interface for accessing Reports

For each course the "Reports" provides statistics using three fields- Course, Reports Type and Time Period-last. The drop down menu can be also used to examine "All activity (All roles)" to get a comprehensive picture of interactivity about all activities in an eLearning courseware.

3.3 Courses included in the research

For this preliminary study I used the "Reports" generated for two sample courses to analyze the "views-posts" data to examine the level of interactivity. The details of the purposive sample of two eLearning courses are given in Table-1.

TABLE-1 Views-Posts Ratio

Courses	Views	Posts	Ratio
ICT-6101	1968	284	6.93
ICT-6201	372	72	5.16
Total	2340	356	6.57

Theses two courses included a total of 8 students who used the Learning Management System (LMS) to access the courseware material during the current semester of their study for their Masters Degree in ICT.

For the purposes of this paper the collection of data started on September 6 and ended on November 1, 2008.

3.4 Basic architecture of the Virtual Interaction Mapping System (VIMS)

Figure-3 given below illustrates the basic framework of a Virtual Interaction Mapping System (VIMS) available in almost every Learning Management System (LMS).

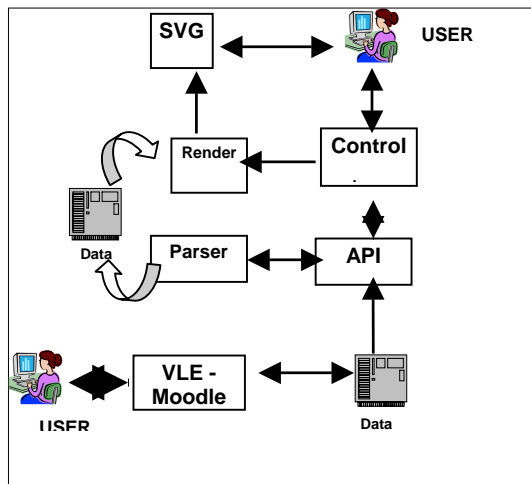


Figure-3 Virtual Interaction Mapping System (VIMS)

A Virtual Interaction Mapping System (VIMS) in a eLearning system is generally composed of four distinct modules: (i) A Control module that handles all web-based user interactions including thread specification, authentication and data management, (ii) a Parser which parses thread and message content and prepares these data for rendering in graphical format, (iii) a Rendering component that uses x-y axis graphical layout as shown in Figure-4 using the built-in algorithms that facilitates deployment within different VLE systems

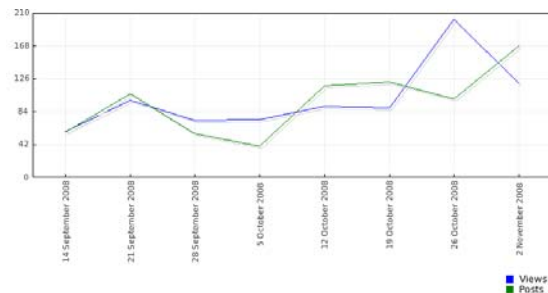


Figure-4 Typical output of a VIMS

(iv) an Application Programming Interface (API) suite that facilitates deployment within different VLE systems.

It is necessary to provide a different API implementation to use VIMS with another VLE [4]. For a Learning Management System (LMS) the open source community of programmer regularly adds new Application Programming Interfaces (APIs) for new functionalities. As shown in Figure-3 both instructor as well as the students can access these “Reports” for examining their activities for each course.

The statistics provided by the “Repots” enables assessment of triangular relationship between learning objects (LOs), online access and interactivity. The details of the participant’s activities are extracted from the database and displayed in graphical format in a browser as shown in Figure-4.

4. Indicators of interactivity in an eLearning courseware

A well designed eLearning courseware should provide ample opportunities for collaborative work, dialogue and study which can increase the flexibility of learning while keeping the participants engaged. The Figure-5 and Figure-6 shown below gives a glimpse of weekly pattern of “view” and “posts” for two ICT course hosted on the Learning Management System (LMS).

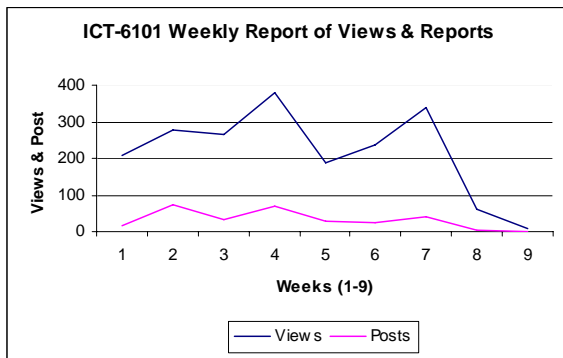


Figure-5 Weekly View & Posts for ICT-6101

Pedagogical studies in eLearning have revealed that a meaningful and effective interaction with learning objects (TO) in a VLE system enhances the learning experiences. During interaction the learner analyses, describes and evaluates the objects and at the same time clarifies and inquires if the content contained in the object is understandable [4].

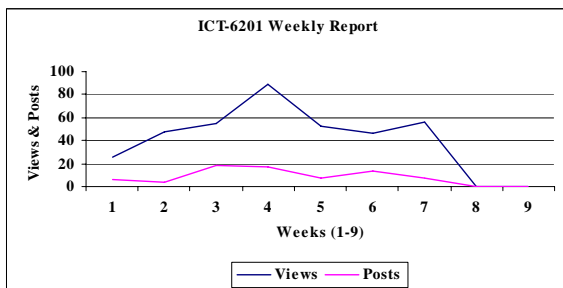


Figure-6 Weekly View & Posts for ICT-6201

The graphical representation of “views” and “posts” as depicted in Figure-7 for eLearning courses can help visualization of the activities in a way to assists the instructor to understand at a glance, several important indicators without any further investigation or research. Such indicators include:

1. Ability to extract information from the Learning Management System (LMS)
2. Frequency of interaction among the students and role played by them in the online discussions through “posts”
3. Development of skills for interaction in a learning environment to engage in higher level thinking

4. Provide students with a tool to measure and evaluate their own engagement and progress in a eLearning course

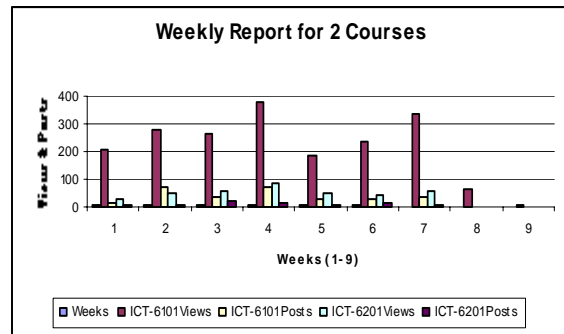


Figure-7 Weekly View & Posts for 2 Courses

4.1 Pearson Product-Moment Correlation for View & Posts

The correlation coefficient is a statistical measure of relationship ranging from -1.00 (a perfect negative relationship) to 0.00 (no relationship) to +1.00 (a perfect positive relationship).

TABLE-2 Correlations of views & posts

Courses	ICT-6101	ICT-6201
Mean For Views	197	37.2
Mean For Posts	28.4	7.2
Correlation	0.855	0.836

The closer the correlation coefficient is to 1 (either positive or negative), the stronger the relationship is. For example, a correlation coefficient of +0.89 will indicates a very strong positive relationship between two variables, “views” and “posts” whereas -0.17 suggests a very weak negative relationship between these two variables. From the data derived from “Reports” correlation between the “views” and “posts” for this study is 0.855 for ICT-6102 and 0.836 for ICT-6201. For both courses the positive correlation is a sufficient proof of interaction between the two activities, “views” and “posts.”

Other researchers have also shown that more knowledge sharing, collaboration and community building occurs in learner-to-learner communication (posts) rather than instructor centered communication [6].

Structuring of the learning objects and the facility of online access to these objects may vary according to the nature of specific disciplines.

5. Conclusions

On the basis of this preliminary study discussed in this paper we can derive the following conclusion:

1. As shown in Table-1 each course differs in terms of total number of “views” and “posts.” This is also supported by weekly data graphed in Figure-5 and Figure-6.
2. The ratio of “views” and “posts” for the two courses slightly varies. The ratio derived from “views” and “posts” are also in a close range.
3. Figure-7 given in the left column depicts the graph of weekly “views” and “posts.” It shows significant weekly fluctuation for the two variables. Further investigation into the reasons for the variance in “views” and “posts” for the two courses can help improve the level of interactivity in an eLearning program.
4. The Pearson correlation as shown in Table-2 for the two courses is 0.855 and 0.836, which is very close. Hence we can derive a conclusion that in ICT-6101 and ICT-6201 the level of interaction between “views” and “posts” has a positive correlation with a courseware. However, the ICT-6201 should be reevaluated in terms of its components, delivery systems and overall student’s participation.

Careful examination of “Reports” in a Learning Management System (LMS) can help create a better eLearning platform that allows students and instructors to interact easily with one another, at any time and in

any place, thus bridging the gap of time and space. More the interaction between learning objects (LOs) and students better is their understanding of eLearning content [7].

In the current version of Learning Management System (LMS) 1.8 released in 2007 the “Reports” tool is very course centric. In other words, each eLearning course has to be examined individually for all the data sets pertaining to all the “views” and “posts” for students as well as instructors. Going forward it may be possible that the new release of Learning Management System (LMS), such as Moodle will have added code to do some sort of ranking of “Reports” for all the eLearning courses hosted on the system, such as Top-10 most participatory or interactive eLearning courses or learning programs based on “views” and “posts” ratios and other relevant indicators.

References

- [1] Wilson, B. G. Constructivist Learning Environments: Case Studies in Instructional Design, *Educational Technology Publications*, Englewood Cliffs. (1996)
- [2] Chou, S and Liu, S. Learning Effectiveness in Web-based Technology-mediated Virtual Learning Environment. *Proceedings of the 38th Hawaii International Conference on System Sciences – 2005*
- [3] Rehak, D. R., Mason, R. Keeping the learning in learning objects, in Littlejohn, A. (Ed.) Reusing online resources: a sustainable approach to e-Learning. Kogan Page, London, 2003. (pp.22-30)
- [4] Jyothi, S., McAvinia, C., and Keating, J. G. An interaction visualization tool for a learning management system. *In Proceedings of the 2007 Conference of the Center For Advanced Studies on Collaborative Research (Richmond Hill, Ontario, Canada, October 22 - 25, 2007).*

*CASCAN '07. ACM, New York, NY, 326-331
(2007)*

[5] Champion, E Meaningful Interaction in Virtual Learning Environments. *In Proceeding Of Second Australian conference on Interactive Entertainment (IE2005), Sydney, November, 2005.*

[6] S. Schrire. Knowledge building in asynchronous discussion groups: going beyond quantitative analysis, *Computers & Education*, vol. 46, Pages: 49 – 70, 2006.

[7] R. Garrote. The use of a Learning Management System to promote group interaction and socialization in a trainee project. *Konfer-enspapper for HSS, 2007*