CASE STUDY: MOODLE Approach to Learning and Content Management System (LCMS)

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Abstract— In this Internet and Smart devices era, unlimited access to online references, learning materials and archives are available. These millennial learners are smart learners. Thus the use of ICT for learning has also taken a leap from classrooms, physical laboratories, Power Point Presentation, Projectors to Smart, Collaborative, Virtual, Visual and 24 x 7 access to Learning. In academic environment, not only learning and evaluation but also reinforced learning is also needed. The learners experience mandates teachers to be creating contents and provide a innovative learning. The Learning and Content Management System (LCMS) not only supports the needs of both the teachers and e-learners community but gives a seamless synchronization between them to enhance the experience of both. In this paper MOODLE, a free and Open Source Software is used as a tool for creating an LCMS for an Engineering course (Computer Architecture). MOODLE's features were exploited to bring in the best of the requirements of Content Creation, Course Scheduling, Course Registration, Creative Learning, Quiz, Assignments, Blogs, Assessments and Analysis. It is found that MOODLE is a rich platform for LCMS and is well suited for academic environment LCMS.

Keywords— LMS, CMS, Moodle, E-learning, Moodle Approach, LCMS, Interactive Learning

I. INTRODUCTION

Content Management System (CMS) supports educators and instructors to create courses, course contents and make them available online. Learning Management Systems supports the features required by both tutor and the learner. For tutors the features are like scheduling of courses, delivery of courses in various modes like video, audio, presentation, textual etc. For the learners LMS offers many learning support features like Course enrolment, listen, visualize, read the course content and evaluation features like assignments, quiz, interaction with peers, tutors etc. Generally in a LMS the tutor and learner are not synchronised. Learning and Content Management System (LCMS) supports features of both CMS and LMS in one platform. Generally any interaction can be via email or on discussion board or in chat rooms. However the term Learning and Content Management System (LCMS) is used to refer the on-line interactions for a variety of courses that takes place between students and teachers. Connolly provides a simpler definition about LMS and LCMS "LMS provides the rules and the LCMS provides the content" [1]. In academic Scenario, course enrolment with teacher, lesson planning and delivery at a pace, periodic assessment and analysis of the registered students are important.

To examine the different aspects of LCMS, an extensive and diversified research was conducted in several schools, grades, subjects and populations by experts. Researchers also adopted and investigated various video-rich learning management systems. The finding was that implementing technology oriented resources in the field of education would improve the student's academic performance and also eases the process of delivering and facilitating course materials. With digital revolution, educationists have decided on the use of smart devices to deliver lessons, to create exercises and activities for students, and even manage an entire class virtually, without the need for tangible objects like a traditional classroom furnished with tables, chairs, and boards. Figure.1. shows the traditional and e-learning environments and their characteristics.
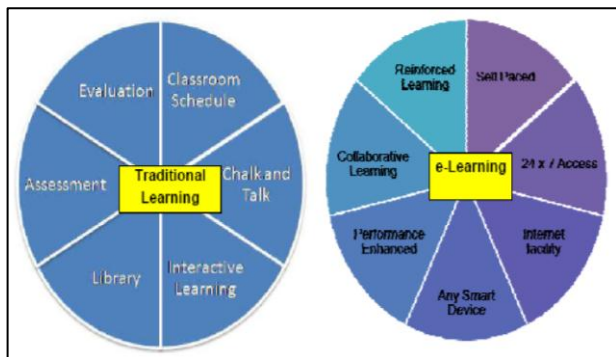
Figure 1. Traditional vs. E-learning

The rest of the paper is organised as follows, Section II presents related work on LCMS and OSS (Open Source Software), Section III details the MOODLE Environment that ernables it to be suitable for LCMS, Section IV specifies the general features required for a LCMS, Section V describes case study on MOODLE for LCMS with various features implementation and results evaluation and Section VI concludes the suitability of MOODLE as LCMS for academic environment.

II. RELATED WORK

E-learning takes a central space on the web where most of the students and faculties can access a set of tools and resources anytime anywhere. E-learning is suitable not only for academic but also for Corporate training, life-long learning. E-learning provides the opportunity for student to interact electronically with each other as well as with their teachers [2]. Faculties and students of the various departments have found this most valuable. Hamish Coates et al have discussed in his paper the possible effects of LMS on teaching practices, student engagement, academic work and also the effect of LMS on the control over academic knowledge [3].

Suman Ninoriya et al have proposed architecture for Learning and Content Management Systems (LCMS) where in CMS and LMS are brought together for e-learning [4]. Dinesh Kumar,C.S. Lamba have explored the features and suitability of Open Source Software for LMS [5].

Use of ICT for e-learning through MOODLE improves effectiveness in Higher Education [6]. V. Nedeva has explored the scenario for Distance education in Bulgaria Technical College – Yambol by implanting MOODLE based courses for subjects like Informatics, Programming languages and Information technology. It is found that such LMS had not only allowed better cooperation among the learners and the tutors but also has improved the accessibility, usability and collaborative learning for learners. Higher motivation among the students and the teachers is achieved [7]. Aman Rai et al has customized

MOODLE to implement a College/University Management System with extended features of Students attendance Moodle card etc [8].

There are many software systems available that provide LMS systems in the category of both commercial and Open Source Software (OSS). Opigno, Forma, OpenOLAT, ILIAS, Eliademy, ATutor, Moodle are few of the most popular LMS software. Moodle has been adopted by many people and organizations around the world because it offers a tightly integrated set of tools said to be designed from a social constructive perspective [9]. Moodle was developed under the General Public License and many of the components were developed without a specific design [10].

Open Source Software is not inferior to commercially off the Shelf Software or Proprietary ones. Kumari summarises that although Open Source software are developed by a community of software developers, the development is also regulated by certain parametric guidance to ensure the usability and protection for Users. These guidelines regulate Quality, Reliability, Security, Support, Stability, Training, Version Control, Cost effectiveness etc. [11].

In today's eco-systems conscious computing scenario, a Cloud based support is important in various aspects. Cloud Computing can enable developing countries product to be part of western world developed countries. Not only this, Cloud Computing is also a factor in cheaper production with high economic value which benefits developing countries [12]. MOODLE is also supported as MOODLE Cloud version.

Thus the choice of MOODLE, Open Source Software for LCMS is justified for LCMS case study for academic environment.

III.   MOODLE ENVIRONMENT

Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. Moodle is license free open-source software for e-learning [13]. Moodle as a Course / Content Management System (CMS) is designed to enhance the productivity of educators in making quality web based courses [14]. CMS is also known as Learning Management System (LMS) or Virtual Learning Environment (VLE). Nag, Adhitya comments that Moodle is the definitive open source learning management system. Like most LMS, MOODLE makes extensive use of the Internet, with features such as discussion forums, chats, journals, automated testing and grading tools, and student tracking [15].

Moodle provides a wonderful platform to manage resources and communication tools that are essential in academic environment. It was created by Martin Dougiamas, a scientist and educator. In the LCMS environment, MOODLE should first be put in on a main server; associated administrator configures the settings for the LCMS chosen

features of the course and also to alter access through user names and passwords. The user accesses Moodle through the Internet from thin or thick client system because it is server or cloud based.
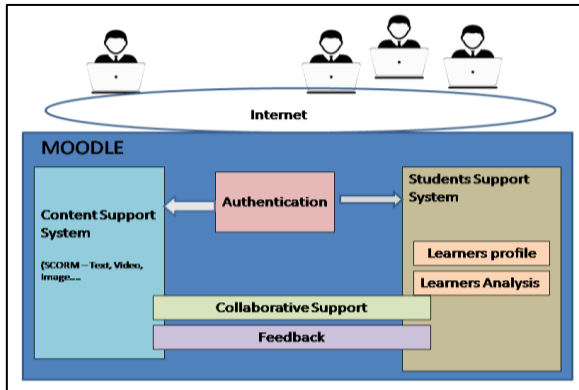

Figure 2. A Descriptive MOODLE Architecture for LCMS

Moodle is written in PHP with associated SQL as database. It is a template-based system using which the content may be added. One of the most recent tools that was accepted and welcomed in academia is Moodle (Wiki, 2013). It is a Learning and Content Management System with features including material content could be (text and video), assignment, and exam sharing among students and instructors. Moodle provides e-learning platform for both instructor-led training and Self-paced courses with support of Virtual Learning Environment (VLE). It supports industry standard learning delivery systems such as SCORM (Shareable Content Object Resource Model), IMS and Lesson. It's open source license and modular design allows content experts to develop additional functionality. MOODLE has features for Student evaluation and assessment using Quiz, Assignment and detailed reports on chosen formats like based on activities, grades, courses and students. In addition it also allows the course instructor to take Feedback and conduct Survey. Forums can also be used to answer commonly asked questions and prevent repeats, to provide a space for informal peer to peer student discussion or even online tutorials. Figure.2. shows the various functional components of MOODLE.

IV.   LCMS FOR ACADEMIC ENVIRONMENT

The features that are important in education environment are the following:

1. *Courseware Management*
Education environment generally deals with Courses. Hence Course Creation, Courseware creation, Courseware Retrieval, Real time content exchange, multimedia provisioning, etc are important feature

requirement [9]. Courseware is the content created by faculty handling the course.

2. *Content Delivery on Multiple Devices*
It is mandated to deliver contents through any of the smart devices and make it viewable in the different screen sizes. This requires appropriate technology.

3. *Course Management*
Listing of course, content handling, enrolment, authentication and easy user interface are all part of this feature.

4. *Interaction between Stackholders*
Communication is required to choose the course, any e-mail or chat with the instructor, admin or co-learners for any kind of clarifications. Interaction among learners in the form of blogs, forums, chats helps in collaborative learning.

5. *Assessment and Analysis*
Periodic assessment is required to reinforce the learning. Subsequently it is important to analyse and give grades too. Reports in various formats like studentwise, coursewise assignment wise etc required.

V.   MOODLE MODEL - CASE STUDY

a. *Courseware Management*
The teacher creates content in various multimedia form for both learning and assessment. These contents could be in Text, Images, Video, Audio and Links to other repositories, Questionnaire for evaluation in various forms etc. Such created Contents will have to be uploaded into LMS in small units or topics. MOODLE supports SCORM which is a technical standard for LMS Contents sharing.

b. *Course Management*
Listing, Scheduling, Bulletin Board, Navigation Menu, Calendar are essential features in Course Management Coursewares created by teachers are part of Courses and the learning contents. Such available courses will have to be listed and be made available to learners and students. This is called Listing of the Courses. The teacher can schedule the courses / Module start period in a calendar. Further in academic environment, the courses will have to be grouped by department or discipline for easy search by learner. Figure.3. shows Listing of two Courses namely Computer Architecture and Data Structures. In the same screen other features as news Bulletin segment, Calender Segment, and Navigation Tabs are available. A brief description about the Course is also mentioned to inform the learner about the structure and flow of the course.
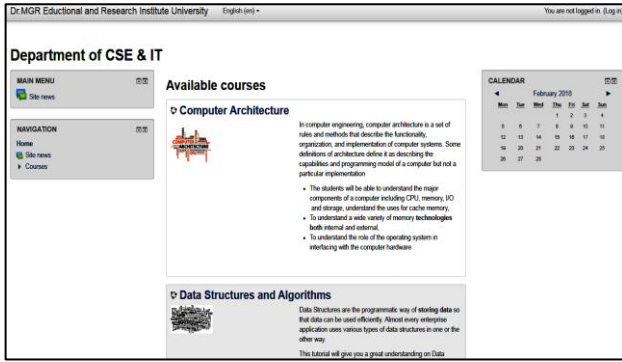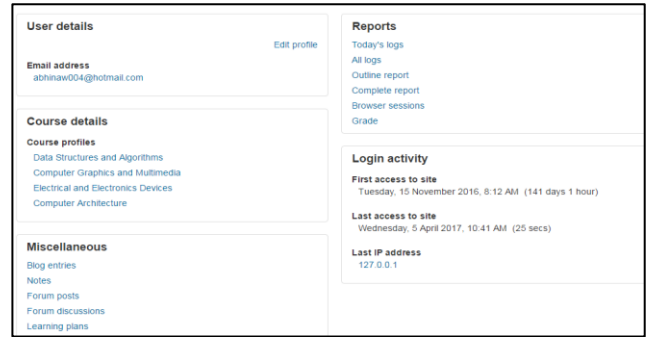
Figure 3. Listing of Courses

Every academic Course may consist of large number of topics and delivered in learnable or deliverable quantum. Hence under each course, topicwise listing can be done along with Schedule. Once a topic is selected, the corresponding Multimedia content is visible. Figure.4. shows sample listing of topics by time frame, and the corresponding Course Content in the same screen. Also this listing gives complete idea of the schedule of the course and time required for comfortable learning.
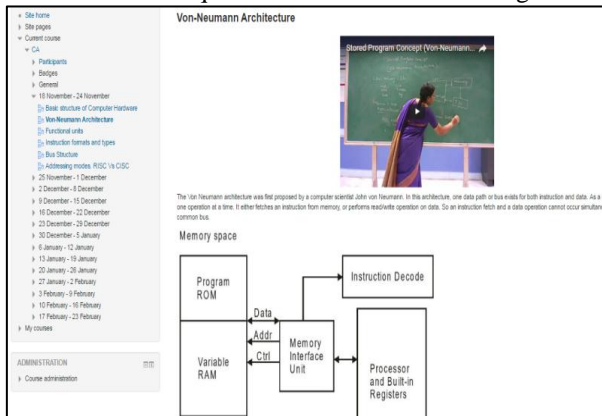
Figure 4. Course Material listing topic wise and the content

Next feature of the Course Management is Course Enrolment and easy user Interface. We can view, change or enrol new users. The process of creating user accounts is called Authentication. After creating user accounts, users can enrol for the listed courses. When users join a course, the process is called Enrolment. Normally only the administrator is allowed to add users to a site. Figure.5. shows the screen details of a user who has logged in. One can have features like edit user Profile, Courses registered for, Details of Login activity including the last accessed from IP, provision for other interaction and reports on activity / performance.

Figure 5. User Interface Screenshot

c. *Interaction between Student and Faculty*

1) Chat

The proposed system is installed with free web-based chat. Most of the students are already familiar with chat and can generate ideas which may not arise during a classroom discussion.

2) E-mail

In this option, ability to send conversation as e-mail, save chat history, smiley (emoticons), able to chat even while user is browsing different pages and option for username or nickname are available. Figure.6. is screenshot of Student – Admin chat.
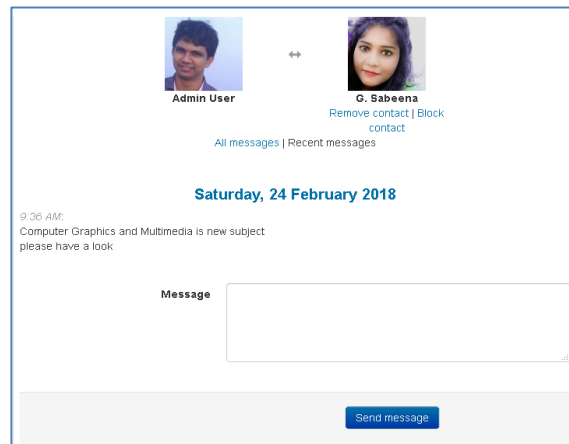

Figure 6. Student and Admin chats

d. *Assessment, Evaluation and Analysis*

Assessment is the process to identify the learning that has happened while evaluation is the quantification of the learning that has happened. Students are assessed with simple exams of Multiple choice or True/False type questionnaire by the teacher. Figure.7. is screenshot of an instance of assessment. Evaluation is in built and the results are not only conveyed but also recorded in the database. From database various reports studentwise, coursewise, modulewise, courses registered etc can be obtained as in Figure.9.

1).Questionnaire

By using the Questionnaire module in Moodle, educator can create a survey or questionnaire for students. For example, a course evaluation or a reading response survey may be created. You may choose whether or not the responses are anonymous. Figure.7. is a sample web page of Questionnaire.

Romero et al have demonstrated the use of data mining of the learners data in e-learning environment and suggested to incorporate this feature with MOODLE [16]. Mining such a data is very useful in academic environment to track the students and progress of course with reference to both the teacher and the learner. Hence we have tried to incorporate a very informative assessment and evaluation as in Figure.9.a, Figure 9.b.and Figure 9.c..
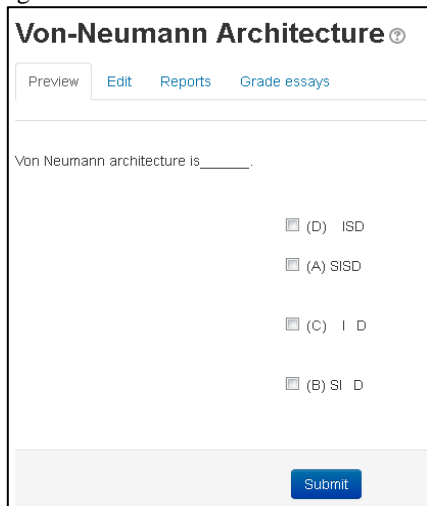
Figure 7. Assessments - MCQ for Students

Grades are scores given to students in a Moodle course. The Grades link (or grade book) in the Course administration menu shows the grade scored for each activity by the chosen student. Score is calculated based on the performance in the assessment exam as per the set evaluation criteria. These scoring and evaluation criteria is the privilege given only to teachers. The grade format will be in the form of A, A-, B+, B, B-, C+, C, C-, D+, D, D- are given. Grade F indicates Fail. Minimum score to get grade is set to 60%. Grades are awarded for each assessment based on the marks scored. Score to Grade conversion is shown in Figure.8.

Figure 8. Marks Range for the Grades

A teacher can view the class performance i.e. performance of all students topic wise for the course as in Figure.9.a. Also the teacher can view any individual candidate's learning and assessment. Figure.9.b. shows the report of student Sabeena as seen by the teacher. Thus the teacher will be able to see the progress of learning and assessment of learning. A student can also get his status of learning and assessment. A sample report is given in Figure.9.c.

Assessment can also be done as opinion survey on the content and delivery of the course to take feedback.

2). Grade Result Summary

Figure 9.a. All students topic wise performance report

Figure 9.b. Performance report of student after completion

Figure 9.c. Student view of status report of learning and assessment

e. *Other features and tools*

Course calendar **-** use this to flag important events to everyone on your course.

Profiles and contact information **-** help students and staff to

get to know each other at the start of the course, also hold information about course team and students in one place.

Video **-** many Educational institute find it easy to record lectures as podcasts or even arrange for videos of lectures or special events– posting these online and making it available to students is straight forward with Moodle

Group tools for students – In Moodle there are many tools that students can use for collaboration with each other e.g. forums, wiki and chat are most of them.

VI. CONCLUSION

A case study to create and offer a course based on LCMS with Moodle as a platform was experimented at Dr.MGR Educational and Research Institute University. Two sample courses on Computer Architecture and Data Structures were developed using MOODLE environment. The LCMS course could establish features for planning, design, delivery, Student Registration, Student Monitoring and also evaluate Student performance. Course Contents earlier created were able to be integrated with MOODLE platform and offered as part of course. It is a seamless integration of Courseware management and Course Management. Personalised secured login is an established feature in this environment. Flexible reports of evaluation and progress is added feature. The proposal to establish a LCMS environment using Open Source LMS tool with all the necessary features proved feasible and useful. MOODLE LCMS would facilitate both faculty and student a better teaching learning environment. A scalable design of LCMS would certainly help achieve this.

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