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Implantation of an Open Source Moodle Platform across an Educational Institution

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Abstract: E-learning includes the use of open source and commercial tools and technologies to enhance teaching learning process, which have become familiar to students and faculty across the globe over the past decade. An online Learning Management System (LMS) provides basic tools to share course materials and other education related plug-in to communicate with students and, faculty for collecting assignments and manage grading method using open source platforms. This article describes the use and full deployment of Moodle, an open source e-learning LMS developed by Galgotias University which is one of the renowned educational institution in north India, into its teaching learning process for its 20000+ users which includes students and faculty. In this research paper we have discussedabout the use of monitoring tools used by the management and higher authorities, use of automated assessment and learning tools for students belonging to engineering and non-engineering domains, management of courses and enrolling users to the courses. The assessment analysis consists of moodle functionalities based on adhoc SQL queries, reports and statistical analysis of moodle activities performed by users of Galgotias University. The result displays the positive engagement of students and faculties on moodle, use of moodle for assessment of students using Virtual Programming Lab (VPL), Quiz, Project Based Learning (PBL), Simulations, Assignments based on rubrics, virtual classes, feedback and surveys.

Keywords: LMS, E-learning, Moodle, Survey, Assessment

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1. Motivation

According to recent studies it has been observed that the students that have been enrolled for online courses or e-learning courses surpass the students that are studying using the traditional methods. An example of this can be seen in the Galgotias University (GU) in Uttar Pradesh, India, where lot of improvements in results and student involvement has been seen as a result of introducing e-learning technique. Therefore, it is important to create an education system that is capable of quick adaption to its social, technological, cultural and political environment [1]. Although adding technology in the learning process may not always guaranteemotivated students, in fact it has been observed that providing online instructions has made the relationship among the student and teacher less personal. Teacher has to convert the classroom into an online environment. But the teacher should know how to motivate or what is required to motivate the student in the online environment. [2]

It's very important for the teacher to understand the motivation of their students. The students start the online courses with an intention to complete the course successfully and learn the content, but they tend to fail because of a number of reasons. Whether, the online instruction succeeds or fails is completely dependent on the motivation of the student. So, the teacher can do the following things to stimulate the students: [3]

a. The teacher should make the online learning easy for them by explaining them how that online learning can be used.

b. The teacher should encourage the students to interact and collaborate among themselves.

c. The teacher should make groups among the students so that the student doesn't have to study in isolation and he gets motivated by the peer members.

d. The teacher can help the students to make friends in the online environment by meeting with the fellow students.

e. The teacher should keep supplying the student feedback and interact with them by monitoring their online presence.

f. The teacher should facilitate the students' to properly interact with the online material by telling them the goal and use of each task.

g. The teacher should be aware of the students' potential, worries, fears, nervousness etc. as these factors can put a negative impact on their accessibility.

The above guidelines if followed can help the teachers make strategic and effective teaching plans increase the motivation of the students.

According to the researcher Wlodkowski the learning by learner is more using online instructions as compared to the traditional teaching methods[4]. The possible reason for this seems to be the increased participation level of the learner due to interactivity in online learning which results in hike in the cognitive engagement and motivation to complete the task.

Some other studies have also shown that the success of online learning method in higher studies is totally dependent on the effectiveness of delivery of the content. So, to adopt e-learning it is necessary to train the staff which is a major challenge as it has been observed that many faculties are very reluctant to adopting the e-learning technology in teaching process. And as a result the teachers who are not well trained face difficulties in using the application [5].But, in order to attain success in e-learning the teachers in the higher education institutes should adopt and implement the technological advancements of online learning. These new advancements are necessary in order to maintain the quality of education [6].So, training should be provided to the teacher and that training should primarily focus on the how to become adaptable with formal and less formal techniques and methods of online teaching [7], rather than focussing on how to use online learning or e-learning [4].

While preparing the course material the instructor uses various educational strategies so that the material can suit the learning styles of all the students as different students have different learning styles. In the same way the lecturers can also make use of the different educational strategies while designing the course material for assessment [8]:

a. The lecturer should explain the students the usefulness of the task to students and if the task should be linked to practices so that the students can use it in their professional life.

b. The lecturer should define the actual objective behind learning the task so the performance standards of the students can be identified which are required to meet the desired goal.

c. Information regarding the average time required to complete the activity should be clearly given.

d. Some preliminary exercises should be provided to the students which will boost their confidence and build motivation among them.

The strategies mentioned above should help the students to understand the goals of the online exercise which will increase their motivation towards online learning.

After the course completion comes the assessment. The methods used for assessment can be formative which is done throughout the duration of the course or it may be summative which is done at the end of the

course. But, summative assessment is considered as more appropriate as it is done at the end of the course. The continuous assessment of the students' performance is apparent in the form the tasks like home assignments, discussions and tests but in many classroom tasks learning is a runaway and can be achieved at great cost and great inconvenience [9]. But, the same can be converted into a simple and achievable task by using e-leaning tools and applying interactive approach for the assessment process.LMS has become a major tool in online learning. Most of the universities have started using moodle [10]. To enhance the efficiency of LMS system we look for tools or plug-ins. Moodle is a free online LMS. It enables educators to create their own private website filled with dynamic courses that extend learning anytime anywhere. Moodle can be installed for free or help of moodle partner can be taken to design the site. In moodle, hundreds of courses can be created, on which contents, gradable assignments, quizzes can be uploaded. It also has collaborative activities like Chat, Wiki, Forms, Survey etc. to make online education scalable effective and fun. As it is truly open source, it can be added with a large number of plug-ins to create new features. The moodle platform is robust as it has grown around ten years. Today a large number of universities, corporations and schools in around 232 countries and 100 languages [11] trust moodle for their online learning means. It provides powerful free tools that help educators to educate the world.

2. Introduction

2.1. E-Learning

E-learning,also known as web-based learning oronline learning, is one of the trending learning methodologies adopted by various universities and colleges around the globe that utilize electronic technologies to access the educational system in addition to the traditional classrooms. Facts have shown that increase in its use is directly proportional to the number of students. That is the reason educators are putting more efforts on content that has multimedia content as it affects the learning process significantly. The effect of blogs and Wikipedia was also found to be positive in learning process. There are many problems faced by the universities which can be solved using the new technologies. In early times, people were concerned about carrying computers in the classroom, as they thought computers would reduce the human.

According to [12], e-learning can be defined as "the learning with the help of internet or intranet". After an year a more generalized definition of e-learning given by [13] was "e-learning is anything that is delivered electronically for the purpose of learning" [14][15]. But according to [16] the alphabet "e" in e-learning should stand for everywhere, evolving, enhancing rather than electronic.E-learning is the new mode of learning in institutions for higher education based on computer and network technologies. The use of e-learning has enabled universities to expand the areas of knowledge both nationally and internationally. E-learning uses multimedia and internet technology to enhance the quality of learning by making use of resources and services, as well as remote exchange and collaboration [17].

The use of e-learning is increasing as the increase of other tools and technology. But more focus is given towards advancing the technology instead of understanding the patterns and learning styles of learners. Online learning has gained rapid progress in the 21st century because of the increased use of internet, and this progress has led to a positive change in higher education [18]. According to [19] there has been increase of around 12-14 % per year in enrolment of online course by higher education students over a fiveyear period that is 2004-2009.This has found so much growth in comparison to traditional methods because of several factors like it gives students the freedom that they can access the education from anywhere and at any time and also there is option of part time or full time [20]. E-learning has made information and data sharing relatively easy for students.

2.2. Types of E-learning

E-learning is categorized into following types:

- Synchronous learning
- Asynchronous learning
- Blended Learning

The first one that is the synchronous learning means "both instructor and learner at the same time", it includes real time interaction of instructor with the participants with the help of internet. It is like a virtual classroom which is similar to a classroom but online. Participants can interact with each other or with the instructor in live sessions by chat, audio and video

options, other than this the session can be recorded and can be played back later. It has various benefits like the learner can login and track their activities and progress, there is a possibility of continuous monitoring, correcting and global connectivity and collaboration activities among learners and each learner can personalize the training.

The second one is asynchronous learning; in this type of learningthere is no need of instructor and learner to be present at the same time. This gives learners the flexibility to learn at their own pace and there is no live interaction between the learner and the instructor. It is also called as web based training. In this information is accessible according to self-suitability and can be accessed 24×7. So, the main advantage of this is the learners can get the information whenever they need. Although the learners do not have live interaction with the instructor or fellow learners but they can communicate with themwith the help of discussion forums. This type of learning includes the CBTs that is computer based training or WBTs that is web based training or through carefully written write ups and articles. The advantages of asynchronous learning is they are always available for instant learning or reference, the learners do have the flexibility to access the information anywhere or anytime, it has the ability to reach to unlimited number of people at the same time, the production cost expenses are only one timeand the content provided is uniform for everybody.

One more type of learning that is the blended learning has also emerged recently. It is a blend of both synchronous and asynchronous learning. It includes first giving online learning and then study material is given for further revision of the learners. These days blended learning is the most used learning type[21].

2.3. Save time and cost effective

A person who is working and cannot manage time for attending traditional classroom can save time by opting e-learning.It provides him/her the flexibility to access the course anywhere and anytime which saves the time of the learner. It is also a cost effective in terms of not buying and carrying printed materials as all materials are available online that can be accessed everywhere. There are no parking problems or expenses, transportation fees, athletic fees, housing and food service fees.

2.4. Learning 24X7 and Fast delivery

By use of e-learning you can learn anything online and can access the learning material any time or anywhere. The major advantage of e-learning is that it has quick delivery of materials than that of traditional classroom. In the research by [22] e-learning reduces the learning time by 25 to 60 percent when compared to traditional learning. Learner can manage their own speed, rather than speed of the group.

2.5. Course Tracking

By use of e-learning tracking the course becomes very easy, which helps both the learner and the instructor. For tracking and monitoring process of staff and learners, LMS can be used. This is more essential for tracking performance of learner and staff for the courses they are enrolled in.

2.6. Environmental Impact

E-learning has a significant impact on the learners but along with that it has significant impact on environment also. Some of the impacts are mentioned below:

- Eliminates the travels and accommodation costs related with undertaking a course.
- Decreases the requirement for a University campus site and the going with expenses of keeping up the office and hardware.
- Reduce the requirement for paper, in this way sparing trees.

3. E-learning Platforms

There are many e-learning tools to describe educational computer applications, such as

- Learning Management System(LMS)
- Course Management System(CMS)
- Virtual Learning System(VLS)

By use of these systems learner can access course contents in text, images, videos and simulation modes. As per [23] the learner can interact with teachers and mates using message boards, forums, chats, video

conferences and various communication tools.In technical perspective, there are various different types of LMS, in which some are having commercial solutions such as Blackboard/WebCT and open source LMS (moodle).As discussed by [24] Modular Object Oriented Dynamic Learning Environment (Moodle) is one of the mostly used LMS platform across the global because of open source and easy to use.

3.1. LMS Moodle

Moodle is an open-source learning management system or course management system which is built using PHP, developed on pedagogical principles. Using Moodle, the teacher can create and design courses and enroll only those students who are enrolled to the course. Moodle allows users to exchange information using both synchronous (chats) and asynchronous (forums) mechanism using chat, bigblue button, feedback, forum etc. Management of Resource materials can be done using files, folders, pages, posters, urls, videos, books and IMS contents. Moodle has the assessment process using Quizzes, Assignments, Virtual Programming Labs (VPL), Surveys discussed by [24][25] etc. It supports 10-20 concurrent users per 1GB of RAM by which many students can take parallel assessment test. Moodle also have report generation system which tracks all the logs of users, Activity usage, statically analysis of course etc.

4. Methodology

4.1. Virtual Programming Lab for Moodle

Virtual Programming Lab(VPL) is an online programming plug-in for moodle which is based on test cases. In VPL all the programming languages such as python, c, c++, java and web based languages, ruby, python, matlab etc. can be performed.

- VPL enables programmer to edit the programs source code in the browser.
- Students can run interactively VPL programs in the browser.
- Students and teachers can run tests to run and evaluate the programs based on test cases.
- Allows searching for similarity between files.
- Allows setting editing restrictions and avoiding external text pasting.

In Galgotias University (GU) all the faculty members who are teaching programming course have to take the course using VPL in moodle. Faculty members have to create programs along with the test cases so that the student program submissions can be evaluated automatically based on test cases.

4.2. Project Based Learning

Project based Learning (PBL) in moodle is one of the innovative and systematic method of online pedagogy which promotes student engagement through rubric based assignments. Faculty members of GU conduct PBL for their courses through LMS and set rubricbased assignments for evaluating the projects. Students were asked to submit their projects in 3 forms such as file upload, online video and online content writing. Then the instructors have to evaluate the project based on the rubrics which is set by them before submission of the work. LMS provide workflow status in PBL i.e when students submit their work; instructors can set a status of the project evaluation.

4.3. Online quiz for internal assessments and labs

Moodle provides an online quiz activity that enables the instructors to create quizzes containing various types of questions which includes multiple choice questions, matching, algebraic and programming type as code runner and various other formats. Instructors can allow the quiz to be attempted as many times as required, with many options such as random question, shuffling of questions and options from a question bank. Restriction and security on the quiz can be done by applying password, time limit and using safe exam browser for conduction exam without any content references. Quizzes are automatically evaluated and grades and points are recorded in the grade book that can be later extracted from the LMS.

University uses quiz modules for following:

- Internal assessment of course using 2 set of quizzes throughout semester.
- Quiz module also used for mock campus placement activity.
- Lab viva voce using quiz module.

- For self-assessment.
- Technical Training and Lifelong learning courses

4.4. Feedback using Surveys and Questionnaires

The feedback at GU is conducted using feedback and questionnaires module that enable a management to create custom survey for collecting a feedback from students based on teaching learning and facility using number of question types using input text, yes/no, true false etc.

Feedback responses are anonymous and results are restricted to management only for performance analysis of faculty.

Feedback activities used for

- Course evaluations, helping improve the content for later participants
- To enable participants to sign up for course modules, events etc.
- Guest surveys of course choices, school policies etc.
- Anti-bullying surveys in which students can report incidents anonymously

4.5. Analytics, Reports and Ad-hoc Queries

Moodle platform provides reports for all the activities and logs done in moodle these are the predefined set of configured reports which is available in both site wise and course wise. The moodle reports consist of live logs, logs, activity reports, course overview, course size, learning reports etc. At GU a special reports are also generated with the help of configurable reports using Ad-hoc database queries to monitor usage reports of individual faculty. Consolidated report which incorporates number of activites such as VPL, Quiz, Assignments, number of materials uploaded by faculty members or not can be configured. Using adhoc queries faculty lms usage reports, student performance reports, department wise usage can also be tracked.

- Events Monitoring
- Overview Statistics.
- Site-Wide Reports
- Engagement Analytics
- Logs
- Forum Graph
- Analytics (Piwik& Google)

4.6 Certificate Generation

Online certificates or e-certificates can be generated in moodleon the basis of some predefined conditions set by the instructor. It can be useful for the students for as it guarantees the successful completion of the course and student will get the e-certificate when they complete the course.

4.7 Attendance and Attendance Register

The moodle has an attendance activity module that enables the instructor to take the attendance of the students during the class and the students can view their attendance record on the same module. The instructor has to create different sessions according to the number of classes and can mark the status of the student against their names. Some default statuses are present in moodle like “Present”, “Absent”, “Late” or “Excused”, but other than these the instructor can modify the status according to needs. To track the marked attendances reports can be generated for the entire class or for an individual student.

There is one more module that is Attendance Register which calculates the time each user spends working in each activity of the online course. It also gives learner the option to record offline activities. The access activity of the learner can be tracked in a single course, in all the courses under same category or in all the courses that are meta linked to the course the learner is enrolled in. Moodle records the log entries of user by which the online work session of an individual user can be calculated. Once the user logs out, the new sessions are added with some delay.

4.8 BigBlueButtonBNand RecordingsBN

This module provides real time online classroom, it can be used in distance education programs as it provides open source web conferencing. To use this module the instructor has to provide the title of the session, description about the session which is

optional, calendar entry which will give the range of date and time to attend the session, create the groups if any and the other details about the session.

The sessions can also be recorded for viewing later. For recording the sessions a Recording resource needs to be added in the course.

4.9 Chat

The chat module available in moodle allows the user to carry out synchronous discussions in real time. This activity may be a onetime activity or can be repeated at the same time may on each day or each week. Moodle saves the chat sessions so that they can be made available to everyone if required or restrictions can also be put on the users to view the chat session logs.

When the groups are not able to meet face to face then chatting can be helpful as learners canshare their experiences with their group membersin the same course but at different locations. A question answer session can be arranged for students by invited speaker. Special sessions can also be arranged for the students for their test preparations and provide important questions.

4.10 Checklist

Moodle has a module named as checklist. This module allows the instructor to create and keep track of learner activities using checklist, it is a task list for the learner.

4.11 Choice

This module enables the instructor to give a question to the students and gives a list of responses to the learners, and the learners are asked to select one from the given choices. This may be helpful when the instructor wants to take students poll about thinking regarding any particular topic or activity, to test students understanding regarding a particular activity, to check students' decision making, students can vote their choice simultaneously.

4.12 Congrea

Congrea activity in moodle is used for real time or live online learning. It provides the feature of synchronous learning which means both the instructor and the learner can interact with each other and are logged into virtual learning environment. Along with synchronous experience the activity it gives the options like chat and whiteboard for learners which give the asynchronous experience. So, this tool gives the learner the advantages of both synchronous and asynchronous learning methods.

4.13 Database

It is the database of the course. This module helps the learners in creating, maintaining and searching any record or entry. The instructor has to design the structure of all the entries as a number of fields. Field types include options like radio buttons, text area, URL, picture, file upload, checkbox, photo and file upload etc.

There are various database templates available in moodle for controlling look and feel of information while editing, listing and viewing the entries in database. The activities of database can also be shared among various courses called as presets also the instructor has the authority of importing and exporting the database entries. Database activity has the option of auto linking, if that filter is enabled, any entry or field in the database will be linked automatically to the location wherever such words or phrases are found in the course. The teacher or instructor can also enable the option to comment on the database entries. Also the instructor can give the option to rate the entries like peer evaluation or the instructor himself can also rate the entries. And finally the ratings can be combined and final grade can be computed on the basis of the ratings which get recorded and can be extracted from the grade book. There can be various uses of activities.They are the collaborative group or collection of the links, journals references, book reviews, books etc. They are also helpful in displaying the materials prepared by students or learners like posters, poems, peer reviews, websites etc.

4.14 Dataform

This module allows the instructor to create or design customized content based on various input elements like text, images, files, URLs, numbers etc. The instructor can create or design number of activitiesand the participants have to submit their content and they can also view the submitted content.

4.15 External Tool

This being the most interesting activity gives

learners the flexibility to interact with the learning resources available on the other websites. Different publishers can reach the learners by providing their e-learning material with the help of this tool. In Galgotias University the external tool used by students is by Mc Graw Hill. The e-books of McGraw Hill are integrated inside the courses which students can read and get benefitted from.

For creating and using the external lab activity, some tool provider is required that can support Learning Tools Interoperability (LTI). The instructor himself can create an external activity or can make use of the tools that are already configured the moodle administrator or site administrator.

The external tool activities are very much different from Uniform Resource Locator (URL) in the following ways:

- The external tool module has the access to the personal information like name, course, and institution etc. of the learner who accessed the course that is they are context aware but in case of URL it is not mandatory.
- It takes part in the overall grading for the course, as it supports reading, updating and deleting grades associated with the activity instance.
- External tool provides secure communication between the site and the tool provider.

4.16 Forum, Moodlerooms Forum

This module is a type of asynchronous learning tool. On this tool learners can have discussions for extended period of time. There are different types of forums such as standard forum where anyone among the course users can start the discussion at any time, restricted forum where the number of posts by the students are restricted each student can post only one discussion, question answer forum where the students have to first post their questions then only they can view other students posts. If the learner wants he can enable the option of attaching posts in forum posts. The forum post displays the attached images.Moodlerooms forum activity also provides a forum for asynchronous discussions by the students.

The learners have to first subscribe to any forum than only they can get the notifications for the new forum posts. The subscription mode is also decided by the instructor. There are three options for subscription mode i.e. optional, auto or forced and block, the instructor can choose any. Also it has option of blocking students from posting more than one discussion at the same time period this will prevent the dominance in discussion.

Forum can also be rated by the instructor or students can also rate for peer evaluation and the rating can be aggregated to calculate the final grade which can be further extracted from the grade book of the course.Following are the uses of forum:

- It helps students to know about each other by providing them social space online.
- It can be used for making announcements in the course by making use of news forum which has forced subscription.
- For discussing about course content or e-learning materials
- A hidden forum for teacher only discussions.
- A help forum where anyone can give advice.
- A private forum for one to one communication between the student and the instructor.
- It can also be used for extension activities like brain teasers for students to think and give solutions.

4.17 Games

This activity is used to gamify the course contents. To make the course more interactive game activity can be added to the course. Students will get a new technique of learning, remembering and revising the concepts. As students are more interested in games there are more chances that students will complete the activity before the other activities and with lots of curiosity and interest. In Galgotias University we have integrated various games like Crossword, Sodoku, Cryptex, Hangman etc in various courses to make them more interactive for the students.

All the mentioned games are available as a pre-defined game plug-in that are automated tools operated on the content uploaded. Plug-in installation is a hassle free operation if we are using version 3 and above. Under site administration in plug-in link we

can install the zip package downloaded from the external source.

4.18 Glossary

This activity is like dictionary. In this module important information or resource of the course like definitions, keywords can be written, collected, organised and maintained.

It can be attached to other activities like games. If the game needs work and definitions it can take directly from glossary as it provides list of words with their definition. To attach images in the glossary, the instructor can allow files to be attached in the glossary and the images in the files attached will be directly displayed in the glossary. The searching in glossary is also very easy. Searching can be made in alphabetical order, author, date or category. Entries made in the glossary should be approved by the instructor before making them publicly visible or if the instructor makes default setting then entries can be uploaded without instructor's permission also.

It has auto linking filter also if this filter is enabled than wherever the concept, phrases or courses appear in the course the entries will be automatically linked to them.The entries made can be graded, commented or rated by the instructor or the students for peer evaluation. The marks can be added and aggregated in the total marks of the course if the instructor wants. The marks or grades will be displayed in the grade book.

4.19 Group Choice

This module is for students only. In this they can enrol them in any group among the course. The teacher decides from which group they can choose from and the size of the group. This helps in group tasks of within the course.

4.20 Hot Question

This module is for rating the questions. Students can rate the questions which are not clear to them and they want the teacher to talk about. So that the teacher can know the topics which students are expecting.

4.21 HotPot

This module is helpful in distributing interactive learning materials and exercises among the students. It can handle the activities or material created from the software like i-Spring, Hot Potatoes, Xerte, Qedoc or any HTML editor. In a HotPot activity there is an entry page, an e-learning exercise and an exit page. The entry and exit pages are optional and the e-learning web page can be static or interactiveweb page that may have text, video, audio, recordings or visual prompts and it should also be able to record the response of students, and these exercises should be first created using authoring softwareby the teacher and then uploaded on moodle. This makes the course more interactive for students.

4.22 H5P Interactive Module

This activity module enables instructor to create modules like videos, Drag & drop components, Question sets, presentations, multiple choice questions and many more. It is basically an authoring tool for creating opulent content and along with that it also helps in importing and exporting H5P file for using the content efficiently for reusing and sharing. The interactions among users can be traced by making use of tools like xAPI and can be extracted with the help of grade book. H5P content can be created using the already available tools for authoring or by can also be outsourced from other sites that are H5P enabled.

4.23 Lesson

This activity helps to make the content to read in the form of a lesson. It provides the functionality and gives the connectivity among the content. As in a chapter we have all connected content and finishing the former content is required to understand the later one, same way in lesson module also the instructor can apply the restrictions like the next content will come only when the current content is completed. For checking the understanding of the student the instructor can give questions after current module and if the student is able to answer the questions then only he should be allowed to the next content. It makes the content more flexible by creating a linear sequence of content pages or activities.

This module is helpful for learning any new topic by the student themselves, for activities involving simulations or decision making tasks, for revision purpose.

4.24 Listening Landscape

This activity helps in designing exercises for

students which needs to watched or listened. In this subtitles can also be provided to fill the text gap which is required to be filled by the students.

4. 25 OpenMeetings

This activity helps in video conferencing. It is free web based software that helps in setting up a conference on the browser quickly. For this the microphone of the system, the webcam can also be used. Using this screen of the system can be shared, meetings can be recorded, and documents can be shared using whiteboard.

4.26 Podcast

This activity enables the students to make a podcast and allows them to publish episodes. The episodes may consist of audio or video files. Episodes shared can be searched alphabetically, by author name, by date or by category. The episodes uploaded by students needs to be agreed upon by the teacher or the teacher can also give them the permission to directly upload. Comments and ratings can also be allowed on the episodes which can be added within the final course grades of the student.

4.27 Quizventure

This activity allows the students to learn while playing. This is basically designed for learning rather than accessing the students. In this the questions from the course are loaded as quiz and the options will come from space ships the students have to shoot the spaceship having correct option. Students can have infinite attempts giving them feedback everytime.

5. Implementing Outcome Based Education using Moodle

It is remunerable to implement Continuous Quality Control (CQC) in education but is very difficult for academic decision makers to implement the same. To address CQC, there are various methods but Outcome based Education (OBE) is universally accepted. OBE is an enlightening way of learning and teaching methods to achieve the set of predefined outcomes. The success of a course is measured by the assessment of the COs (CO). National Board of Accreditation (NBA) or other specialized accreditation bodies consider the CO assessment for measuring the educational effectiveness. This assessment or analytics is important for all the organs of an institution may it be student, teacher or parent. Different learning management System (LMS) platforms provide many useful learning analytics programs. They are used to track and extract reports on student's performance on different activities. But, there is no integrated learning analytics method that could combine both, that is accessing the COs and tracking the performance of students for the corresponding outcomes. LMS Moodle can be used to access the COfor developing a learning analytics tool.

5.1 Outcome Based Education

Outcome is the net result or end result that is expected from students to demonstrate at the end of the learning. They cannot be measured on the basis of belief system, attitude or mental state of the learner but actually outcomes are what the learner will be able to do after gaining the knowledge of learning.

Outcome is a tangible product of learning, the knowledge, skill and competency acquired by the learner. They are the actions that reflect the competency of learner in using or applying the knowledge, ideas and tools successfully in desired areas. So, outcome based education can be defined as an education system with well-defined goals or outcomes. The outcomes will be decided on the basis of what the students are expected to do after the completion of the course. After the goals or outcomes are decided the syllabus, curriculum, assessment and instructions are made in such a way that make sure the learning happens. The key points in outcomes based education system are as follows:

1) To decide crystal clear set of outcomes around which all the other components of the system can be decided.

2) Provide curriculum and conditions in the organization that can encourage and help the students to attain the outcomes.

5.2 Difference between Outcome Based Education System and Traditional Education System

Traditional education system and outcome based education system can be differentiated on four major key points:

A. In Outcome Based Education Systems everything is built on well-defined set of exit outcomes.

In OBE the syllabus, instructions, assessment methods and performance standards are made in order to facilitate the outcomes. They are considered as flexible and alterable means so as to clearly define outcomes.

On the other hand traditional education systems have curriculum structure that is largely predefined. It is designed according to the outcomes expected from students. Their curriculum and assessment system is considered to end in themselves.

B. In Outcomes Based System time can be considered as an alterable resource according to the needs of students and teachers

In OBE time is manipulated in order to provide the best advantage to the all students as some students canunderstand some part of the curriculum very fast while the others need a little more time to grasp.

While in case of the traditional educational system time is not considered as a flexible constraint. System features are defined according to fixed time constraint and the learning and performance of the students is based only on schedule and calendar.

C. The main focus of Outcome Based Education is to rise the learning and performance of the students to their highest possible level before completion of the course

In OBE students learning and achievements are measured at macro level. Their mistakes are considered as important steps for improving students' performance. OBE defines students' achievement as the highest level of performance a student can achieve, and then steps are taken to continuously improve the performance of students. Ultimately the achievements are reflected by what students do after the successful completion of the course or the formal instruction have been completed [26].

The traditional system follows exactly the opposite approach. Testing and performance evaluation takes place at every step on all stages of curriculum and their mistakes are recorded and they become a part of their permanent record.

5.3 The OBE pyramid

A good Outcome based system has number of key components that work together to improve and facilitate successful learning of students [27]. The OBE pyramid has five key components namely paradigm, purposes, premises, principles and practices. Each of these is described in the given subsections.

A. Paradigm

Paradigm defines the way of viewing and a way of doing things consistent with a particular viewpoint. The viewpoint is that "what" and "whether" students had learned successfully than "how" and "when" they had learnt. This approach towards learning changes the way how the system operates, a change that focuses more on accomplishing results instead of simply focusing on providing services. OBE paradigms implicitly desire to make all the students to rise as successful learners. In broader aspect this component defines ten characteristics that tells how students and education system should operate.

B. Purposes

- Two main philosophy of OBE are "Success for all student and staff" are reflected by the following purposes:

- Ensuring that all the students have acquired the knowledge, competency and skills that are required to be successful after the completion of their education.

- Operating the organization in such a way that outcomes are achieved to the maximum possible level by all the students.

In other words it can said that these two ways asks for a commitment from the system to focus on the performances of the students and operate in way that is success oriented. They do not comply with the notion that some students depending on their abilities of attitude should be given special curriculum or opportunities, that may lead to permanently leaving behind some students than the others moving permanently ahead. Instead, the systems are expected to fulfil the commitment of endowing all the students with knowledge, skill, competency and qualities which are needed in order to face the challenges

beyond the doors of the education system. The purposes mainly focus on system has to change how they operate in order to accomplish their commitments [28].

C. Premises

The purposes mentioned above are based on three key premises that have been discovered by manyresearchers and based on the experiences of educators. These premises are described as follows:

- All the students have the capability of learning and succeeding but not in same way and on same day.
- Successful learning promotes even more successful learning.
- The conditions of the education system directly affect successful learning.

The first assumption considers the different learning rates and learning styles of students does not create barrier in successful learning but they can be considered as important factors in a sound educational process [29]. It views the learning potential of the students in an optimistic way. The second assumption or premises is based on the fact that successful learning takes place on the students having a strong psychological and cognitive base of earlier learning success. The stronger the organization will be able to make both foundations, the easier it will be for the students to achieve successful learning. Those who implement OBE believe that they are capable of changing their operating styles so as to operate and allow all the students to become successful learners. Organizations can work differently than the way worked in past if they choose to implement the needed changes.

D. Principles

There are four major principles of OBE which help in decision making and action. To put the purposes and premises into action, the ones who implement always guide what they do around the principles. These principles can be considered as the heart of OBE, when they work together they help the students and teachers to be successful [30]. These four principles are described below:

1. Clarity of focus on achieving the exit outcomes
2. Expanded opportunity and support for learning success
3. High expectations for all to succeed
4. Design down from your ultimate, culminating outcomes.

These principles can be applied in many ways to achieve OBE's purposes many implementation options are available. The successful OBE practitioners have applied these principles in four ways: consistently, systematically, creatively and simultaneously. These four criteria for applying principles lead to system effectiveness.

The three principles guided with the purposes serve as the base for OBE implementation.

E. Practices

Those who emphasized OBE or outcomes recognized that some traditional practices like tracking and competitive grading should be modified.

5.4 Course Outcomes

Outcomes are specific details of points that describe what the students will learn after the completion of the course or activity. These outcomes are rated on the basis of some scale known as knowledge level scaled from K1 to K6 based on Bloom's Taxonomy. Outcomes are also known by names like Competencies and grades.

OBE measures the desired outcomes on the basis of well-defined set of outcomes of the known as program outcomes (CO). COs are mapped with Program Outcomes (PO) in order to facilitate the alignment of the COs with POs. It helps in creating a visual map of any program and also helps to know how students are meeting POs at course level. It basically focuses on student learning.

5.5 Implementation of COs in Moodle

In moodle COs can be defined using outcomes plug-in available in moodle. They are like subcomponents of grades, an assessment of overall performance which may be based on quizzes, tests, projects, participation, attendance etc[31].

A. Enabling course outcomes in moodle

Steps for enabling outcomes on any course are:

Step1: Click on "Site Administration"

Step 2: Go to Advanced features

Step 3: Check the "Enable Outcome" checkbox

Step 4: Finally save the changes done

B. Adding course level outcomes in moodle

Following are the steps to add course level outcomes in any particular course.

Step1: Go to "Course Outcomes" and click on outcomes.

Step 2: Click on "Edit outcomes"

Step 3: Click on "Add a new outcome" and fill the form that appears

Step 4: Save changes.

C. Using the defined outcomes

In the above subsections outcomes have been defined now we to make use of the defined outcomes, for that following step are required to be performed:

Step 1: Define list of outcomes for a course

Step 2: Add the outcome for each activity, whichever outcomes apply for the activity using activities setting option.

Step 3: Now while grading, each student can be graded based on the outcome scales.

Step 4: These outcomes can be used a part of assessment and outcome report can also be used to know feedback how the students are performing in the course.

D. Outcomes Report

Outcomes report can be extracted from the course by clicking on "Course Administration", then selecting "Grades" and finally clicking on "Outcomes Report". It is basically a table having six columns containing short name of the outcome, course average scores, whether the outcome is site wide or not, list of activities, average score of each activity and the number of grades for each activity.

E. Importing and Exporting Outcomes

Once outcomes have been defined they can be exported by "Export all outcomes" option. All outcomes can be exported in .csv format, which is readable by Excel or any text editor. To add these exported outcomes in any other course, the .csv file can be imported directly using following steps:

Step 1: Click on "Course Outcomes"

Step 2: Go to "Outcomes"

Step 3: Click on "Import outcomes"

Step 4: Select "Import as custom outcomes" or "Import as standard outcomes" whichever is required.

Step 5: Upload the .csv file

In an educational organization, the evaluation of the students is done by scoring and score analysis is done to assess the students. The traditional score analysis is calculated on the basis of written examination, internal examination, activities etc. The activities organized for evaluation are also not related to course outcome. The mode of evaluation is nowhere connected with course outcomes. Also, regarding the curriculum used for the course, it is difficult to assess whether the curriculum followed is helpful in fulfilling the requirements of the course. To assess the students in and curriculum and increase the efficiency outcome based approach can be followed instead of traditional approach. In this paper we have discussed the benefits of outcome based education. After that we have compared the traditional approach for teaching learning process and the new outcome based education approach and concluded that OBE is more effective and beneficial than the traditional approach and is also helpful for the development for each and every student of the organization. Different techniques are used for implementing OBE, in this paper we have used free open source software moodle for implementing OBE. As moodle is open source it is available for free and can be easily used. Further, we have discussed the steps for adding course outcomes in moodle and how to extract the outcomes.

6. Use of Moodle at Galgotias University

This section comprises two major results including one the extent of use of Moodle at GU and second is the questionnaire results are analysed based on blended learning.

6.1. Moodle at GU

The e-learning platform moodle adopted by Galgotias University comprises a set of tools that can be used in the teaching and learning process. The configured modules from the standard Moodle platform that provide interaction among students and faculty namely VPL, Assignments/Workshops, Chats, Forums, News and Quiz/Survey and (ii) the external tools that are incorporated in the platform, such as impartus for lecture recording, McGraw Hill digital books etc.

The following is the sample for VPL activity in moodle for the question.

Generate the Short name for the given full name as per the following rules:

1. Place the last name as it is. Then put dot('.')

2. Pick the initial (first alphabet) of the first name. Then put dot('.') .

3. If the middle name is present then pick the initial (first alphabet).

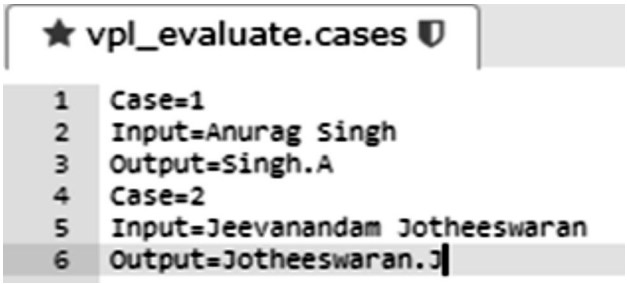

Fig 1. Screenshot of test case for the problem above.

Example 1:

Input: Anurag Singh

Output: Singh. A

Example 2:

Jeevanandam Jotheeswaran

Jeevanandam. J

Fig. 2 describes the number of activities on Moodle at GUin 1094 courses during the winter semester at GU. The figure displays the number of activities such as McGrawHill e-books, quiz, assignments, resource upload and VPL used in GU in winter semester against 16849 users. The results display the number of uploads which was the highest followed by the number of assignments and quizzes.

In GU, students use virtual programming lab present in Moodle for practise purpose of languages like C, C++ etc. Fig 3 shows the statistics for the use of VPL and quizzes by computer science engineering students.

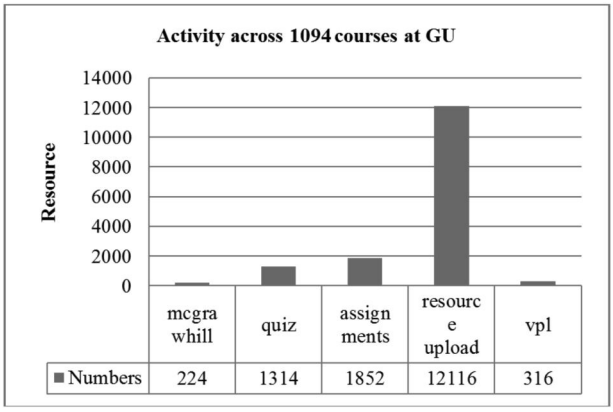

Fig 2.moodle activity for winter semester

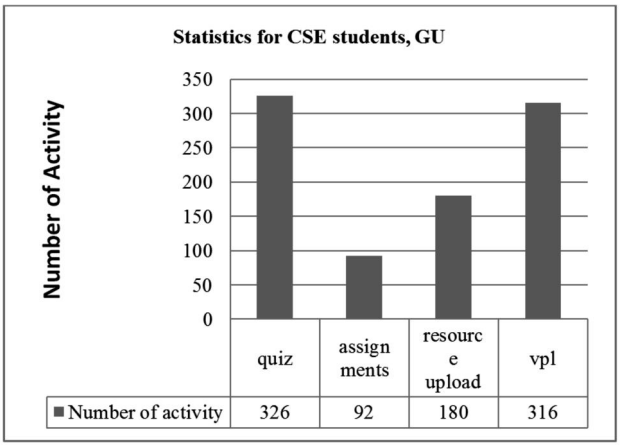

Fig 3. Use of Virtual Programming Lab and Quizzes for assessment of 5000+ computer science engineering students

7. Conclusions and future studies

This paper covers the main functionalities and tools available in the Moodle platform and their use at the Galgotias University. Moodle at GU contains some of the main tools of the standard Moodle platform, like VPL, Assignments, Chats, Forums, News and Quiz/Survey. Furthermore, it incorporates some external tools like McGraw Hill, impartus, Questionnaires and Video-conference. Every external tool needs a customized APIs which is to be built. The challenge in this external tool implementation is handshaking of protocols. This activity will ensure the single sign on facility for the users. The analysis of the students' answers to the applied questionnaire revealed that the most mentioned purpose of the use of the Moodle at GU were 'Download teaching materials', 'VPL', 'Deliver assignments', PBL and for aptitude and reasoning building for campus placements. Additionally, students gave more importance to 'VPL', 'Assignments' and 'Quizzes'. These results are compatible with the hypothesis that the Moodle at GU is being used mainly as a repository of materials and information. It can also be noted that the not so used tools and thus not so important for students, enable the interaction, collaboration and the real time communication. To overcome the constraints just presented it should be taken into account that the successful use of e-learning platforms in the teaching and learning context critically depends on the teachers having knowledge about the tools, being aware of how they should be used and being capable of organizing all the communication process.As future work it is considered important to perform a careful analysis of the students' course recommendations based on the performance. An advanced programming platform can be incorporated for industries conducted through moodle.Future study can also investigate how these tools can help in promoting the success of the teaching and learning process.

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