

# Custom Reporting Framework for Moodle LMS Based E-Learning

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**Abstract** - This paper aims to provide moodle LMS based instructors with real-time insights into their learner data. The project involves requirements analysis, design, data integration, user testing, deployment and evaluation, considering factors such as ease of use, data accuracy, and scalability. The framework is integrated with Moodle’s data sources to ensure that the reports generated are accurate and up to date. The framework will be tested with a sample group of moodle users to ensure it meets their reporting needs and requirements. Upon successful testing, the framework will be deployed on the moodle platform for all instructors to access. The framework is maintained to ensure it continues to work correctly and meets the evolving needs of moodle instructors. The framework’s effectiveness is evaluated, and any necessary improvements are made based on feedback from moodle instructors. This paper aims to provide moodle instructors with real-time insights into their data, making it easier for them to make informed decisions and monitor the progress of their e-learning courses.

**Keywords:** Learning Management System, E-Learning, Analytics

## I. INTRODUCTION

In the new normal post COVID-19, the traditional way of learning in formal, taking place in a single location, is less relevant [1]. The video conferencing apps like Zoom, Google meet has enabled information dissemination to learners without the need to meet in the physical location. According to Ryann K. Ellis, a Learning Management System (LMS) “is a software application that automates the administration, tracking and reporting of training events.” Any learning institute requires a management system to organize content, assessment etc. An LMS caters to asynchronous learning. Some of the advantages of LMS are automatic and timely evaluation, reduced usage of paper, reuse of course content, and caters to large volume of learners. While e-learning can happen in workplace [2], this paper mainly focuses learning on academic institutions.

## II. LITERATURE REVIEW

The significance of LMS is more in the distance education sector[3]. To detect motivational problems for learners, [4] analysed behaviour patterns in the interaction with various activities in LMS. Using LMS, electric and electronic measurement courses which typically require physical presence, can also be taught [5][6][7]. With the rise in the need of asynchronous learning, many software developers

started designing tools to facilitate the management of courses and programs to engage learners remotely. Figure 1 illustrates the features that can be incorporated in an LMS. Table 1 gives some examples of popular LMS. According to various marketing agencies, the LMS market size is expected to grow from USD 18.7 billion in 2022 to USD 43.6 billion by 2027.

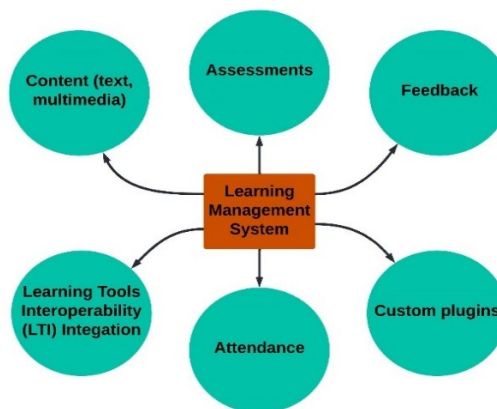


Fig. 1 Learning Management System

TABLE I SOME EXAMPLES OF LMS

Category	LMS	Description
Open Source	Moodle	acronym for “Modular Object Oriented Dynamic Learning Environment.” It is used for blended learning, distance education and flipped classroom.
	Sakai	A free, community driven software platform designed to support teaching, research and collaboration.
	Canvas	Modern LMS developed and maintained by Instructure Inc.
Proprietary	blackboard	is a modern, intuitive LMS that leverages pedagogical best practices to create flexible and inclusive online learning experiences.
	eCollege	On-demand, software as a service provider of eLearning software owned by Pearson PLC
	HotChalk	Education technology company acquired by Noodle in November, 2020

### III. METHODOLOGY AND REQUIREMENT ANALYSIS

[8] proposed an assessment model for information quality in e-learning systems based on the quality framework. Another paper [9] compared accuracy of Decision Tree and Bayesian network algorithms in predicting the academic performance

of Undergraduate and Postgraduate students. LMS also facilitates the use of blended learning model [10].

For our methodology we installed moodle 3.9 in our personal system, created categories, courses and enrolled a limited number of learners. After testing the framework, we implemented the same in our University LMS. Some of the features available in moodle and moodle cloud version are listed below:

TABLE II DIFFERENCE BETWEEN LOCAL MOODLE AND CLOUD MOODLE

Moodle in Local Machine	Moodle Cloud
The admin has complete control over it.	Functionality through web and the admin might not have complete access.
It is free and doesn't have any limit.	It is also free but limits the storage you can access.
Cyber breaching is almost impossible.	Cyber breaching is possible because of the cloud.
Customization is difficult.	Customization is easy because of web functionality.

### IV. MODEL FORMULATION AND SYSTEM IMPLEMENTATION

Assessment is an essential aspect of LMS. [11] addressed key issues in the assessment of a good LMS for higher education.

Some assessment types include quizzes and assignment submissions (both individual and group). [12] developed a measurement framework regarding depth of learning and student productivity.

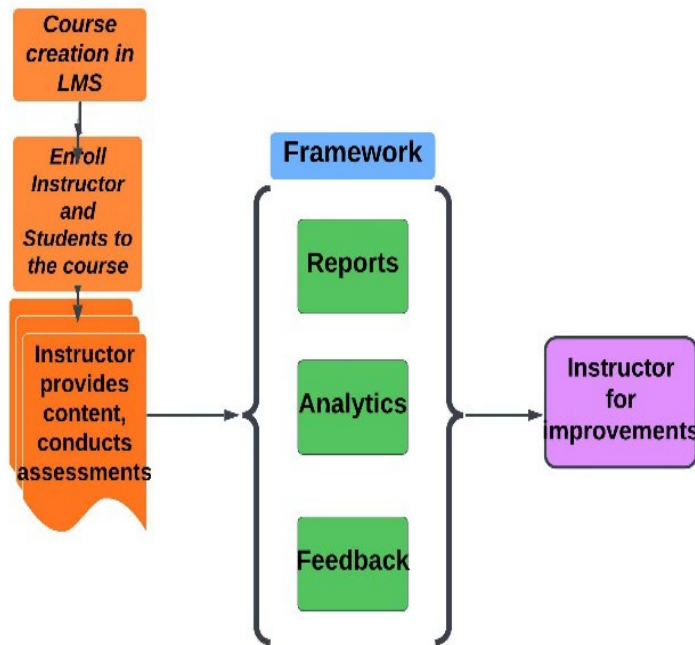


Fig. 2 Custom reporting Framework

### V. RESULTS AND DISCUSSION

To evaluate, a course with 5683 learners is taken. Figure 3 and Figure 4 represent the log report of event context accessed by the learners over a 6-month period and the grades received.

Figure 3 clearly shows that the learners accessed the assessment activity several times to check the score obtained in the assessment. Figure 4 represents the distribution of grades and it follows the traditional bell curve[1] skewed towards the higher grade.

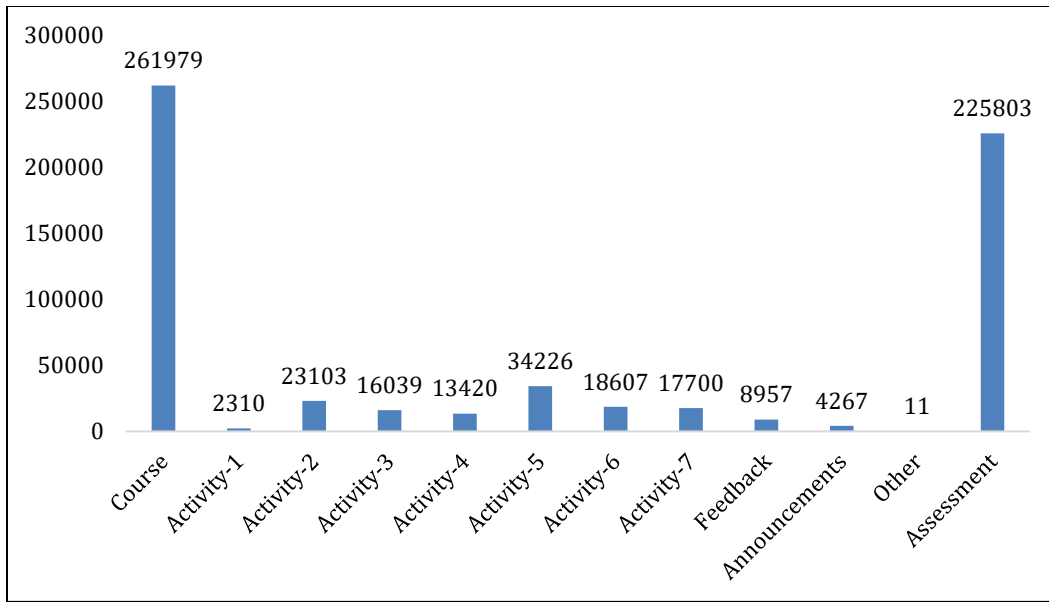


Fig. 3 Log report of event context

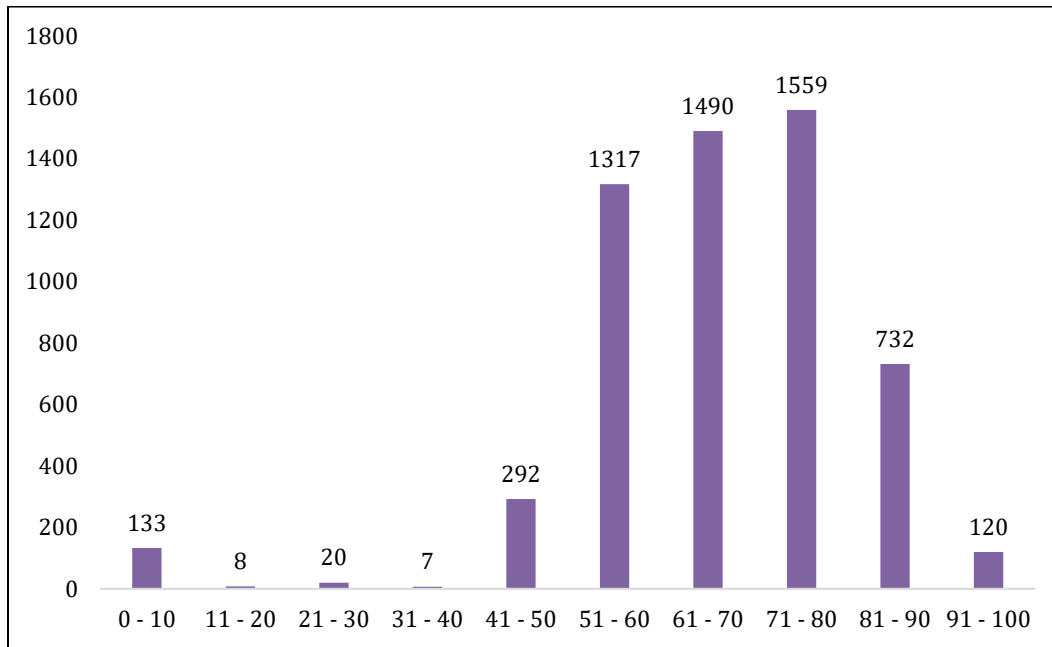


Fig. 4 Distribution of grades

The queries are written in a general Structured Query Language (SQL). Sample Queries are given below.

The query below displays the list of participants who have never accessed the course.

```
SELECT username FROM prefix_user_enrolments ue
JOIN prefix_enrol en ON ue.enrolid = en.id
JOIN prefix_user uu ON uu.id = ue.userid WHERE
en.courseid = 3 AND NOT EXISTS ( SELECT * FROM
prefix_user_lastaccess la WHERE la.userid = ue.userid
AND la.courseid = en.courseid )
```

This query shows the complete login and logout history for a specific user and its analysed output is shown in Figure 5.

```
SELECT l.id AS "Log_event_id", l.timecreated AS
"Timestamp", DATE_FORMAT(FROM_UNIXTIME(l.timecreated), '%Y-%m-%d %H:%i') AS "Time_UTC",
l.action, u.username, l.origin, l.ip FROM
prefix_logstore_standard_log l JOIN prefix_user u ON
u.id = l.userid WHERE l.action IN
('loggedin', 'loggedout') AND l.userid = 4 ORDER BY
l.timecreated
```

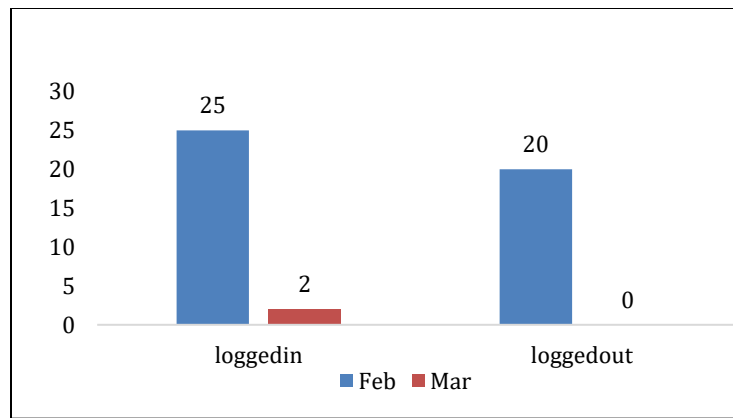


Fig. 5 Query Output analysis

Further queries and their output are kept in a GitHub repository (<https://github.com/SurajAravind/Custom-reporting-Framework-for-moodle-LMS-based-e-learning/blob/main/README.md>).

## VI. CONCLUSION

As many institutes want to develop their e-learning platform to reach their students and staff, a reporting framework is necessary to introspect to improve the learning experience. The results are based on an LMS used by our Institute. During the pandemic, a pedagogical shift was witnessed across major institutes on how to reach out to learners interactively. Generating reports will help all the stakeholders on improving teaching and learning. With improvements in technology, teaching pedagogy will be more student centric. The testing is done on a limited number of users. Reports which include the time spent by the learner on an activity, what time the learners are engaged on the e-learning platform, performance of the learners on graded activities and similar insights can be obtained from a more extensive user base. The reports that were generated helped our department in identifying the short comings and improved the course structure. The work can be extended by comparing our results with the past courses which did not use any specific e-learning platform.

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