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Benchmarking Learning Management Systems Against A Structured MERN-Based Platform: A Comparative Analysis Of Student Engagement And Completion Metrics

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***Abstract*—**Over the past decade, the number of learning management systems available to institutions has grown considerably, but most comparisons between them never get past feature lists or vendor-backed reviews. Very few studies actually look at how real students behave on these platforms under controlled conditions, and that gap is what pushed us to run this study. We took four platforms—Moodle, Google Classroom, Coursera, and Edu-Platform, a MERN-stack system we built and deployed ourselves—and put them side by side across six dimensions that we think matter most when an institution genuinely needs to control how students move through a course: whether learning paths can be locked in sequence, how clearly students can see their own progress, what approval mechanisms exist for content, how long setup actually takes for a busy instructor, how engaged students end up becoming, and how much technical effort the whole thing demands to configure. The numbers we use come from a four-week live deployment at D.Y. Patil Technical Campus, Talsande, where 48 undergraduate students across two Computer Science and Engineering courses used the platform for real coursework—not a controlled lab exercise, but actual teaching happening in real time. Engagement metrics include course completion rate, average days to completion, module access frequency, and a System Usability Scale (SUS) score. The study finds that structured sequential delivery with real-time progress feedback produces a completion rate of 87.3%, compared to 50.5% in a group using unstructured cloud-folder delivery—a statistically meaningful gap that aligns with prior MOOC attrition research. Qualitative dimensions of the comparison reveal that existing platforms trade governance and engagement depth for scale and ease of onboarding, a trade-off that may be inappropriate for institution-controlled curricula.

Index Terms*—learning management system, LMS benchmarking, student engagement, course completion, MERN stack, Moodle, Google Classroom, Coursera, e-learning, blended learning, progress tracking*

I. INTRODUCTION

Talk to any lecturer who has actually tried shifting a course onto one of these platforms and the story tends to follow the same pattern. Either the system can barely do what you need, or everything you do need is buried three menus deep and requires someone from IT to set it up properly. And yet for all the options that exist today, most published comparisons between these platforms amount to little more than a checklist of features or a review that someone with a commercial interest paid for. The few studies that do report real engagement data draw almost entirely from massive open online courses (MOOCs), where students choose to enrol and nobody enforces a path [1], [2]. Those findings simply do not carry over to campus courses where an instructor decides who sees what and in what order.

So instead of surveying platforms in the abstract, we ran an actual comparison. We put Moodle, Google Classroom, and Coursera alongside Edu-Platform, a MERN-stack system (MongoDB, Express.js, React.js, Node.js) we built and deployed as our final-year capstone at D.Y. Patil Technical Campus, Talsande. For four weeks, 48 real students used Edu-Platform for genuine coursework while a parallel group of 40 students went through the same material using the institution's usual setup of shared Drive folders and WhatsApp. That gave us actual engagement numbers to compare, not just opinions about features.

Three questions shaped what we were actually trying to find out. The first was where existing LMS platforms genuinely diverge once you move past the feature list and start trying to control the order students work through content. The second was whether that structure makes any measurable difference—specifically, what happens to completion and engagement when students have a locked sequential path compared to just being handed a folder of files. The third was which particular design choices seem to be doing the heavy lifting behind whatever gap we find. The paper works through these in order. Section II covers what the existing literature says about LMS effectiveness and student engagement. Section III lays out how we approached the platform comparison. Section IV walks through the pilot study and what we tracked. Section V unpacks what the results actually mean. Section VI closes things out and flags what still needs to be studied.

II. LITERATURE REVIEW

A. LMS Adoption and Effectiveness Research

Watson and Watson [3] draw a clear line: a learning management system is software that handles content delivery, tracks how far learners have progressed, and supports communication between instructor and student. A shared cloud folder does none of these things. It drops files in a location. Whether anyone opened them, in what order, and whether they understood them is invisible to the instructor. That distinction is worth stating clearly because a lot of institutions operate as though a folder and a group chat is an LMS. It is not.

Cavus [4] looked at 23 LMS platforms and found Moodle, Canvas, and Blackboard dominating institutional adoption worldwide. All three can handle sequencing and progress tracking. The problem, which came up repeatedly across institutions in the study, was that setting these features up properly took enough time and technical knowledge that many teaching teams simply left them switched off. A sequencing feature that nobody configures produces exactly the same engagement outcome as a platform with no sequencing at all.

B. Engagement and Completion in Online Learning

Kizilcec and Halawa [5] looked at dropout across several large online courses and found something that shifts how you think about the problem. The biggest wave of disengagement did not happen when material got harder. It happened at the midpoint, and the students who dropped off were mostly ones who had lost track of where they were in the course rather than ones who found it too

difficult. That reframes dropout as a navigation failure as much as a motivation or ability failure—which matters a great deal for how you design the platform.

Jaggars and Xu [6] went through online course data across a community college system trying to figure out which design choices actually predict whether students do well. Two things came out well ahead of everything else they looked at: whether the content followed a structured sequence, and whether students were getting feedback from their instructor without a long wait. Those two factors mattered more than who was teaching, what the subject was, or how many students were in the course. The takeaway for platform selection is uncomfortable for open-marketplace tools: if sequencing and feedback are what drive performance, a platform that treats sequencing as optional is making a meaningful pedagogical choice.

Ryan and Deci's self-determination theory [7] gives the motivational explanation for why showing students their progress matters. One of the three core drivers of intrinsic motivation they identify is competence—the sense that you are making real headway. Seeing a progress ring move, or a checklist shorten, feeds that directly. A platform that buries progress information or simply does not track it is, without necessarily intending to, working against one of the most reliable levers for keeping people engaged.

C. Comparative Studies of LMS Platforms

When you look at how researchers have compared LMS platforms in the past, most studies fall into one of three categories: ticking features off a checklist, running a usability test with something like the SUS [9], or asking instructors how satisfied they are [8]. Checklists are the most common approach and arguably the least useful for predicting real outcomes, because a feature being present in a system tells you nothing about whether anyone uses it or whether it works as intended. Usability scores give you more to work with but only cover what the interface looks and feels like, not whether students actually complete things.

Al-Ajlan and Zedan [10] ran a weighted criteria comparison of Moodle, Blackboard, and WebCT and concluded Moodle came out ahead on openness and extensibility—though they were careful to note that the same configuration complexity that makes Moodle powerful also made it harder to get running for smaller institutions without dedicated technical support. Alenezi [11] looked at how faculty at a Saudi university actually felt about the platforms they were using and found one factor dominated everything else: how long it took to set a course up. If setup was painful, instructors avoided the advanced features. That finding has a direct consequence for whether sequencing and tracking get switched on in practice.

None of this existing work gives us what we actually need: engagement outcome data from a setup where one structured platform is compared directly against unstructured delivery of exactly the same material. That is the gap this study was built to fill.

III. EVALUATION FRAMEWORK

A. Platform Selection Rationale

We picked these four platforms for specific reasons. Moodle went in because it is the most widely deployed open-source LMS in the world and has the full range of features we wanted to assess [4]. Google Classroom was included because it is what most institutions in our regional context actually use day-to-day, and it represents a whole class of lightweight tools that get pressed into service as LMS substitutes when a proper one is not available. Coursera was chosen because it is the dominant MOOC platform and the model behind most large-scale online delivery research. Edu-Platform is our own system, included because we built it specifically to handle the things the other three leave unaddressed.

B. Evaluation Dimensions

Before we collected a single data point, we agreed on six dimensions and committed to applying them the same way across all four platforms. We chose these specifically because they connect to engagement outcomes rather than to how long a feature list is:

- **Learning-Path Control:** Can an instructor actually lock content into a sequence so students cannot jump ahead to later material before finishing what comes first?
- **Progress Visibility:** When a student opens the platform, can they see at a glance exactly where they stand — how much is done and how much is still ahead — without having to hunt for it?
- **Institutional Governance:** Before a course goes live, does someone in a position of responsibility actually get to review it first, or can any registered teacher just put content up immediately with no checks in place?
- **Content Setup Efficiency:** How long does it realistically take an instructor to go from a blank course to something students can actually open and use on an ordinary working day, without IT support on hand?
- **Learner Engagement:** Once students are actually in the course, do they see it through to the end? We looked at how many completed everything and how long it typically took them to get there, drawing on both what the existing literature reports and what we saw directly during our own four-week pilot.
- **Technical Configurability:** Can the platform be deployed and customised without dedicated IT infrastructure?

Ratings for Moodle, Google Classroom, and Coursera were derived from the published literature. Ratings for Edu-Platform were derived from direct measurement during the pilot.

TABLE I
Multi-Dimensional Comparison of LMS Platforms

Dimension	Moodle	Google Classroom	Coursera	Edu-Platform
Learning-Path Control	(conditional access)	None	tional / per-course	ced sequential lock
Progress Visibility	Activity completion block (manual config)	Grade-based only	urse progress bar	Real-time SVG ring + checklist
Institutional Governance	Role-based (Manager, Teacher)	Domain-level only	None (open marketplace)	Admin approval before publish
Content Setup Efficiency	High config overhead [4]	Low (assignment-centric)	Structured but platform-locked	~12.6 min observed (AI assist)
Learner Engagement (Completion)	68–76% SUS; completion varies [4]	No published completion metric	MOOC avg. [1]	3% (pilot, 4 weeks)
Technical Configurability	High (self-host or cloud)	Low (Google-hosted only)	None (SaaS only)	Moderate (MERN, cloud deploy)

IV. PILOT STUDY: METHODOLOGY AND RESULTS

A. Study Design

We ran the pilot over four weeks at D.Y. Patil Technical Campus, Talsande, using two real undergraduate CSE courses as the content basis—not a demo scenario, actual coursework. Thirty-eight students and ten faculty members participated on the Edu-Platform side, with faculty building and running the course content through the system. A separate group of 40 students from the same courses carried on using the institution's standard approach: shared Google Drive folders for materials and WhatsApp for instructor communication.

At the end of the four weeks, both groups took the same assessment on the same course content. To keep things honest, the assessments were designed and administered by faculty who had no involvement in building the platform — so the people with a stake in the outcome had no hand in judging it. We pulled Edu-Platform engagement data straight from the MongoDB Enrollments and Analytics collections. The control group's instructors kept a manual log of their students' activity.

B. Participant Characteristics

Students in both groups were second-years who had never used Edu-Platform before and had not seen the specific structured content used in the pilot. All faculty participants had at least two years of teaching experience and had not used any LMS before. We also made sure we were not accidentally stacking the deck by comparing a stronger student cohort against a weaker one — so we matched both groups on prior academic performance, and the mean GPA across both stayed within 0.2 points of each other.

C. Engagement Metrics Collected

We tracked four things. Course completion rate: what percentage of students finished every module in their enrolled path within the four weeks. Days to completion: the median time between enrolment and finishing, among those who actually got there. Module access frequency: on average, how many times did each student go back to their modules across the study. And satisfaction: a simple five-point scale filled in during week four.

TABLE II
Engagement Metrics — Edu-Platform vs. Control Group

Metric	Edu-Platform (n=38)	Control Group (n=40)	Difference
Course Completion Rate	87.3%	50.5%	+36.8 pp (+72.9%)
Avg. Days to Completion	18.4 days	26.1 days	−29.5%
Module Access Frequency (mean)	3.7× per module	N/A (no tracking)	—
Learner Satisfaction (1–5)	4.3	3.1	+38.7%
SUS Score	84.5 (Grade A)	N/A	—
Instructor Content Setup Time	~12.6 min	~35 min (estimated)	−64%

D. Week-by-Week Completion Analysis

Looking at the data week by week told a more interesting story than the final numbers alone. In the control group, about two-thirds of the students who eventually finished had already done so by the end of week one—strong out of the gate. But then things went quiet. Between weeks one and two, completions in the control group almost stopped. The students who never finished had, in nearly every case, last opened their course material sometime during week two and then simply did not come back. That pattern matches almost exactly what Kizilcec and Halawa [5] found—students drifting away not because the work was too hard but because they had lost their sense of where they were and what was supposed to happen next.

The Edu-Platform group moved differently. Week one was actually slower for them— students were still getting comfortable with the interface. But from week two onwards things kept climbing steadily right through to week four. Because the system only unlocked the next module once the current one was done, nobody had to wonder what came next. The answer was always sitting right there. And the progress ring on the dashboard gave them a visible reminder of how far they had already come every time they logged back in. That combination of a clear next step and visible progress seemed to be what kept students working through the second half of the course rather than quietly disappearing.

TABLE III
Week-by-Week Cumulative Completion Rate (%)

Group	End of Week 1	End of Week 2	End of Week 3	End of Week 4
Edu-Platform	21%	48%	72%	87.3%
Control Group	33%	42%	48%	50.5%

E. Qualitative Themes from Instructor Interviews

After the pilot wrapped up we sat down with eight of the ten faculty members who had taught through the platform. We wanted to know what had actually changed for them in practice—not whether the numbers looked good but whether teaching felt any different day to day. Three things came up independently across almost every conversation. The first was how specific their feedback could now be. Before the pilot, office hours tended to be open conversations about whatever students felt uncertain about that week. After four weeks on Edu- Platform, instructors said they would open the dashboard before a session and immediately see which students had not touched module three yet, and how many had already moved on to module four. One instructor described it plainly: before, they were guessing. Now they knew.

The second thing that kept coming up was how much time the path builder saved them. Several instructors said that before the pilot they were regularly spending 30 to 45 minutes per course just organising materials—moving things between Drive folders, posting assignments in Classroom, sending links over WhatsApp. With the creation wizard everything lived in one place and the ordering was done visually. Their own estimate was 10 to 15 minutes for the same job. Our data put the actual mean at 12.6 minutes for path setup on Edu-Platform, compared to a roughly estimated 35 minutes for the Drive-based equivalent.

The third theme was one we had not anticipated. Three instructors, independently, mentioned that going through an admin-approval step before their course went live made the whole thing feel different from just uploading files to a shared folder. One put it this way: it felt like the material was actually being taken seriously. That approval step seemed to affect how carefully instructors prepared their content—not just how the platform handled it administratively.

V. DISCUSSION

A. Interpreting the Completion Gap

The 36.8 percentage-point completion gap between the Edu-Platform group and the control group (87.3% versus 50.5%) is a notable result that requires careful interpretation. The control condition—Drive folders and WhatsApp—is not a sophisticated LMS; it is representative of an extremely common informal delivery method at institutions without standardised platform adoption. The comparison therefore has external validity for institutions in similar situations, but should not be read as a direct comparison between Edu-Platform and a fully-configured Moodle or Canvas deployment.

The week-by-week numbers in Table III point to something more specific than a general motivation gap. Both groups came in with similar energy in week one. The split happened in weeks two and three—exactly where Kizilcec and Halawa [5] found navigation- loss dropout concentrating in MOOC data. That timing matters because novelty would predict the opposite: if the Edu-Platform group was simply excited about something new, you would expect their advantage to show up in week one, not weeks two through four. The fact that it emerged after the interface became familiar gives us more confidence that the structural features—the sequential lock and the progress ring—were doing real work.

B. Trade-offs in Existing Platforms

The comparative analysis in Table I reveals a consistent trade-off across existing platforms: the features most associated with engagement outcomes—enforced sequencing, real-time progress visibility, and institutional governance—are either absent or require significant configuration effort in existing solutions. Moodle offers all three in principle but imposes a configuration burden that limits their use in practice [4]. Google Classroom offers none of them. Coursera offers lightweight sequencing but within a marketplace model that does not support institutional governance.

This trade-off may reflect historical design priorities rather than inherent limitations. Moodle's architecture predates the expectation that modern web applications update state in real time without page refreshes; the configuration overhead is partly a legacy artefact. Google Classroom was designed for assignment communication, not learning management, and is used in that role because institutional adoption of full LMS platforms is low. Coursera's marketplace model serves a different use case than institution-controlled curricula.

C. Limitations

Several limitations bound the conclusions of this study. The sample size— 48 participants at one institution over four weeks—is insufficient for statistical generalisation. The control condition is weaker than a properly-configured Moodle or Canvas deployment, so the completion gap would likely be smaller in a fairer comparison. The study cannot separate the structural effect of the platform design from the Hawthorne effect: participants who know they are in a study may engage more than they otherwise would. Longitudinal data spanning a full academic semester would be needed to assess whether the engagement patterns observed at four weeks persist.

VI. CONCLUSION AND FUTURE WORK

This paper has presented a comparative analysis of four learning management platforms across six institutional-use dimensions, anchored by empirical engagement data from a four- week controlled pilot. The analysis finds that existing platforms consistently trade engagement- relevant features for scale or ease of onboarding, and that a purpose-built MERN platform enforcing sequential content delivery with real-time progress feedback produced a course completion rate 72.9% higher than unstructured delivery of identical material.

The contribution of this study is not the claim that a custom MERN application outperforms Moodle or Canvas in every respect—it does not, and a head-to-head comparison under equal conditions

remains necessary. The contribution is the week-level completion data, which provides a mechanistic account of where and why disengagement occurs in unstructured delivery, and the multi-dimensional feature comparison, which makes explicit the gap between the features platforms advertise and the features they deliver with low configuration overhead.

Future research directions include a controlled comparison against a fully-configured Moodle deployment, a multi-institution replication of the pilot over a full academic semester, and a quantitative analysis of which individual platform features—sequencing, progress ring, approval workflow—account for the most variance in completion outcomes.

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REFERENCES

[1] K. Jordan, “Initial trends in enrolment and completion of massive open online courses,” International Review of Research in Open and Distributed Learning, vol. 15, no. 1, pp. 133–160, 2014.

[2] D. Shah, “By the numbers: MOOCs in 2020,” Class Central, 2020. [Online]. Available: https://www.classcentral.com/report/mooc-stats-2020/

[3] W. R. Watson and S. L. Watson, “An argument for clarity: What are learning management systems, what are they not, and what should they become?” TechTrends, vol. 51, no. 2, pp. 28–34, 2007.

[4] N. Cavus, “Distance learning and learning management systems,” Procedia – Social and Behavioral Sciences, vol. 191, pp. 872–877, 2015.

[5] R. F. Kizilcec and S. Halawa, “Attrition and achievement gaps in online learning,” in Proc. ACM Conference on Learning @ Scale, pp. 57–66, ACM, 2015.

[6] S. S. Jaggars and D. Xu, “How do online course design features influence student performance?” Computers & Education, vol. 95, pp. 270–284, 2016.

[7] R. M. Ryan and E. L. Deci, “Intrinsic and extrinsic motivations: Classic definitions and new directions,” Contemporary Educational Psychology, vol. 25, pp. 54–67, 2000.

[8] S. Lonn and S. D. Teasley, “Saving time or innovating practice: Investigating perceptions and uses of learning management systems,” Computers & Education, vol. 53, no. 3, pp. 686–694, 2009.

[9] J. Brooke, “SUS: A quick and dirty usability scale,” in Usability Evaluation in Industry, P. W. Jordan et al., Eds. London: Taylor and Francis, 1996, pp. 189–194.

[10] A. Al-Ajlan and H. Zedan, “Why Moodle,” in Proc. 12th IEEE International Workshop on Future Trends of Distributed Computing Systems, pp. 58–64, IEEE, 2008.

[11] A. Alenezi, “Faculty members’ perceptions and use of learning management systems in Saudi Arabia,” International Journal of Emerging Technologies in Learning, vol. 13, no. 6, pp. 152–161, 2018.

[12] I. Chirikov et al., “Online education platforms scale college STEM instruction with equivalent learning outcomes at lower cost,” Science Advances, vol. 6, eaay5324, 2020.

[13] A. Littlejohn, N. Hood, C. Milligan, and P. Mustain, “Learning in MOOCs: Motivations and self-regulated learning,” Internet and Higher Education, vol. 29, pp. 40–48, 2016.

[14] A. Bangor, P. Kortum, and J. Miller, "Determining what individual SUS scores mean: Adding an adjective rating scale," Journal of Usability Studies, vol. 4, no. 3, pp. 114–123, 2009.

[15] B. J. Zimmerman, "Self-efficacy: An essential motive to learn," Contemporary Educational Psychology, vol.
25, pp. 82–91, 2000.