

Recent Trends in Utilising MOODLE LMS for Digital Learning in Higher Education

Vindya V. Senadheera*, Dileepa S. Ediriweera, Thilini P. Rupasinghe

Abstract

Modular Object-Oriented Dynamic Learning Environment (MOODLE) is an open-source learning management system (LMS) which is highly adopted in higher education institutions worldwide. The objective of this scoping review was to explore the adoption of Moodle LMS in digital learning in higher education and identify the features of LMS that will fulfil the evolving teaching and learning needs in this digital age. Nine databases including SCOPUS were searched for eligible publications. Sixty-seven quantitative, qualitative, and mixed-method research conducted on Moodle in higher education that were reported in English language were included in this review. Results showed that courses delivered via Moodle have achieved the intended learning objectives and student satisfaction. Drawbacks identified in using Moodle are not being effectively used to encourage interactions within the online learning environment; lack of opportunities provided for peer-learning; and lack of providing learning analytics for students. In order to address the evolving teaching and learning needs, the ideal LMS for higher education in this digital age should be user-friendly, interactive, engaging, inclusive, and provide learning analytics for teachers as well as students. Digital literacy skills of students and teachers, self-regulation skills in learning of students, and prior training on LMS to teachers facilitate effective implementation of digital learning via LMS.

Keywords: Moodle, digital learning, peer-learning, interaction, learning analytics

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Introduction

Learning Management System (LMS) is a software application designed for administration, documentation, reporting, tracking, automation and delivery of educational courses, training programmes or learning, and development programmes (Fry, 2022). Since the Covid-19 pandemic outbreak, LMSs have become an integral part in teaching and learning in modern higher education. Though online learning via LMS has been the panacea during the pandemic, previous studies have identified technological and pedagogical challenges in this mode of delivery, such as lack of technological expertise and resources, lack of competence in online teaching and learning, and lack of learning engagement (Veluvali & Suriseti, 2021). These challenges have occurred mainly due to the fact that higher education institutions were forced to quick transition to online learning via LMS with minimum pedagogical and technological preparation (Veluvali & Suriseti, 2021).

As technology evolves, LMS platforms are likely to play a greater role in shaping the future of teaching and learning in higher education institutes worldwide (Veluvali & Suriseti, 2021). In order to ensure sustainability of digital learning in higher education, it is crucial to identify features of LMS that will fulfil evolving teaching and learning needs in this digital age.

Modular Object-Oriented Dynamic Learning Environment (MOODLE) is an open source LMS which is used by various disciplines within academia. To date, Moodle is used in more than 240 countries with 400 million users worldwide (Moodle, 2024a). Affordability, ease of use, compatibility with other software and platforms, and availability of various activities, resources,

and many assessment options in Moodle LMS have made it widely adopted in the higher education sector (Gamage et al., 2022).

Gaps in effective implementation of digital learning using LMS can be identified and solutions to fulfil the gaps can be recognised through exploring the adoption of Moodle in higher education due to its widespread use. Therefore, the objective of this scoping review was to explore the adoption of Moodle LMS in digital learning in higher education and identify the features of LMS that will fulfil the evolving teaching and learning needs in this digital age.

Methodology

Framework

This scoping review followed the ‘Updated methodological guidance for the conduct of scoping reviews’ by Joanna Briggs Institute (JBI) (Peters et al., 2020). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist (Tricco et al., 2018) and the ‘Methodological Guidance Paper: The Art and Science of Quality Systematic Reviews’ (P. A. Alexander, 2020) guided the reporting of this scoping review.

Search Strategy

The following nine databases were searched for eligible publications: SCOPUS, EBSCOhost, Emerald, JSTOR, Taylor and Francis, PubMed (MEDLINE), ERIC, ACM, and IEEE Xplore using the search string as “MOODLE” AND “higher education”. Articles published from year 2020 to year 2024 were searched.

Study Selection

The study selection was performed using the Covidence platform. The citations were imported to Covidence for screening. Quantitative, qualitative, and mixed-method research conducted on MOODLE in higher education and which were reported in English language were included in this review.

Data Extraction and Synthesis

Data items used during the extraction were as follows: author/s, year of publication, title, country, aim, study design, population, inclusion/exclusion criteria, field of study, course name, sample size, use of Moodle, and outcomes.

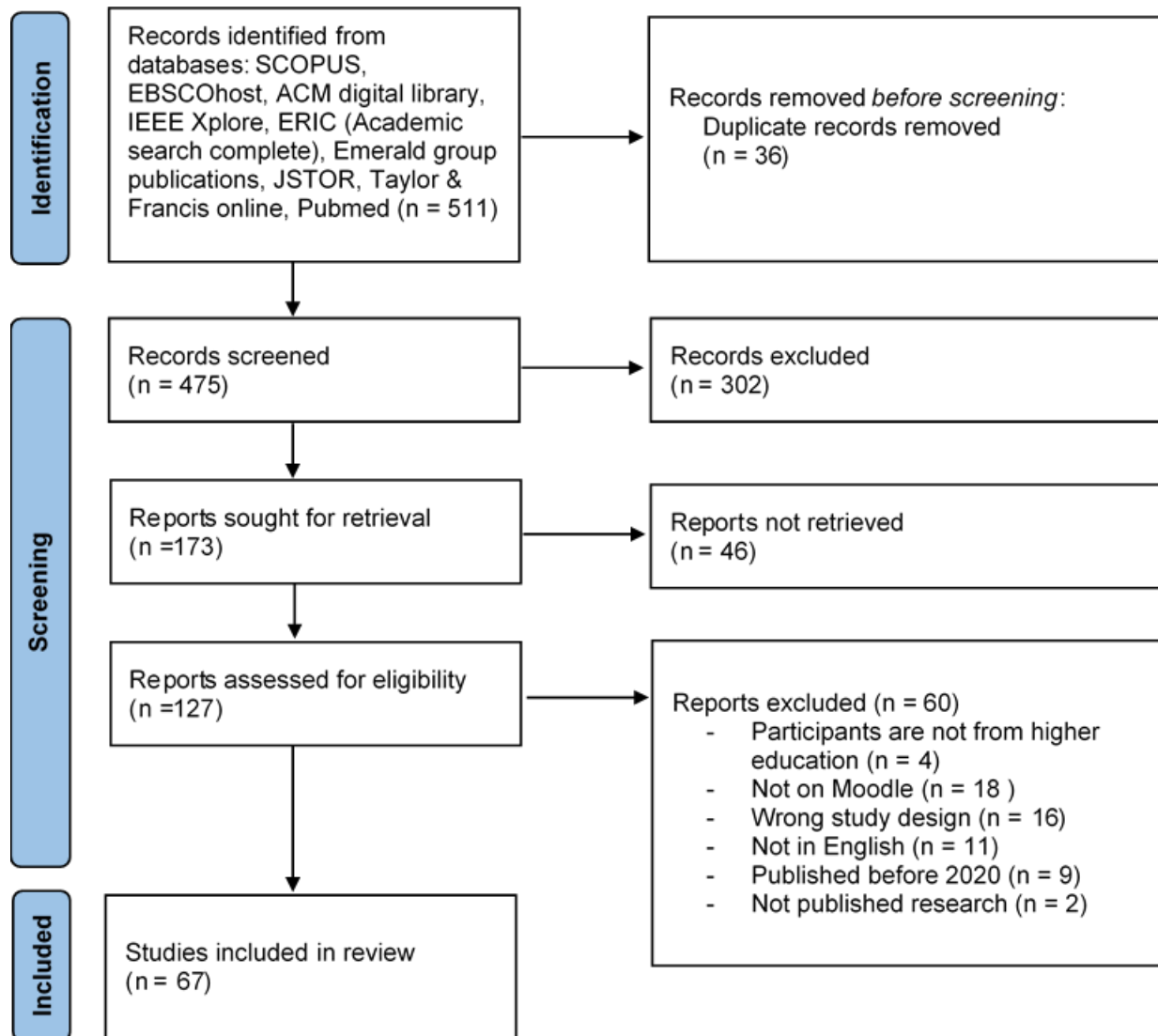
Results

Overview

The search retrieved 511 records, and among those, 36 were duplicates. Out of the 475 articles, 173 were selected for full-text review after title/abstract screening. At the end of the full-text review, 67 articles were included in this review. The flow of the studies through the search and selection process is presented in Figure 1.

Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews flowchart for the article search



Study Characteristics

The 67 included studies were published from 2020 to 2024 (i.e. number of articles in each year: 2020-16, 2021-21, 2022-16, 2023-12, and 2024-2). These researches originated from 37 countries. Participants of the included studies were 15226 undergraduate students, 31

postgraduate students, and 1245 university teachers. The selected researches have been conducted in various study fields including Education, Engineering, Language Learning, and Computer Science.

Moodle for Digital Learning in Higher Education

The included studies have: 1. Investigated the effects of using Moodle for course delivery (n=36), 2. Investigated the factors that influence the usage and acceptance of Moodle by higher education students (n=8), 3. Investigated the factors that influence the usage and acceptance of Moodle by university teachers (n=9), 4. Used Moodle to assessment of students' academic performance (n=6), 5. Explored the effects of using gamification in Moodle (n=4), 6. Used Moodle for learning analytics (n=12), and 7. Explored the effects of Moodle plug-ins (n=8).

1. Moodle LMS for course delivery

Results show a huge increase of Moodle LMS usage during the COVID-19 pandemic period compared to the periods before and after (De Santos-Berbel et al., 2022; Pereira & Guerreiro, 2021). The benefits of using Moodle, such as reduced administration time, efficient distribution of teaching materials, ease of updating materials, access to interactive materials and flexible learning environment, have eased the teaching and learning for university teachers and students (Tomsic et al., 2020). The courses delivered via Moodle have achieved the intended learning objectives and have resulted in high student satisfaction (Bal & Akcil, 2024; Bengueddach et al., 2023; Diahyleva et al., 2020; Gaftandzhieva et al., 2022; Gu et al., 2020; Mayo-Cubero, 2021;

Medvedeva, 2020; Müller & Svalina, 2020; Polhun et al., 2021; Reyes et al., 2022; Shapauov et al., 2023; Volodarets et al., 2022; Volodarskaya & Pechinskaya, 2020).

2. Factors that influence the usage and acceptance of Moodle by higher education students

The main factor that has influenced students' acceptance of Moodle is reported as perceived ease of use (García-Murillo et al., 2023; Goh & Yang, 2021). Students have shown a positive attitude toward Moodle regarding its perceived ease of use (García-Murillo et al., 2023). Intrinsic motivation towards learning has influenced behavioural intention to use Moodle (Raman et al., 2022).

3. Factors that influence the usage and acceptance of Moodle by university teachers

The usage and acceptance of Moodle LMS have been influenced by the competence of faculty members to use LMS, efficiency of the LMS, and prior training on LMS (Al-Naabi, 2023; Lavidas et al., 2023; Mahasneh et al., 2021; Raman et al., 2022; Sghari & Bouaziz, 2022). Teachers who had higher computer self-efficacy (CSE) had shown more positive Perceived Ease of Use (PEOU) and Perceived Credibility (PC) beliefs regarding LMS (Sghari & Bouaziz, 2022). The behavioural intention to use Moodle LMS has been influenced by the perceived usefulness and perceived ease of use (Lavidas et al., 2023).

4. Moodle to assess academic performance of students

Moodle quizzes turned out to be a reliable and efficient strategy for learning of contents in scientific matter, with a high participation in the knowledge tests, with good marks in the average

score (López-Tocón, 2021; Rodríguez et al., 2023). Moodle might be particularly interesting when the type of survey goes beyond a closed-ended quiz (Aldalur et al., 2022). The students have been satisfied with the design of the tests and content, and the effectiveness of the tests designed in Moodle platform (Kharchenko et al., 2021; Zeller & Marquet, 2023).

5. Gamification in Moodle

Four of the included studies have reported findings of using gamification in Moodle (Asiksoy & Canbolat, 2021; Bernik et al., 2020; Palová & Vejačka, 2022; Petrović et al., 2022). The integration of game elements into Moodle LMS, such as badges, leaderboards, ranks etc., has been reported as an effective strategy for extending common formal learning models (Petrović et al., 2022). Usage of gamification features in Moodle has increased the level of active participation in the education process and has helped to improve final results achieved by the students (Asiksoy & Canbolat, 2021; Bernik et al., 2020; Palová & Vejačka, 2022; Petrović et al., 2022).

6. Moodle for learning analytics

Twelve studies have reported findings on using Moodle for learning analytics. Eight of those studies have used built-in features of Moodle (Aitdaoud et al., 2023; Al-Kindi & Al-Khanjari, 2022; Dobashi et al., 2022; Llerena et al., 2021; Maloney et al., 2022; Paajanen, 2022; Poellhuber et al., 2023; Suay et al., 2022) and four studies have used Moodle plug-ins for learning analytics (Brandenburger & Janneck, 2021; Jayashanka et al., 2022; Molins & García, 2023; Safsouf et al., 2021). As per the analysis of Moodle log data, number of interactions with the LMS has been useful in identifying the learning patterns of students, predicting students' performance, tracking

learning progress, identifying challenges in self-regulated learning, and identifying students who need more assistance during the course (Aitdaoud et al., 2023; Al-Kindi & Al-Khanjari, 2022; Dobashi et al., 2022; Llerena et al., 2021; Maloney et al., 2022; Paajanen, 2022; Poellhuber et al., 2023; Suay et al., 2022).

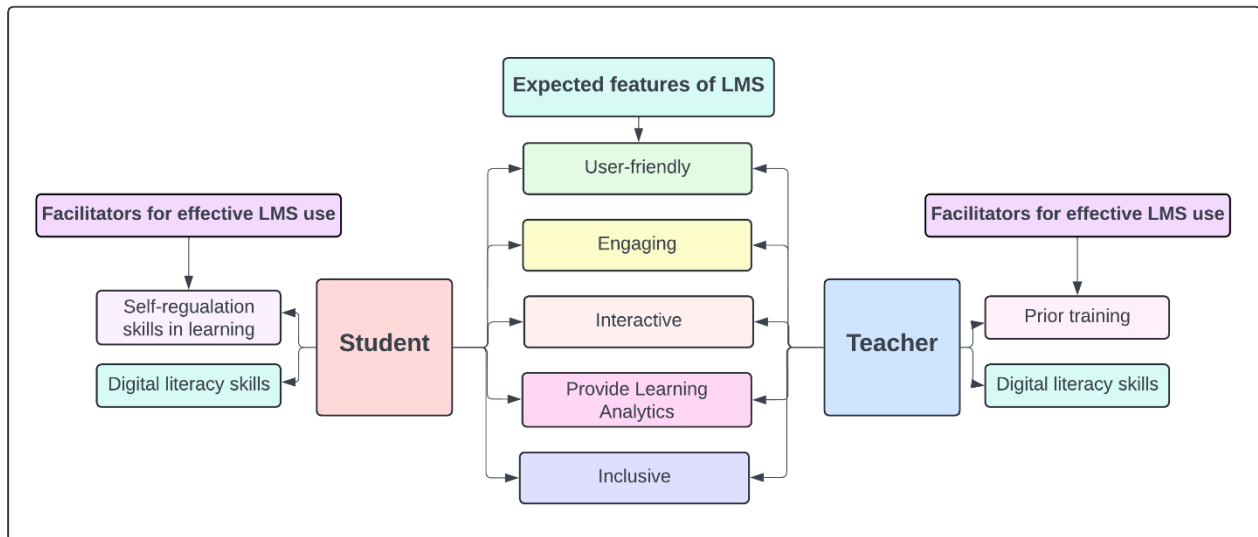
7. Moodle plug-ins

In eight of the included studies, plug-ins have been incorporated in Moodle LMS. The aims of using these plug-ins were reported as: supporting self-regulated learning (Villalobos et al., 2022); providing learning analytics for students (Jayashanka et al., 2022; Molins & García, 2023; Safsouf et al., 2021); delivering augmented reality mediated quizzes (Rodríguez et al., 2023); increasing interaction and feedback in online classroom (Bikanga Ada, 2023); and enhancing collaborative learning in Moodle platform (Brandenburger & Janneck, 2021; Peramunugamage et al., 2020). The plug-ins have achieved the intended aims and thereby have helped to enhance the effectiveness and student satisfaction in learning, using the Moodle LMS.

Based on the data analysis a conceptual framework for effective implementation of digital learning through LMS was designed for higher education as shown in Figure 2.

Figure 2

Conceptual Framework for Effective Implementation of digital learning through LMS in Higher Education



Discussion

Moodle LMS for Course Delivery

Moodle LMS has demonstrated a moderate degree of success in addressing the evolving learning needs of the higher education sector in the digital age. Results showed a huge increase in the usage of Moodle LMS during the Covid-19 pandemic. The closure of higher education institutes throughout the world during the pandemic led to shifting to online/distance learning mode which was mainly conducted via LMS. Compared to other LMSs, Moodle has been widely adopted all over the globe, mainly because of the cost effectiveness of Moodle, as it is an open source web-based LMS that educators can use for free (Morze et al., 2021). Moreover, extensive customisation options and ability to seamless integration with other platforms and plug-ins have

also contributed to the extensive use of Moodle in the higher education sector (Morze et al., 2021). Moodle offers various activities and resources that can be used to design and deliver teaching and learning effectively (Sáiz-Manzanares et al., 2021). These factors have contributed to the courses delivered via Moodle to achieve the intended learning objectives and result in high student satisfaction.

The major drawback in learning via Moodle LMS was reported as the lack of interaction in the online learning environment. Students have indicated a decline in attention and interest occurred with the progress of online courses due to the boredom resulting from lack of interaction (Martín-Sómer et al., 2024). Likewise, teachers have also identified this absence of interaction as the most prominent challenge in the online learning environment as it impedes their ability to measure students' progress and receive valuable feedback (Martín-Sómer et al., 2024). Moodle plug-in has been used to fill the gap in Moodle to provide interactive feedbacks. "MyFeedback" plug-in has made the feedback feel more personal, provided a quicker turnaround by making it easier for the teachers to provide feedback, and has prompted more dialogue between the teachers and students (Bikanga Ada, 2023).

The participants emphasised the importance of social interaction in online education. In their view, achieving meaningful social interaction is challenging in an online education model. Thus, adding social interaction features can sustain the use of LMS in higher education in this digital age (Martín-Sómer et al., 2024; Mpungose & Khoza, 2022). Due to this reason, more user-friendly and less sophisticated learning platforms than Moodle have started to emerge in the learning

process (Kanetaki et al., 2021). Currently, LMSs with social networking features, such as Course Networking (CN) LMSs as “CN Post”, are gaining increased popularity in the higher education sector as those LMSs provide a platform for increased interactions within the online learning environment (Patil et al., 2018; Turnbull et al., 2023).

Factors that Influence the Usage and Acceptance of Moodle by Higher Education Students

The perceived ease of use of Moodle LMS has influenced students’ acceptance and satisfaction using Moodle. The user-friendly activities and resources in Moodle have resulted in positive attitudes of students regarding Moodle’s ease of use (Sáiz-Manzanares et al., 2021). Moreover, the behavioural intention to use Moodle has been influenced by the students’ intrinsic motivation to learn. This might have caused the higher academic performance of students with higher self-regulation skills in learning (Gaftandzhieva et al., 2022; Kerimbayev et al., 2020). Students have suggested to incorporate training of digital literacy skills at the beginning of the online course (Ruiz-Palomino et al., 2021). Digital literacy skills enable students to effectively follow the offered courses using digital technologies (Law et al., 2018).

Factors that Influence the Usage and Acceptance of Moodle by University Teachers

The perceived ease of use has influenced acceptance and usage of Moodle LMS by university teachers. Teachers with higher computer self-efficacy have reported to have higher perceived ease of use beliefs. This implies that digital literacy skills serve as a facilitator for effective LMS use for teachers (Law et al., 2018). Furthermore, the use of Moodle LMS has also been influenced by teachers’ prior training on Moodle. The absence of prior training on Moodle has resulted in

many teachers not being familiar with activities and resources in Moodle in order to use them effectively (Al-Naabi, 2023; Buinytska et al., 2021). This has caused failure in effective implementation and continuation of digital learning via LMS (Al-Naabi, 2023). Therefore, the sustainability of digital learning in higher education requires to equip the teachers with digital literacy skills and provide necessary training opportunities regarding digital technologies (Bove & Conklin, 2020).

Moodle to Assess Academic Performance of Students

Moodle has offered various assessment methods which could be aligned according to the learning objectives. Moodle can produce large collections of questions, including multiple-choice, generative questions, open answer, and complex tasks (Gamage et al., 2022). Students have appreciated providing different types of assessment methods as it provides equal opportunities for every student to demonstrate their performance. Students have been satisfied with the design of the tests and content, and the effectiveness of the tests designed in Moodle platform (Kharchenko et al., 2021; Zeller & Marquet, 2023). Though shifting to online education through Moodle LMS has affected continuous assessment outcomes very little in terms of student performance, it has caused more drop-out rates (De Santos-Berbel et al., 2022). The reason for this has been identified as the lack of opportunities for complete collaborative assessment tasks in the online environment. While face-to-face classroom interaction encourages a social environment with interpersonal communications, the lack of interaction with peers and peer-learning in online environment could have diminished opportunities to engage in collaborative assignments (De Santos-Berbel et al., 2022).

Gamification in Moodle

Incorporation of gamification features as points, badges, and leaderboards in courses offered via Moodle has increased the level of active participation in the education process by encouraging task completion and has helped to improve the final results of the students (Kaufmann, 2018). Gamification is identified as a highly effective strategy to increase students' learning engagement (Alexander, 2017; Kaufmann, 2018). Therefore, in online learning environment, where boredom and lack of interest can occur due to lack of interactions, gamification can make the student motivated to actively engage in learning (Kaufmann, 2018).

Moodle for Learning Analytics

Online LMSs make it convenient for teachers to analyse students' data (Gamage et al., 2022). Eight of the articles reviewed discussed the in-built statistical tools in Moodle for learning analytics. The articles used data mining and statistical tools to measure and analyse student engagement, student satisfaction, and online courses' performance (Aitdaoud et al., 2023; Al-Kindi & Al-Khanjari, 2022; Dobashi et al., 2022; Llerena et al., 2021; Maloney et al., 2022; Paajanen, 2022; Poellhuber et al., 2023; Suay et al., 2022). However, from the perspective of the students, they have preferred external tools as "analytic dashboards", which enabled them to track their performance level, their progress in the course, and performances compared to the rest of the class (Jayashanka et al., 2022). The information-rich learning analytic dashboard has motivated the students to actively engage with the learning activities (Jayashanka et al., 2022).

Moodle Plug-ins

Moodle has numerous plug-ins that can add new functions that improve administration, assessment, collaboration, communication, content, and the interface (Moodle, 2024b). This indicates the interest of software developers and researchers to expand the usability of Moodle for teaching and education (Gamage et al., 2022). In the reviewed studies, plug-ins have been incorporated in Moodle LMS to effectively achieve aims which are difficult to fulfil through in-built Moodle features such as supporting self-regulated learning (Villalobos et al., 2022), providing learning analytics for students (Jayashanka et al., 2022; Molins & García, 2023; Safsouf et al., 2021), delivering augmented reality (AR) mediated quizzes (Rodríguez et al., 2023), increasing interaction and feedback in online classroom (Bikanga Ada, 2023), and enhancing collaborative learning in Moodle platform (Brandenburger & Janneck, 2021; Peramunugamage et al., 2020).

Conclusion

Moodle LMS continues to play an important role in supporting digital learning in higher education because it is affordable, flexible, and adaptable to different teaching and learning needs. Its open-source nature, ability to integrate with other platforms, variety of assessment methods, and wide range of learning activities have contributed to its widespread use in universities around the world. However, this scoping review shows that simply having access to Moodle is not enough to ensure effective digital learning. The success of Moodle-based learning largely depends on how well universities support meaningful teaching and learning practices within the online environment.

One of the key implications of this review is that universities need to rethink how they implement digital learning and train both staff and students to use LMS platforms effectively. Training programmes should move beyond teaching only the technical aspects of Moodle and instead focus on how to use the platform to create engaging and interactive learning experiences. Academic staff should be supported to develop skills in online interaction, collaborative learning, inclusive course design, and digital pedagogy. At the same time, students should be guided in developing digital literacy, self-regulated learning skills, and effective online communication practices, as these are increasingly important for successful learning in digital environments.

Overall, the long-term sustainability of Moodle LMS in higher education depends not only on improvements in technology, but also on the ability of universities to build supportive digital learning ecosystems that combine strong infrastructure, effective pedagogy, learner support and evidence-based decision-making. Future studies could further explore how AI-enhanced Moodle environments, learning analytics, and socially interactive LMS designs influence student engagement, learning outcomes, and the broader digital transformation of higher education.

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