

# Effectiveness of E-Learning Platforms in Higher Education: A Comparative Literature Review (2020–2025)

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**Abstract:** E-learning has become a vital pillar in higher education, especially since the COVID-19 pandemic forced a sudden shift towards digital learning methods. This article examines the effectiveness of e-learning platforms through a comparative literature review (2020–2025), focusing on Moodle, Google Classroom, Microsoft Teams, Zoom, and CIDOS 4.0 as the local platform. The study evaluates aspects of student engagement, accessibility, assessment, and technological innovation. Findings reveal that although e-learning enhances flexibility, challenges remain in terms of the digital divide, system usability, and reliability of assessment. This review highlights that Moodle provides strong interactive and assessment features, while Google Classroom offers simplicity and accessibility but lacks advanced analytics. Microsoft Teams supports collaboration and integration with Office 365, yet requires stable internet. Zoom is highly effective for synchronous interaction but less suitable for task management. CIDOS 4.0 addresses Malaysia's TVET context but continues to face issues with server stability and user interface design. Beyond platform-specific strengths and weaknesses, the analysis emphasizes that student engagement, fair access, and reliable evaluation methods are central to e-learning effectiveness. Hybrid approaches that combine face-to-face and online learning are identified as the most effective strategy within the Malaysian higher education context. The study concludes that institutions must not only choose appropriate platforms but also enhance digital literacy, invest in infrastructure, and explore innovations such as AI and gamification. These measures can maximize e-learning's potential to improve teaching, learning quality, and the broader digital transformation of higher education.

**Keywords:** Comparative Study; E-learning; Google Classroom; Higher Education; Moodle.

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## 1. INTRODUCTION

Over the last five years, the development of information and communication technology (ICT) has been a major driver in the transformation of higher education. The emergence of e-learning platforms not only introduced new ways to access learning materials but also became a necessity during global crises such as the COVID-19 pandemic, which began in 2020. The sudden transition to online learning tested the effectiveness of digital platforms in supporting distance education and ensuring academic continuity [1], [2]. Globally, platforms such as Moodle, Google Classroom, Microsoft Teams, and Zoom were the primary choices for universities and colleges. In Malaysia, polytechnics and community colleges use CIDOS 4.0 as the official learning management system. Despite advantages in accessibility, challenges remain, including the digital divide between urban and rural students, low learning motivation, and the reliability of online assessments [3], [4].

## 2. RESEARCH METHODOLOGY

This study employs a systematic literature review (SLR) approach that involves several key stages. The first stage consisted of searching academic databases such as Scopus, IEEE Xplore, SpringerLink, Elsevier ScienceDirect, Taylor & Francis, and Google Scholar. The search was limited to articles published between 2020 and 2025 to ensure the inclusion of up-to-date resources. Keywords used included E-learning, Higher Education, Moodle, Google Classroom, Microsoft Teams, Zoom, CIDOS 4.0, Student Engagement, and Digital Learning Malaysia.

A screening process was then conducted by applying inclusion and exclusion criteria. Eligible articles included journal papers, conference proceedings, or academic reports that discussed the effectiveness of e-learning platforms in higher education. Excluded were articles published before 2020, non-academic works, or editorials without empirical data. Out of more than 150 articles identified in the initial search, 40 were shortlisted after abstract screening. Ultimately, 18 articles were selected for in-depth analysis as they met the study's criteria.

The analysis was then categorized into four key themes: student engagement, accessibility, assessment, and technological innovation. Each theme was compared across platforms to identify trends, strengths, and weaknesses.

## 3. ANALYSIS AND DISCUSSION

Findings from the literature review indicate that the effectiveness of e-learning platforms can be evaluated through four main aspects: student engagement, accessibility, assessment, and technological innovation.

### Student Engagement

Student engagement is a critical factor in determining the success of any e-learning platform. Studies found that Moodle offers a wide range of interactive features such as discussion forums, quizzes, and SCORM modules that foster active participation. Microsoft Teams provides effective collaboration through breakout rooms and live document sharing, while Zoom emphasizes synchronous interaction using video, polling, and breakout rooms. However, Zoom's limitation is its focus mainly on synchronous learning, unlike Moodle, which combines both synchronous and asynchronous elements. Google Classroom is user-friendly and efficient for managing assignments but lacks advanced gamification and interactivity. CIDOS 4.0 is suitable for the TVET context but struggles with user interface design and server stability, which negatively affect student engagement.

PLATFORM	KEY ENGAGEMENT FEATURES	WEAKNESSES	REFERENCES
MOODLE	Forums, interactive quizzes, SCORM modules	Requires technical skills	[6], [7]
GOOGLE CLASSROOM	Assignments, simple comments, user-friendly	Limited gamification	[8]
MICROSOFT TEAMS	Breakout rooms, document collaboration	Requires stable internet	[7], [9]
ZOOM	Live interaction, polling, breakout rooms	Limited to synchronous use	[9]
CIDOS 4.0	Basic forum, assignments, local quizzes	Server & UI issues	[10]

### Accessibility and Usability

From the accessibility perspective, literature emphasizes that Google Classroom is the most user-friendly due to its lightweight design, ease of use, and availability across multiple devices, including smartphones. Moodle also has an advantage as it is open-source and supports mobile applications for easier access. However, Microsoft Teams and Zoom require more stable internet connections and higher data usage, which pose difficulties for students in areas with poor infrastructure. In Malaysia, CIDOS 4.0 is used officially in Polytechnics and Community Colleges but continues to face usability challenges, especially with unstable servers and an interface considered less user-friendly.

PLATFORM	ADVANTAGES	DISADVANTAGES	REFERENCES
MOODLE	Open-source, mobile application	Complex interface	[11]
GOOGLE CLASSROOM	Lightweight, mobile-friendly	Limited analytics	[12]
MICROSOFT TEAMS	Integrated with Office 365	High data consumption	[13]
ZOOM	Easy to use for live lectures	Poor suitability in low-bandwidth areas	[9], [13]
CIDOS 4.0	Tailored for Malaysian TVET	Unstable servers	[14]

### Assessment and Feedback

Assessment effectiveness is another crucial aspect widely discussed in recent studies. Moodle is recognized as the most comprehensive platform for assessment, supporting multiple forms of assignments, quizzes, and performance analytics through plugins. Google Classroom provides only basic assessment features such as assignments and short feedback, making it less suitable for deeper learning analysis. Microsoft Teams integrates with Office 365 applications like OneNote and Excel, enabling collaborative feedback, though the process can be complex. Zoom lacks built-in assessment functions, relying on third-party applications for assignments and quizzes. CIDOS 4.0 provides basic assessment features sufficient for TVET institutions but is often hindered by technical issues.

PLATFORM	ASSESSMENT SUPPORT	TECHNOLOGICAL INNOVATION	WEAKNESSES
MOODLE	Quizzes, assignments, performance analysis	AI integration, gamification	Requires intensive training
GOOGLE CLASSROOM	Basic assessment, short feedback	Integration with Google Suite	No detailed analytic reports
MICROSOFT TEAMS	Integration with OneNote, Excel, SharePoint	AI collaboration, cloud-based	Complex for new users
ZOOM	No built-in assessment	VR/AR via add-ons	Not suitable for official tests
CIDOS 4.0	Basic quizzes, assignments	TVET-focused	Technical issues, limited innovation

### Technological Innovation

From the innovation perspective, recent studies highlight that integrating new technologies such as Artificial Intelligence (AI), gamification, and Virtual/Augmented Reality (VR/AR) positively impacts student motivation and achievement. For example, AI-based e-learning systems can adapt content to individual student capabilities, creating personalized learning experiences. Gamification elements like achievement badges and leaderboards have been proven to increase student motivation to continue online courses. However, VR/AR requires high costs and

advanced infrastructure, making it more suitable for well-funded institutions. In Malaysia, such innovations are still in the early stages of adoption and have yet to be widely implemented.

#### 4. IMPLEMENTATION

In Malaysia, the most visible implementation of e-learning is through CIDOS 4.0 in Polytechnics and Community Colleges. This platform functions as a learning management system that supports assignments, forums, quizzes, and lecturer-student interactions. Although it frequently experiences server instability and interface design weaknesses, CIDOS 4.0 has ensured continuity of teaching and learning throughout the COVID-19 pandemic.

Besides CIDOS 4.0, many higher education institutions also adopted alternative platforms such as Google Classroom, Microsoft Teams, and Zoom to complement learning. Studies reveal that combining multiple platforms is more effective since each has unique strengths. For instance, Google Classroom is widely used for assignment management, Microsoft Teams for group discussions and official meetings, while Zoom is favored for interactive live lectures.

Blended learning, which merges face-to-face and online elements, has become the preferred model post-pandemic. This model is particularly important for TVET students, as technical skills still require hands-on sessions in labs or workshops. Therefore, e-learning cannot completely replace traditional learning but serves as a complementary tool to enhance teaching and learning effectiveness.

#### 5. CONCLUSION

This literature review demonstrates that e-learning plays a significant role in sustaining higher education, particularly in the post-pandemic era. However, no single platform excels in all aspects. Moodle and Microsoft Teams are more effective in providing interactive functions and assessments, while Google Classroom offers easier access for students with varied levels of digital literacy. Zoom is effective for live interaction but lacks task management capabilities. CIDOS 4.0, as a local platform, addresses TVET needs but still requires substantial technical improvements to achieve higher levels of effectiveness.

Overall, hybrid approaches that integrate online and face-to-face learning are the most suitable strategies for ensuring learning effectiveness. Higher education institutions must focus on improving digital literacy among both lecturers and students while exploring new technologies such as AI and gamification. With these measures, e-learning can enhance teaching effectiveness and contribute to the broader digital transformation agenda in Malaysian higher education.

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