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Computer Applications in Online Learning Management Systems: A Review of Moodle and Canvas with Emphasis on Features, User Engagement, and Facilitation of Remote Education

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ABSTRACT: Learning Management Systems (LMS) represent critical computer applications that support the design, delivery, assessment, and administration of online and blended education. This review examines two widely adopted platforms—Moodle (open-source) and Canvas (cloud-native commercial)—focusing on their core features, mechanisms for fostering user engagement, and contributions to remote education. Drawing on platform documentation, comparative analyses, and empirical literature, the paper highlights Moodle’s modular flexibility, extensive plugin ecosystem, and social-constructivist foundations alongside Canvas’s intuitive interface, integrated analytics, and streamlined collaboration tools. Both systems have proven effective in sustaining remote learning continuity, particularly during and after the COVID-19 pandemic, though they differ in customization depth, ease of use, total cost of ownership, and technical requirements. The review concludes with implications for educational institutions in resource-constrained and digitally evolving contexts, including India, and identifies directions for future research on AI integration and learning analytics.

Paper type: Review Paper

KEYWORDS: Learning Management Systems, Moodle, Canvas, online learning, remote education, user engagement, computer applications in education

I. INTRODUCTION

The rapid expansion of digital education has positioned Learning Management Systems as foundational computer applications within Computer Science and Applications. An LMS is a software platform that enables educators to create, deliver, track, and manage instructional content and learner interactions in online or hybrid environments (Al-Fraihat et al., 2020). The global shift to remote education accelerated by the COVID-19 pandemic underscored the necessity of robust LMS platforms capable of supporting asynchronous and synchronous learning at scale. [1]

Among the numerous LMS solutions available, Moodle and Canvas stand out due to their widespread institutional adoption, complementary strengths, and extensive research attention. Moodle, developed by Martin Dougiamas and first released in 2002, is an open-source platform grounded in social constructivist pedagogy. Canvas, launched by Instructure in 2011, is a cloud-hosted commercial system emphasizing usability and modern design. This review analyses their features, approaches to user engagement, and roles in facilitating remote education, with particular relevance for higher education and training contexts in developing regions.

II. OVERVIEW OF LEARNING MANAGEMENT SYSTEMS AS COMPUTER APPLICATIONS

Modern LMS platforms integrate multiple computer science domains: web technologies (HTML5, responsive design), databases for user and content management, authentication and security protocols, APIs for interoperability (e.g., LTI 1.3, SCORM, xAPI), mobile applications, and increasingly artificial intelligence for personalization and analytics. Core functional modules typically include course authoring and organization, assessment engines, communication tools, gradebooks, reporting dashboards, and administrative controls (roles, permissions, enrollments). [2]



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These systems support fully online, blended, and flipped-classroom models. Their effectiveness depends on pedagogical alignment, technical reliability, accessibility (WCAG compliance), and the capacity to generate actionable data on learner behavior.

III. MOODLE: FEATURES, ARCHITECTURE, AND CAPABILITIES

Moodle (Modular Object-Oriented Dynamic Learning Environment) is free under the GNU General Public License and can be self-hosted or deployed via MoodleCloud or certified partners. Its modular architecture allows extensive customization through more than 2,000 community plugins. [3]

Key features include:

Course management: Flexible formats (topics, weekly, social), activity completion tracking, conditional access, and competency frameworks.

Assessment tools: Rich quiz engine with 15+ question types, workshops for peer assessment, assignments with inline annotation, and advanced grading methods.

Collaboration and communication: Discussion forums, wikis, glossaries, messaging, blogs, and integration with BigBlueButton for virtual classrooms featuring breakout rooms, whiteboards, and polling.

Engagement and gamification: Badges, certificates, experience points (via plugins), leaderboards, and H5P interactive content.

Analytics and reporting: Activity logs, completion reports, gradebook exports, and predictive models (e.g., students at risk of dropping out). Recent versions (Moodle 4.x–5.2) have improved usability, AI provider integrations (e.g., OpenAI, Gemini), and mobile offline support.

Accessibility and Multilanguage support: WCAG 2.1 AA compliance options and support for 120+ languages.

Empirical reviews indicate that Moodle is frequently used in STEM higher education and improves student performance, satisfaction, and engagement when interactive activities (quizzes, forums, workshops) are effectively designed (Gamage et al., 2022). Its open-source nature makes it particularly attractive for institutions seeking data sovereignty and low licensing costs, though it requires technical expertise for optimal configuration and maintenance.

IV. CANVAS: FEATURES, ARCHITECTURE, AND CAPABILITIES

Canvas is a proprietary, cloud-native LMS offered primarily as Software-as-a-Service (SaaS). It prioritizes a clean, consistent user interface and rapid deployment with minimal institutional IT overhead. [4]

Key features include:

Course management: Module-based organization, Mastery Paths for differentiated learning, Outcomes tracking, and easy content import/export.

Assessment and feedback: Modern quizzes, SpeedGrader for efficient annotation and rubric-based scoring, peer review, and automated grading.

Collaboration and communication: Discussions, Announcements, Inbox messaging, real-time notifications, Collaborations (e.g., Google Docs), and native or integrated video conferencing (Zoom, BigBlueButton, Microsoft Teams). Canvas Studio supports interactive video.

Engagement tools: Badges, to-do lists, calendars, and group workspaces.

Analytics: New Analytics and Admin Analytics dashboards providing course- and student-level data on page views, participation, grades, and submission patterns. Advanced options include Canvas Data for institutional warehouses and Intelligent Insights for at-risk identification and AI-assisted querying.

Mobile experience: Highly rated native iOS and Android apps for both students and instructors.

Interoperability: Strong LTI 1.3 support and Edu App Center integrations with Google Workspace, Microsoft 365, and numerous third-party tools. [5]

Canvas consistently receives high marks for ease of use and faculty adoption speed. Comparative studies note its polished interface and built-in analytics as advantages for institutions prioritizing rapid onboarding over deep code-level customization (SelectHub, 2026; Instructure comparative materials).



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V. COMPARATIVE ANALYSIS OF FEATURES AND USER ENGAGEMENT

A synthesis of recent comparisons reveals complementary profiles:

Dimension	Moodle	Canvas
Licensing & Hosting	Free open-source; self-hosted or cloud	Subscription SaaS; cloud-only
Customization	Extensive (plugins + source code)	Configuration & theming; limited code access
User Interface	Functional; improved in 4.x/5.x	Modern, intuitive, low learning curve
Assessment Depth	Very high (question types, workshops)	Strong (SpeedGrader, modern quizzes)
Built-in Analytics	Solid + highly extensible via plugins	Strong out-of-the-box dashboards
Collaboration	Forums, wikis, BigBlueButton (integration)	Discussions, Collaborations, notifications
Mobile Experience	Functional app with offline support	Highly polished native apps
Total Cost of Ownership	Low licensing; higher technical overhead	Higher licensing; lower maintenance

User engagement is supported in both platforms through forums/discussions, notifications, gamification elements, and progress visualization. Moodle's social-constructivist design emphasizes collaborative knowledge construction (wikis, workshops, peer assessment). Canvas emphasizes frictionless interaction and real-time visibility of engagement metrics, enabling timely instructor intervention. Studies report positive effects on motivation and participation when interactive features are purposefully employed (Zhao & Park, 2024; various LMS comparative reviews).

Both platforms support mobile learning, a critical factor for remote and geographically dispersed learners. Accessibility compliance and multilanguage capabilities further broaden reach.[6]

IV. ROLE IN FACILITATING REMOTE EDUCATION

LMS platforms proved indispensable during the sudden transition to emergency remote teaching. Moodle and Canvas enabled continuity of instruction through content repositories, asynchronous activities, synchronous virtual classrooms, online assessments, and communication channels. Features such as conditional release, activity completion, and analytics allowed instructors to monitor progress and identify disengaged learners—functions essential in fully online settings where physical cues are absent.

In resource-constrained environments, Moodle's zero licensing cost and self-hosting options have facilitated adoption in many developing countries, including institutions across India and other Global South regions. Canvas's managed cloud model reduces infrastructure burdens for institutions with limited technical staff. Both systems integrate with video conferencing, plagiarism detection, and external content repositories, supporting hybrid and fully remote models.

Post-pandemic, these platforms continue to underpin flexible learning pathways, competency-based education, and lifelong learning initiatives. Emerging AI integrations (content generation, summarization, predictive analytics) further enhance personalization and instructional efficiency.

VII. CHALLENGES AND LIMITATIONS

Common challenges include the digital divide (device and connectivity access), the need for faculty digital pedagogical skills, potential for reduced social presence if tools are underutilized, and data privacy/security concerns. Moodle's flexibility can result in inconsistent user experiences across courses if institutional templates and training are inadequate. Canvas's subscription model may pose budgetary challenges for large-scale or public institutions. Both require ongoing attention to accessibility, inclusive design, and equitable engagement strategies.



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VIII. CONCLUSION AND FUTURE DIRECTIONS

Moodle and Canvas exemplify the maturation of computer applications in education. Moodle offers unmatched flexibility and cost advantages for technically resourced institutions committed to open-source principles and deep customization. Canvas provides a polished, low-friction experience that accelerates adoption and delivers strong native analytics. Both demonstrably support user engagement and the effective facilitation of remote education when aligned with sound pedagogy.

For Indian higher education and vocational training contexts, hybrid strategies—leveraging Moodle for institutional control and cost efficiency, or Canvas where rapid usability and vendor support are prioritized—warrant careful evaluation against local infrastructure, faculty readiness, and learner demographics. Future research should examine longitudinal learning outcomes, the impact of AI-enhanced features on engagement equity, cross-cultural usability, and integration with national digital education frameworks. Continued advances in learning analytics, adaptive pathways, and interoperable ecosystems will further strengthen the role of LMS platforms as central computer applications in 21st-century education.

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