

# The Role of Academic Libraries in E-Learning Ecosystems in Higher Education: A Narrative Review

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**Abstract:** As higher education continues its shift toward digitally mediated instruction, academic libraries have undergone a profound transformation, moving from traditional custodians of print collections to dynamic partners in e-learning. This narrative review explores the evolving contributions of academic libraries to the development and sustainability of online learning ecosystems, guided by Connectivist Learning Theory (Siemens, 2005). Drawing on peer-reviewed literature, institutional case studies, and policy documents published between 2013 and 2024, the review synthesizes emerging practices and conceptual frameworks that define the library's role in digital education. Findings reveal that libraries now play multifaceted roles: curating digital resources, embedding services into Learning Management Systems (LMS), delivering virtual information literacy instruction, and collaborating with faculty on course design. Libraries also lead in initiatives such as Open Educational Resources (OER), personalized learning support, and digital scholarship. However, persistent challenges including inadequate digital infrastructure, limited staff capacity, and marginalization in institutional strategy constrain broader impact. By organizing these developments thematically and theoretically, this review offers a comprehensive lens on how libraries are reshaping their identities within higher education. It reinforces the need for strategic investment, cross-departmental integration, and further research to fully leverage libraries as critical enablers of inclusive and sustainable digital learning.

**Keywords:** Academic Libraries, E-Learning, Digital Pedagogy, Higher Education, Narrative Review, Learning Ecosystems

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## 1. Introduction and Background

Academic libraries have evolved from custodians of physical collections into dynamic facilitators of digital learning. The growth of e-learning has expanded their roles, positioning libraries as active partners in educational delivery, digital innovation, and student success (Steele, 2019; Brenton & Tury, 2021). A key aspect of this transformation is digital resource curation. Libraries provide e-books, scholarly databases, multimedia resources, research guides, and course-integrated materials to support virtual learning (Steele, 2019; Oyedokun, 2024). Emerging technologies, including artificial intelligence, virtual reality, and learning analytics, further enhance personalized and interactive services (Onunka et al., 2023; Bihan, 2022). Virtual reference services, including 24/7 chat, video conferencing, and asynchronous support, enable equitable research assistance for geographically dispersed learners (Steele, 2019; La Macchia, 2020). Similarly, information literacy instruction has shifted to online tutorials, interactive modules, and virtual workshops embedded in Learning Management Systems. These services require librarians to combine technological and pedagogical expertise while developing students' critical research and evaluation skills (Garner et al., 2024; Vogus, 2020). Collaboration with academic staff has also strengthened, with librarians contributing to curriculum development and co-creating digital learning materials such as video tutorials and modular resources (Owens et al., 2024; Makwana & Gadhavi, 2023; Sanches, 2018). Overall, libraries have become collaborative and pedagogically aligned partners in e-learning, supporting more responsive, inclusive, and digitally oriented education (Farmer, 2019).

### 1.1 Problem Statement

Despite the rapid expansion of e-learning in higher education and the transformation of academic libraries from custodians of print collections into active partners in digital pedagogy (Eyre et al., 2017), the literature examining this transformation remains fragmented across library science, educational technology, and higher education research. Studies identify various library functions, including digital resource curation, virtual reference, embedded librarianship, LMS integration, and support for Open Educational Resources (Abhinandan, 2026), but rarely synthesise these contributions into a coherent understanding of how academic libraries support e-learning ecosystems. Consequently, the contribution of academic libraries to the development and sustainability of e-learning ecosystems remains fragmented and insufficiently understood, despite their expanding pedagogical, technological, and information-support roles. This problem is further compounded by inconsistent theoretical grounding and considerable variation in institutional contexts, with research often examining individual library initiatives or cases rather than synthesising their broader contribution to e-learning (Bah et al., 2024). The lack of an integrated understanding makes it difficult for higher education institutions to recognise how academic libraries contribute to the development, continuity, and sustainability of e-learning environments. This narrative

literature review therefore synthesises existing research to examine the ways in which academic libraries have contributed to the development and sustainability of e-learning ecosystems in higher education, while identifying the key roles and challenges emerging from the literature.

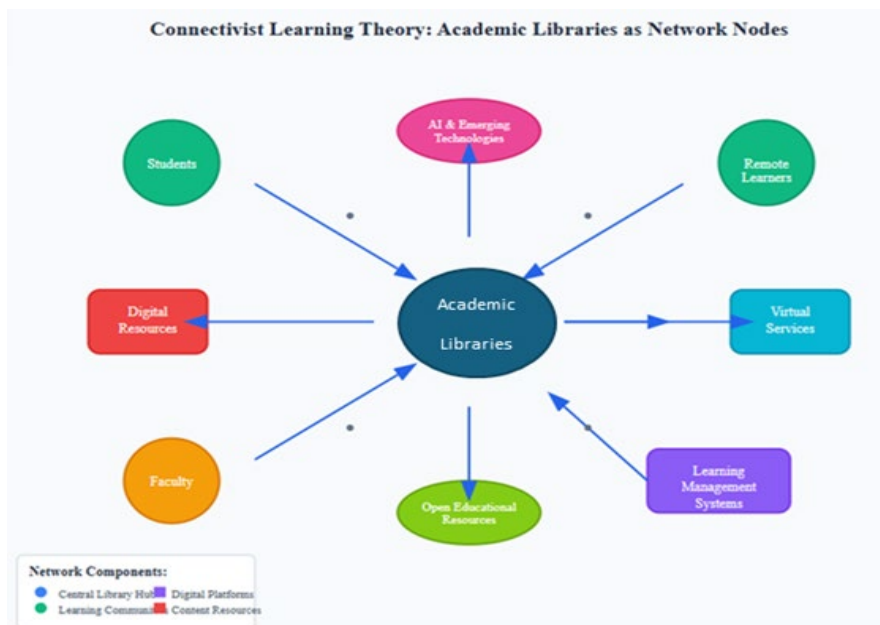
## 1.2 Research Question and Objectives

This narrative review is guided by the central research question: *In what ways have academic libraries contributed to the development and sustainability of e-learning ecosystems in higher education?* To address this question comprehensively, the review pursues several specific objectives:

- To identify and categorize the various roles that academic libraries have assumed within e-learning environments
- To explore and analyse the theoretical perspectives that underpin the role of libraries within higher education ecosystems
- To explore how academic libraries are integrated into higher education e-learning systems
- To identify and analyse the challenges that shape and limit library contributions to e-learning in higher education
- To present emerging trends and innovative practices in library-supported digital education.

## 1.3 Theoretical Framework

This review is grounded in Connectivist Learning Theory, proposed by Siemens (2005), which posits that learning occurs through the formation and navigation of networks comprising individuals, digital content, and technological platforms. Within this framework, academic libraries function as critical nodes in the e-learning ecosystem. They facilitate access to distributed knowledge, support the development of digital literacy skills, and enable learners to engage meaningfully with information in a connected environment. Connectivism emphasizes the learner's ability to identify, connect, and traverse diverse sources of knowledge. Academic libraries play a central role in this process by offering curated digital resources, guiding students in evaluating information, and fostering the competencies needed to thrive in digitally mediated learning spaces. This theoretical lens positions libraries not merely as information providers, but as integral facilitators of learning within dynamic, networked educational systems. Figure 1 below illustrates how academic libraries act as central nodes in the e-learning ecosystem, aligning with the core principles of Connectivist Learning Theory.



Source: Author, 2026

**Figure 1:** This illustrates Connectivist Learning Theory, with the academic library serving as a central network node connecting students, faculty, digital resources, virtual services, LMS platforms, OER and emerging technologies. It highlights the library's role in connecting learners to information, technology and learning support within the e-learning environment.

## 1.4 Methodology

This study employed a narrative literature review within an interpretivist paradigm to examine academic libraries' evolving contribution to e-learning in higher education. The approach supported the synthesis of diverse theoretical and empirical perspectives across library science, educational technology, and digital pedagogy (Green et al., 2006; Snyder, 2019). The review included peer-reviewed English-language journal articles published between 2015 and 2024 on academic libraries, e-learning, digital literacy, information literacy, and higher education. Relevant studies were thematically analysed through open coding, grouping similar concepts into broader categories. Iterative refinement produced five themes addressing library roles, theoretical foundations, integration practices, and challenges, which structured Section 2.

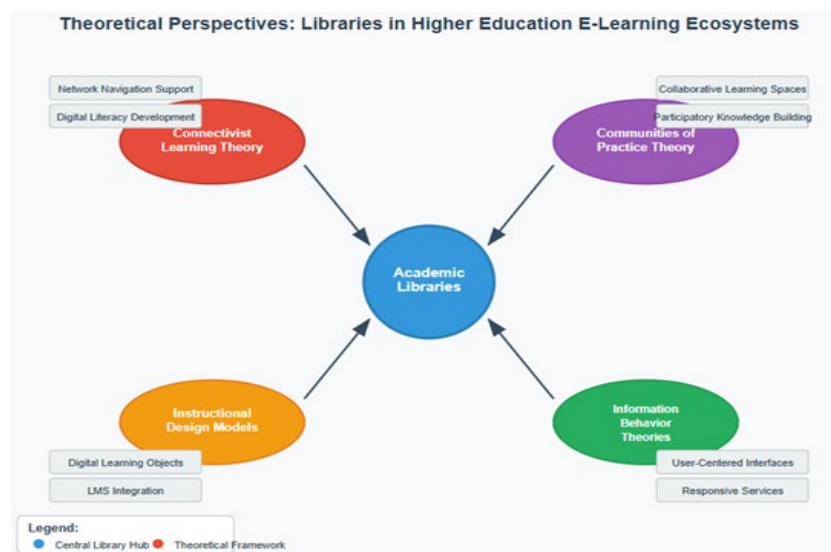
## 2. Overview of Literature

### 2.1 The Evolving Roles of Academic Libraries in E-Learning Ecosystems

As introduced in Section 1, academic libraries have moved from custodians of physical collections to active facilitators of digital learning, expanding into digital resource curation, virtual reference, information literacy instruction, and collaboration with academic staff (Steele, 2019; Brenton & Tury, 2021; Oyedokun, 2024; Onunka et al., 2023; Bihan, 2022; La Macchia, 2020; Garner et al., 2024; Vogus, 2020; Owens et al., 2024; Makwana & Gadhavi, 2023; Sanches, 2018; Farmer, 2019). These developments position libraries as increasingly collaborative and pedagogically integrated partners within higher education.

### 2.2 The Role of Libraries in Higher Education Ecosystems: Theoretical Perspectives

Academic libraries contribute to e-learning through several theoretical perspectives. Connectivist Learning Theory positions libraries as nodes in digital learning networks that provide curated information and support digital literacy and information navigation (Siemens, 2005; Detterbeck & Sciangula, 2017; Duke et al., 2013). Communities of Practice Theory views libraries as collaborative spaces that facilitate knowledge sharing and co-creation (Transue, 2013; Kim, 2015). From an Instructional Design perspective, libraries support teaching through digital learning objects, LMS integration, and collaboration with faculty to align information literacy with course objectives (Fonseca et al., 2024; Yukawa, 2010). Information Behaviour Theories, including TRA, TAM and TPB, highlight the importance of users' attitudes, intentions and behaviours in engaging with digital resources, informing the development of responsive, user-centred services (Efird et al., 2024; Salim et al., 2016; Kwanya, 2016). Collectively, these perspectives show how libraries support networked learning, collaboration, pedagogical integration and user-centred services in e-learning environments. Figure 2 integrates these theoretical perspectives and illustrates the multifaceted role of academic libraries in digital learning ecosystems.



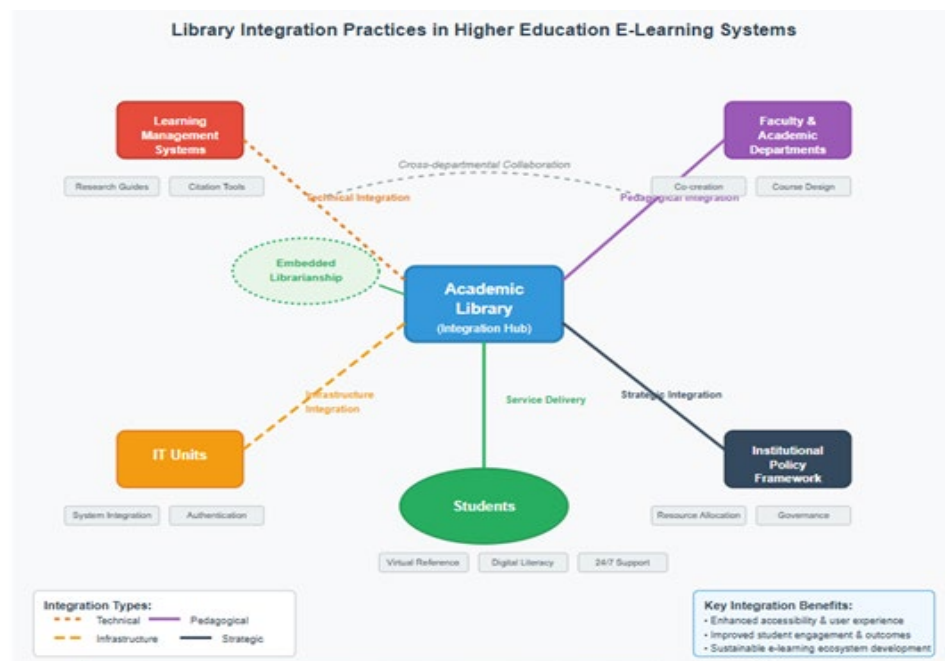
Source: Author, 2026

**Figure 2:** Illustrates how the four theoretical perspectives complement rather than compete with one another. Connectivism and Communities of Practice emphasise networked and collaborative learning, while

Instructional Design and Information Behaviour highlight applied, user-centred services. Together, they capture the library's pedagogical, technical, and social contributions to e-learning ecosystems.

### 2.3 Library Integration Practices in Higher Education E-Learning Systems

Academic libraries are increasingly integrated into e-learning through Learning Management Systems (LMS), embedded services, and collaboration with academic and technical staff. LMS integration allows research guides, citation tools, and course-specific resources to be placed directly within online courses, providing students with timely access to information without moving between platforms (Nel, 2020; Karplus, 2017). This approach makes library support more accessible and connects information-literacy development with students' immediate learning activities. Embedded librarianship further strengthens this integration by positioning librarians as partners in online teaching and learning. Librarians may contribute to course design, provide targeted research support, and participate in online learning activities, thereby extending library expertise into the curriculum (Kumar et al., 2024). Such integration also depends on collaboration with academic staff and IT units to align library services with curricular and technological requirements (Arroyo-Vázquez & Gómez-Hernández, 2020; Jank, 2013). The literature therefore suggests that effective e-learning integration requires libraries to work across institutional boundaries rather than operate as separate support services. At the institutional level, integrating library strategies into policies and planning can strengthen the sustainability of these practices by supporting coordinated governance, resource allocation, and service delivery (Kumar et al., 2024). However, limited awareness of library services among students and faculty remains a constraint, highlighting the need for ongoing training, evaluation, and outreach (Digital Collaborative Governance, 2022). Overall, the literature indicates a shift from standalone library services towards embedded, collaborative, and strategically aligned participation in e-learning. Figure 3 illustrates these integration practices and their relationship within higher education e-learning systems.



Source: Author, 2026

**Figure 3: Positions the academic library as an integration hub linking four interdependent domains: Learning Management Systems (technical), faculty and academic departments (pedagogical), IT units (infrastructure), and institutional policy frameworks (strategic). The cross-departmental connections highlight that effective e-learning integration requires institution-wide coordination, governance, resource allocation, and aligned service delivery, as discussed in Section 2.3.**

### 2.4 Challenges Framing Library Contributions to E-Learning

Academic libraries' contributions to e-learning are constrained by technological, financial, human-resource, institutional, and ethical challenges. These barriers shape the extent to which libraries can provide accessible

and integrated digital learning support. Legacy systems, inadequate network infrastructure, complex authentication, and poor mobile optimization limit seamless access to digital resources (Hu & Raman, 2024; Brenton & Tury, 2021). Rising digital-resource costs and inadequate funding for infrastructure and staff development further restrict institutional capacity (Satvik & Naik, 2024; Hu & Raman, 2024). These challenges are compounded by the digital divide, particularly among students with limited connectivity and devices (McAllister, 2018; Pettalongi et al., 2024). Effective digital transformation requires librarians with technological and pedagogical competencies, yet recruitment, retention, and competing traditional and digital responsibilities can contribute to professional fatigue (Frank et al., 2021; Barthorpe & Wright, 2017). Faculty resistance, departmental silos, and limited recognition of libraries' pedagogical value can also restrict collaboration and curriculum integration (Pathak, 2023; Lalitha et al., 2024; Din & Ali, 2024). AI, immersive technologies, and personalized learning tools create additional concerns regarding privacy, depersonalization, infrastructure requirements, and equitable access (Idowu, 2024; Lo & Vitale, 2024; Priya & Ramya, 2024). Therefore, technological advancement must be accompanied by ethical governance and attention to equitable access. Overall, these challenges do not diminish the importance of academic libraries; rather, they demonstrate that their contribution to e-learning depends on institutional capacity, technological readiness, staff competencies, collaboration, and responsible innovation.

## 2.5 Innovations and Emerging Trends in Library-Supported Digital Education

Library-supported digital education is increasingly personalised, interactive, and learner-centred, with AI, immersive technologies, gamification, OER, digital scholarship, personalised learning, and embedded librarianship reshaping library support. AI enables 24/7 reference assistance, personalised recommendations, and course-aligned content analysis (Fitria, 2023; Shankar et al., 2023), while VR and AR support experiential learning through virtual environments and simulations (Sarkar, 2023; Pope, 2018). Gamification enhances engagement in research and information literacy (Pope, 2018), while OER strengthens affordability and access through open-material development and adoption (Katz, 2019; Goodsett et al., 2015; Cassidy et al., 2016; Henke et al., 2024). Digital scholarship and learning analytics provide specialised tools, training, publishing platforms, and personalised support (Gisip et al., 2024; Giannaros et al., 2020; Priya & Ramya, 2024), including adaptive sequencing, learner profiling, and flexible pacing (Çullhaj, 2017). Embedded librarianship integrates librarians into online courses and LMSs to provide research and information-literacy support (Bonnand & Hansen, 2012; Tumbleson, 2016). Collectively, these developments position libraries as active partners in digital education, although sustainability requires investment, institutional alignment, inclusivity, and ethical technology use.

## 3. Discussion and Interpretation of Findings

The findings indicate that academic libraries are shifting from traditional resource providers to active participants in e-learning ecosystems. Their roles now extend to digital resource curation, virtual reference, information-literacy support, LMS integration, embedded librarianship, collaboration with academics, OER and emerging technologies. This suggests that effective e-learning depends not only on technological platforms but also on access to reliable information and professional expertise. A key interpretation is the shift from custodianship to collaboration and pedagogical engagement. Librarians increasingly support course delivery through online consultations, information-literacy instruction and embedded services (Steele, 2019; Oyedokun, 2024; Tumbleson, 2016). However, the depth of integration depends on institutional structures, staff capacity and recognition of library roles. Similarly, virtual reference, tutorials and LMS-embedded resources extend library support beyond physical spaces, but connectivity, devices and digital skills can limit equitable access (La Macchia, 2020; Vogus, 2020; Garner et al., 2024; Frank et al., 2021; Pettalongi et al., 2024). The findings also suggest that libraries should be viewed as components of institutional e-learning infrastructure, rather than peripheral support services. LMS integration, collaboration with IT units and involvement in curriculum development position libraries as partners in teaching and learning (Arroyo-Vázquez & Gómez-Hernández, 2020; Karplus, 2017). Nevertheless, departmental silos, faculty resistance and limited institutional recognition continue to constrain this role (Pathak, 2023; Lalitha et al., 2024; Din & Ali, 2024). Emerging technologies such as artificial intelligence, virtual and augmented reality, learning analytics and gamification provide opportunities to enhance library-supported learning. However, their value depends on educational relevance and responsible implementation. Concerns surrounding privacy, equity, infrastructure and staff capacity indicate that technology adoption should complement, rather than replace, human-centred library support (Fitria, 2023; Lo & Vitale, 2024; Priya & Ramya, 2024). These findings align with Connectivist Learning Theory, which views learning as occurring through networks of people, information and technologies (Siemens, 2005). Libraries function as

important nodes within these networks by connecting learners to curated information, digital resources and learning support. Collaboration among librarians, academics and learners further reflects the principles of Communities of Practice in digital learning environments (Ghosh et al., 2024; Transue, 2013; Kim, 2015; Yukawa, 2010). Overall, the findings position academic libraries as increasingly interconnected partners in e-learning, whose future effectiveness depends on institutional integration, adequate resources and strategic positioning within e-learning planning.

### 3.1 Limitations of Current Research

Research on library contributions to e-learning has several limitations. First, there is a geographic and institutional bias, as much of the existing literature originates from high-income countries, leaving limited evidence from the Global South (Din & Ali, 2024). Second, there is a lack of longitudinal research, with limited evidence on the sustained impact of library innovations on student outcomes over time (Gisip et al., 2024). Finally, inconsistent evaluation measures make it difficult to assess library contributions systematically, as many studies rely on descriptive or case-based evidence rather than standardised performance indicators (Frank et al., 2021).

## 4. Conclusions and Recommendations

This narrative review examined how academic libraries contribute to the development and sustainability of e-learning ecosystems in higher education. The literature indicates that academic libraries have moved beyond their traditional role as custodians of physical collections to become active partners in digitally mediated teaching and learning. Their contributions include curating digital resources, providing virtual reference and information-literacy services, integrating library resources into Learning Management Systems (LMS), supporting embedded librarianship, and collaborating with academic staff in course and curriculum development. The review further shows that libraries contribute to e-learning through their capacity to connect learners with digital knowledge, develop information and digital literacy, facilitate collaboration, and support learner-centred services. These contributions are consistent with Connectivist Learning Theory, which positions libraries as important nodes within networks of learners, information and digital technologies. Emerging practices, including artificial intelligence, virtual and augmented reality, Open Educational Resources (OER), gamification, learning analytics and personalised learning, are also expanding the potential of libraries to support more interactive and accessible digital learning environments. However, the sustainability of these contributions is dependent on the conditions within which academic libraries operate. The literature identifies technological and financial constraints, limited staff capacity, inadequate professional development, departmental silos, weak institutional recognition and inequalities in students' access to digital infrastructure as significant challenges. Therefore, strengthening the role of academic libraries in e-learning requires institutional support, strategic integration, adequate resources and continued professional development. Overall, the review suggests that academic libraries are increasingly important components of higher education e-learning ecosystems, but their potential can only be fully realised when their contributions are recognised and supported at institutional level.

### 4.1 Recommendations for Practice

- Strengthen embedded librarianship and LMS integration: Higher education institutions should systematically integrate librarians into online courses and Learning Management Systems to provide contextualised information-literacy instruction, research support and digital learning resources (Tumbleson, 2016; Bonnard & Hansen, 2012).
- Invest in digital infrastructure and staff development: Institutions should provide adequate technological infrastructure, resources and continuous professional development to enable librarians to deliver sustainable digital services and respond effectively to changing e-learning demands (Frank et al., 2021; Steele, 2019).
- Promote responsible adoption of emerging technologies and OER: Libraries should expand their support for OER and carefully evaluate emerging technologies such as AI, VR/AR and learning analytics, while addressing issues of accessibility, privacy, equity and ethical use (Goodsett et al., 2015; Katz, 2019; Fitria, 2023; Priya & Ramya, 2024).

## 4.2 Areas for Further Research

- Longitudinal evaluation of library-supported e-learning: Future research should examine the long-term relationship between library integration into e-learning environments and outcomes such as student engagement, academic performance, retention and information-literacy development.
- Comparative research across geographical and institutional contexts: Further studies should investigate library contributions to e-learning in the Global South and compare these with practices in the Global North, particularly in relation to infrastructure, funding, digital access and institutional support.
- Ethical and user-centred evaluation of emerging technologies: Future research should examine students' and staff members' perceptions of AI, learning analytics and immersive technologies in library services, with particular attention to privacy, equitable access, trust and the role of human support.

## Ethics Declaration

This study did not require ethical clearance, as it did not involve human participants or personal data. All sources used were publicly available.

## AI Declaration

AI tools were used in a limited capacity to support language refinement. The intellectual content, analysis, and conclusions are the sole responsibility of the author.

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