

Books, Digital Resources and Artificial Intelligence in Technology-Enabled Academic Libraries: A BDALS Conceptual Framework for Higher Education Student Development

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ABSTRACT

The rapid development of artificial intelligence (AI), generative artificial intelligence (GenAI), and digital information environments is reshaping the role of academic libraries in higher education. At the same time, books and other scholarly resources continue to provide structured knowledge, disciplinary depth, contextual understanding, and authoritative evidence. This conceptual article examines how books, digital resources, AI-enabled services, librarians, and students can function as complementary components of a technology-enabled academic library ecosystem. Drawing on academic-library impact literature, AI-literacy research, and current professional guidance, the article proposes the BDALS framework—Books–Digital Resources–AI–Librarian–Student—as a student-centred conceptual model. The framework proposes that books and scholarly resources provide an evidentiary foundation; digital resources extend access and discovery; AI supports conversational search, synthesis, discovery, and research workflows; librarians provide information-literacy, AI-literacy, methodological, and ethical guidance; and students remain responsible for evaluating evidence and constructing knowledge. The paper identifies a research gap concerning the combined rather than isolated effects of book use, digital resources, AI-enabled library services, and librarian guidance on student learning, critical thinking, research capability, and future learning readiness. Because this is a conceptual article, no primary empirical data are claimed. Instead, the paper develops research questions, testable hypotheses, a proposed measurement model, and a mixed-method explanatory sequential design for future empirical investigation. The framework also addresses academic integrity, privacy, copyright, transparency, bias, source verification, and responsible AI use. The central proposition is that AI should augment—not replace—deep reading, authoritative source consultation, critical evaluation, and independent intellectual judgment. The article concludes with practical implications for collection development, AI-enabled discovery, AI-literacy programmes, research support, student orientation, policy development, and library assessment.

KEYWORDS: Academic libraries; Artificial intelligence; Generative AI; AI literacy; Information literacy; Digital resources; Books; Higher education; Research support; Academic integrity; BDALS framework.

1. INTRODUCTION

Academic libraries have moved beyond their traditional role as repositories of printed books and have increasingly become integrated learning, research, and digital scholarship environments. Contemporary academic library collections may include printed textbooks and monographs, e-books, scholarly journals, licensed databases, institutional repositories, learning-management systems, research-support services, and AI-enabled discovery tools. This transformation does not eliminate the value of books; rather, it changes the way different information resources interact within the learning ecosystem.

The emergence of generative AI has intensified this transformation. GenAI systems can converse with users, summarize text, generate ideas, support coding, transform information into different formats, and assist with some stages of research. UNESCO's guidance emphasizes a human-centred approach to GenAI in education and research, including attention to privacy, ethical validation, safety, equity, and meaningful educational use (Miao & Holmes, 2023). Current professional guidance for academic library workers similarly emphasizes AI knowledge, critical evaluation, ethical considerations, privacy, intellectual property, and context-sensitive application (Association of College and Research Libraries [ACRL], 2025).

The central issue, therefore, is not whether academic libraries should retain books or adopt AI. The more productive question is how these resources and capabilities can be deliberately integrated so that technological convenience strengthens rather than weakens students' capacity to read, evaluate evidence, conduct research, think critically, and learn independently. This article develops a conceptual framework for such integration.

2. PROBLEM STATEMENT

AI creates both opportunities and tensions in higher education. Students can obtain rapid explanations and summaries without necessarily developing the reading, source-evaluation, and research practices expected at higher levels of study. At the same time, an exclusive dependence on traditional resources without digital and AI capabilities may leave students insufficiently prepared for contemporary academic and professional environments.

The practical problem is therefore one of integration rather than substitution. The research problem is that academic-library impact, information literacy, and AI literacy have each received substantial attention, while fewer conceptual and empirical models explicitly examine their combined relationship with book use, digital resources, librarian guidance, research capability, and future learning readiness. Recent literature confirms the growing importance of AI-literacy guidance for academic libraries, but it also indicates the need for librarians and users to develop the capacity to evaluate AI critically and responsibly (Ali & Richardson, 2025).

3. AIM AND OBJECTIVES

Aim

To develop a student-centred conceptual framework explaining how books, digital resources, AI-enabled library services, and librarian guidance can be integrated to support higher-education students' learning, research capability, critical thinking, and future learning readiness.

Objectives

1. To examine the continuing educational role of books and scholarly reading in higher education.

2. To identify potential AI-enabled library services for information discovery, learning, and research support.
3. To examine the conceptual relationship among resource use, information literacy, AI literacy, librarian support, and student outcomes.
4. To identify ethical, pedagogical, institutional, and technological challenges associated with AI-enabled academic library services.
5. To propose the BDALS (Books–Digital Resources–AI–Librarian–Student) conceptual framework.
6. To develop research questions, hypotheses, and a proposed mixed-method methodology for future empirical testing.

7.

4. LITERATURE REVIEW

4.1 ACADEMIC LIBRARIES AND STUDENT LEARNING

Academic-library assessment has increasingly shifted from counting inputs and transactions toward examining educational outcomes. The ACRL Assessment in Action programme synthesized evidence from multiple institutional teams and emphasized the relationship between library engagement and student learning and success (ACRL, 2017). This outcome-oriented perspective suggests that library effectiveness should not be judged solely through collection size, circulation, gate counts, or database usage. It should also consider students' ability to discover, evaluate, synthesize, and ethically use information.¹⁰

5. PROPOSED BDALS CONCEPTUAL FRAMEWORK

The BDALS framework stands for Books–Digital Resources–AI–Librarian–Student. It places the student at the centre while treating books, digital resources, AI, and librarians as complementary elements of an academic learning and research ecosystem.

Component	Primary Function	Expected Contribution
Books and scholarly resources	Provide structured, contextual and evidence-based knowledge	Deep understanding, source verification, disciplinary foundation
Digital resources	Extend access, discovery and retrieval	Breadth, currency, accessibility and efficient information retrieval
Artificial intelligence	Support conversational discovery, synthesis and research workflows	Search support, personalization, ideation and task efficiency
Librarian	Provide information literacy, AI literacy, research and ethical guidance	Critical evaluation, responsible use, methodological support
Student	Interrogate, evaluate, synthesize and create knowledge	Learning, research capability, critical thinking and future readiness

Conceptual pathway:

Books + Digital Resources → AI-assisted discovery and interaction → Information Literacy + AI Liter-

acy → Librarian-guided verification and ethical use → Student Learning + Research Capability + Critical Thinking + Future Learning Readiness.

6. THEORETICAL PROPOSITIONS OF THE FRAMEWORK

1. Books provide depth and evidence; AI provides speed and interaction. Their educational value is potentially complementary when students are taught to verify AI-assisted outputs against authoritative sources.
2. Digital resources provide breadth and immediacy, while books and scholarly literature provide sustained disciplinary context.
3. AI literacy is a necessary mediator between access to AI tools and responsible academic use because access alone does not guarantee accurate or ethical use.
4. Librarian guidance functions as an enabling and moderating mechanism by connecting information literacy, AI literacy, research methodology, and academic-integrity practices.
5. Student intellectual agency is the ultimate outcome: students should remain responsible for evaluating evidence, making scholarly judgments, and producing academic work.

7. PROPOSED METHODOLOGY FOR FUTURE EMPIRICAL TESTING

7.1 RESEARCH DESIGN

A mixed-method explanatory sequential design is proposed. The quantitative phase would measure relationships among resource use, AI literacy, librarian support, and student outcomes. The qualitative phase would then explain the quantitative patterns through interviews or focus groups examining how students actually combine books, digital resources, and AI during academic tasks.

7.2 POPULATION AND SAMPLING

The population may include undergraduate, postgraduate, and research scholars in a selected higher-education institution or a multi-institution sample. Stratified sampling by discipline and year of study can improve representation. A target of approximately 300–500 valid student responses may be appropriate for a medium-to-large institutional study, subject to statistical power calculations and the final analytical model.

7.3 INSTRUMENT

A structured questionnaire using a five-point Likert scale may include the following constructs:

1. Demographic and academic profile.
2. Frequency and purpose of book and digital-resource use.
3. Engagement with AI-enabled library services.
4. Information literacy and AI literacy.
5. Librarian guidance and research-support engagement.
6. Research capability, critical evaluation, responsible AI use, and future learning readiness.

7.4 QUALITATIVE PHASE

Approximately 15–25 students and 5–10 librarians or faculty members may be interviewed, subject to saturation and institutional feasibility. Questions should focus on how participants verify AI-generated information, select authoritative sources, use books and databases, disclose AI assistance, and respond to issues of privacy, copyright, bias, and academic integrity.

7.5 DATA ANALYSIS

1. Descriptive statistics: frequency, percentage, mean and standard deviation.

2. Reliability analysis: Cronbach's alpha or an appropriate reliability coefficient.
3. Correlation analysis: relationships among resource use, AI literacy, librarian support, and outcomes.
4. Multiple regression or structural equation modelling: predictors and pathways associated with research capability and future learning readiness.
5. Moderation analysis: the role of librarian guidance in the relationship between AI engagement and responsible AI use.
6. Thematic analysis: qualitative interview and focus-group data.

8. PROPOSED MEASUREMENT MODEL

Construct	Role in Model	Indicative Indicators
Academic book use	Independent variable	Frequency, duration, purpose, scholarly reading behaviour
Digital-resource use	Independent variable	Database use, e-books, institutional repository, discovery tools
AI-library engagement	Independent variable	AI-assisted search, reference support, recommendations, research assistance
AI literacy	Mediator / predictor	Understanding, evaluation, prompting, verification, ethics
Librarian guidance	Moderator / enabling factor	Training, consultation, source evaluation, research support
Research capability	Dependent variable	Question formulation, searching, source evaluation, synthesis, citation
Future learning readiness	Dependent variable	Independent learning, adaptability, responsible technology use, lifelong learning

9. EXPECTED FINDINGS AND INTERPRETIVE PROPOSITIONS

Because this article is conceptual and does not report primary survey data, the following are propositions to be tested rather than findings. Students who regularly use scholarly books and related resources may demonstrate stronger contextual understanding and evidence-based learning. Students with stronger AI literacy may use AI more effectively for discovery and ideation while remaining more cautious about unsupported claims. Integrated use of books, digital resources, and AI may be associated with stronger research capability than dependence on a single information channel. Librarian guidance may strengthen responsible use by helping students verify sources, recognize limitations, and apply academic-integrity practices.

These propositions should not be interpreted as established causal effects until they are tested with appropriately designed empirical research. In particular, self-selection, discipline, prior academic achievement, digital access, and institutional differences could influence observed relationships.

10. DISCUSSION

The BDALS framework suggests that the educational question surrounding AI in academic libraries is not simply how quickly information can be produced, but how the information environment contributes to learning. An AI system can provide a useful starting point for a question, yet higher education requires students to examine evidence, understand context, compare perspectives, identify limitations, and construct defensible arguments. Books, scholarly journals, databases, and institutional repositories remain central to these activities.

The framework also expands the role of the academic librarian. Librarians can contribute not only by teaching database searching but also by helping students formulate research questions, select appropriate AI tools, evaluate generated content, trace claims to authoritative sources, recognize uncertainty and bias, and comply with institutional policies. ACRL's current AI competency framework supports this broader professional role, emphasizing ethical considerations, knowledge, evaluation, and application (ACRL, 2025).

At the institutional level, an AI assistant should ideally connect users with the library's authenticated information environment rather than function as an isolated answer generator. Possible architecture could include the library catalogue/OPAC, licensed databases where technically and legally permitted, institutional repositories, library guides, research-support documentation, and retrieval-augmented generation (RAG) mechanisms that preserve source provenance. Such integration should be implemented only after security, licensing, privacy, copyright, accessibility, and accuracy requirements have been evaluated.

11. PRACTICAL IMPLICATIONS FOR ACADEMIC LIBRARIES

1. Collection development: Maintain appropriate print textbooks, scholarly monographs and reference materials while expanding e-books, databases and other digital resources according to curriculum and research needs.
2. AI-enabled discovery: Where appropriate, deploy AI interfaces that clearly identify the sources behind answers and direct users to authoritative library resources.
3. AI-literacy programmes: Provide progressive training covering AI concepts, prompting, source verification, bias, privacy, copyright, attribution, academic integrity, and responsible use.
4. Research support: Integrate librarian-led database searching, literature-review support, citation guidance, research-data support, and carefully governed AI assistance.
5. Student orientation: Combine traditional library orientation and reading practices with practical AI-literacy activities.
6. Academic-integrity policy: Develop clear institutional guidance on acceptable AI use, disclosure, attribution, verification, and prohibited practices.
7. Privacy and data governance: Avoid unnecessary exposure of personal, confidential, unpublished, or sensitive research information to external AI systems.
8. Assessment: Move beyond circulation and usage counts to outcome-oriented indicators such as information-evaluation ability, research consultation outcomes, student learning evidence, and AI-literacy competency.
9. Professional development: Establish continuing AI-literacy development for librarians and library staff, aligned with current professional competencies.

12. ETHICAL, LEGAL AND GOVERNANCE CONSIDERATIONS

Responsible AI use in academic libraries requires attention to privacy, intellectual property, copyright, bias, transparency, accessibility, accountability, and equitable access. UNESCO's guidance calls for a human-centred approach to GenAI in education and research and emphasizes privacy and ethical validation (Miao & Holmes, 2023). IFLA's work further highlights the need for libraries to consider ethical and societal implications and copyright issues associated with AI (IFLA, 2025a, 2025b).

AI-generated content should not automatically be treated as authoritative. Library policies should encourage users to identify the provenance of information, verify significant claims against reliable sources, and disclose AI assistance where institutional or publisher requirements call for it. AI-detection tools should also be treated cautiously; apparent AI-generated text is not, by itself, proof of misconduct. Academic-integrity decisions should follow institutional procedures and evidence-based review.

13. LIMITATIONS

1. This article is a conceptual framework and does not report primary survey, experimental, or interview data.
2. The proposed relationships and hypotheses require empirical testing before causal or generalizable conclusions can be made.
3. Findings from a single institution, discipline, language environment, or socioeconomic context may not generalize to all higher-education settings.
4. AI technologies, licensing models, institutional policies, and professional guidance are changing rapidly; the framework should therefore be periodically reviewed.
5. Measures of AI literacy and responsible AI use require careful validation because self-reported competence may differ from demonstrated performance.

14. FUTURE RESEARCH DIRECTIONS

1. Conduct longitudinal studies examining changes in research capability before and after structured AI-literacy instruction.
2. Compare patterns of learning and research behaviour among students with different combinations of book, digital-resource, and AI use.
3. Evaluate source-grounded or retrieval-augmented library AI assistants for their effects on information literacy and source verification.
4. Examine disciplinary differences among engineering, management, humanities, social sciences, and doctoral researchers.
5. Study librarian-led AI-literacy interventions and their relationship with academic-integrity outcomes.
6. Develop and validate an institutional BDALS measurement scale.
7. Investigate privacy, accessibility, copyright, and equity implications of AI-enabled academic library services.
8. Study the relationship between AI-assisted research practices and students' long-term learning readiness.

15. CONCLUSION

The future-ready academic library should not be understood as a choice between books and artificial intelligence. The evidence and professional guidance reviewed in this conceptual article support a

complementary perspective in which different resources perform different but interconnected functions. Books and scholarly resources provide depth, context, and evidence; digital resources provide breadth and accessibility; AI can facilitate discovery, interaction, synthesis, and selected research tasks; librarians provide critical, methodological, ethical, and information-literacy guidance; and students remain responsible for evaluating evidence and making intellectual decisions.

The BDALS framework offers a structured basis for examining these relationships in future empirical research. Its principal contribution is to shift the discussion from technology adoption alone toward student-centred information practices. AI has educational value when it is embedded in a high-quality information environment and accompanied by the skills needed to evaluate its outputs. A technology-enabled academic library can therefore combine enduring scholarly collections with responsible AI services while protecting the central goals of higher education: evidence-based learning, critical thinking, research capability, academic integrity, and lifelong learning.

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