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From Digital to AI Literacy: Repositioning Academic Libraries in the Age of Generative AI

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Abstract- The rise of generative artificial intelligence (AI) is reshaping the landscape of digital and information literacy in higher education, demanding a redefinition of the role of academic libraries. This paper presents a literacy continuum that links digital, information, and AI literacies through a constructivist learning lens, positioning libraries as active pedagogical partners in cultivating student competencies. The framework emphasises that digital literacy provides technical grounding, information literacy builds evaluative and ethical capacity, and AI literacy advances critical engagement with generative technologies. Applications for libraries include redesigning instructional programs, fostering faculty collaboration, and offering leadership in institutional policy development. A comparative perspective highlights divergent trajectories between the Global North and Global South, where disparities in infrastructure, pedagogical innovation, and ethical debates shape the adoption of AI literacy. Two tables support this analysis: one contrasts global trends in literacy development, and the other aligns methodological approaches with empirical research directions. The paper also identifies methodological pathways, qualitative, quantitative, and mixed-method that can operationalise AI literacy across critical evaluation, functional use, ethical practice, and reflective engagement. While the model offers a flexible foundation, its conceptual scope and the evolving pace of AI present limitations that require ongoing adaptation. The conclusion calls for context-aware strategies that expand librarian expertise, embed AI literacy in curricula, and advance libraries as ethical leaders in AI integration. By doing so, libraries can not only mediate access but also drive equitable, future-ready knowledge practices in the AI era.

Keywords: academic libraries, digital literacy, information literacy, AI literacy, constructivist learning, Global North–South, higher education

I. INTRODUCTION

The rapid advancement of artificial intelligence (AI), particularly the emergence of generative models such as ChatGPT, Gemini, and Copilot, has accelerated debates about the competencies required for effective engagement in higher education. While digital literacy and information literacy have long been central to academic practice, the proliferation of generative AI has introduced the need for AI literacy, encompassing technical fluency, ethical discernment, and critical interrogation of algorithmic outputs (Ameen, 2023; Koltay, 2023; Siemens & Matheos, 2023). In this context, academic libraries, traditionally positioned as facilitators of digital and information literacy, are being called upon to expand their mandate and mediate this new literacy frontier (Tzoc, 2024; UNESCO, 2023). Recent scholarship underscores that generative AI is not merely a technological tool but a cultural force reshaping knowledge production and scholarly communication. For instance, studies highlight that students now require competencies in evaluating, contextualising, and applying AI-generated content, thereby expanding the boundaries of literacy beyond earlier digital paradigms (Chen & Li, 2024). At the same time, scholars caution that the rapid adoption of AI risks widening global inequalities, as access to infrastructure and institutional readiness remains uneven across contexts (Peters, Jandrić, & Hayes, 2023). These tensions highlight the need for frameworks that not only integrate AI literacy but also account for global disparities and local specificities in implementation. Within this shifting landscape, academic libraries emerge

as both pedagogical actors and equity mediators, uniquely placed to embed AI literacy into higher education. Libraries' long-standing expertise in curating resources, delivering instructional programs, and fostering critical engagement makes them central to the task of repositioning literacies as a continuum from digital literacy to information literacy and finally to AI literacy. By conceptualizing this progression as interconnected rather than isolated domains, libraries can actively shape how students and faculty engage with AI in ways that are both context-sensitive and ethically grounded (Ifijeh & Yusuf, 2023; Gonzales, 2024). This paper advances a conceptual framework that positions academic libraries as catalysts in this transition. It explores the theoretical underpinnings of literacy in the age of generative AI, introduces a model of literacies as a continuum, engages critically with global North–South perspectives, and outlines methodological implications for future empirical research. In doing so, it reaffirms the central role of libraries in ensuring that AI adoption enhances educational inclusion and intellectual integrity rather than exacerbating digital divides.

II. THEORETICAL FOUNDATION

The framework of this paper is anchored in Constructivist Learning Theory and articulated through three interrelated domains digital literacy, information literacy, and AI literacy. This continuum reflects the progressive and interconnected competencies required in the AI-driven knowledge landscape. Constructivism emphasises that learners actively build knowledge through contextual engagement, collaboration, and critical reflection, positioning libraries as mediating spaces where these literacies are cultivated rather than delivered in isolation (Siemens & Matheos, 2023; Ifijeh & Yusuf, 2023).

2.1 Digital Literacy

Digital literacy forms the foundation of this continuum, encompassing the capacity to effectively and responsibly use digital tools, platforms, and environments. Recent scholarship stresses that digital literacy goes beyond technical proficiency to include critical awareness, ethical engagement, and adaptive use of evolving technologies (Ng, 2022; Eze & Igbo, 2023). In academic libraries, this has traditionally involved navigating databases, employing reference management tools, and supporting online collaboration. However, constructivist learning theory suggests that these practices must evolve into active, participatory learning processes, equipping learners to adapt digital skills toward emerging technologies like generative AI. Thus, digital literacy becomes a dynamic capacity for lifelong learning, rather than a static set of skills.

2.2 Information Literacy

Information literacy builds upon digital skills by developing learners' ability to locate, evaluate, and ethically apply information. This has long been a cornerstone of academic library instruction, but the rise of generative AI introduces new complexities. AI-generated content often lacks clear provenance, embeds systemic bias, or produces factual inaccuracies, requiring learners to adopt heightened critical scrutiny (Akakpo, 2023; UNESCO, 2024; IFLA, 2023). From a constructivist perspective, information literacy involves interrogating and contextualising knowledge claims rather than passively accepting them. Libraries, therefore, must design instructional programs that encourage learners to critically compare AI

outputs with human-authored sources, fostering judgment, reflection, and contextual understanding.

2.3 AI Literacy

AI literacy represents the most recent and transformative stage of the continuum. It includes functional competencies such as effective prompting, tool selection, and refinement of AI-generated outputs, while also demanding critical awareness of AI's ethical, social, and epistemic consequences (Zhou et al., 2025; Lo, 2024). Recent work conceptualises AI literacy as a multidimensional construct, spanning technical understanding, ethical reasoning, critical evaluation, and contextual application (Zhang & Lee, 2024; Chigwada, 2024). Constructivist learning theory enriches this view by positioning AI literacy as a process of co-creation of knowledge with AI, where learners actively interrogate, adapt, and reframe AI outputs in ways that deepen personal understanding and maintain scholarly integrity. For libraries, this means fostering not only proficiency but also critical reflexivity, enabling learners to responsibly integrate AI into academic practice.

2.4 Constructivist Integration

While these three domains can be delineated, they function most effectively when understood as a continuum framed by constructivist pedagogy. Digital literacy provides the technical grounding, information literacy adds evaluative and ethical depth, and AI literacy extends this trajectory toward advanced critical engagement with generative technologies. Academic libraries, positioned at the intersection of pedagogy and technology, are uniquely placed to facilitate this progression. By embedding constructivist approaches such as collaborative workshops, embedded curricula, and inquiry-based projects, libraries ensure that learners do not simply consume AI-generated knowledge but instead actively construct, critique, and contextualize it (Rahman & Norliya, 2022; Gonzales, 2024). In this way, the theoretical foundation establishes a transformative literacy continuum, positioning academic libraries as catalysts for cultivating learners' capacity to navigate, evaluate, and ethically engage with information in the age of generative AI.

III. CONCEPTUAL MODEL: FROM DIGITAL TO INFORMATION TO AI LITERACY

The conceptual model presented in this paper frames academic libraries as transformative hubs that mediate the progression from digital literacy through information literacy to AI literacy. Rather than viewing these literacies as discrete competencies, the model conceptualizes them as interconnected and sequential layers, each building on the other to prepare learners for navigating a technology-intensive academic environment. Constructivist learning theory underpins this progression, emphasising that learners do not passively acquire skills but actively construct, reflect upon, and contextualize knowledge at every stage (Siemens & Matheos, 2023; Ifijeh & Yusuf, 2023).

3.1 Digital Literacy as the Foundation

Digital literacy serves as the foundational layer of the model. In libraries, it has traditionally involved skills such as database searching, catalog navigation, and engagement with e-resources. However, contemporary scholarship emphasises that digital literacy must extend beyond technical

proficiency to include critical adaptability, ethical awareness, and reflexive engagement with evolving platforms (Ng, 2022; Adeoye et al., 2023; Eze & Igbo, 2023). Within a constructivist orientation, digital literacy is not static but a gateway capacity, enabling students to participate in dynamic, digitally mediated learning spaces and laying the groundwork for higher-order literacies.

3.2 Information Literacy as the Bridge

Information literacy builds upon digital skills by enabling learners to locate, evaluate, and ethically apply information in scholarly and professional contexts. Traditionally a cornerstone of library instruction, it has gained new urgency in the age of generative AI, where students interact with AI-generated summaries, essays, and visual content that may embed bias or factual inaccuracies (Akakpo, 2023; UNESCO, 2024; IFLA, 2023). Constructivist pedagogy reframes information literacy as an active process of inquiry and contextualization, requiring learners to interrogate AI-generated content, compare it with human-authored sources, and critically situate knowledge within disciplinary frameworks.

3.3 AI Literacy as the Transformative Goal

AI literacy represents the most advanced and transformative stage of the continuum. It integrates functional competencies such as prompting, tool selection, and refining outputs with critical interrogation of AI's social, ethical, and epistemic implications (Lo, 2024; Zhou et al., 2025). Scholars increasingly conceptualise AI literacy as multidimensional, spanning technical skills, ethical reasoning, and reflective application (Zhang & Lee, 2024; Chigwada, 2024). Constructivism adds depth by positioning AI literacy as a practice of co-creating knowledge with AI, where learners not only use tools but also critically reshape outputs, ensuring academic integrity and contextual relevance. For libraries, this requires embedding AI literacy within instructional programs and modeling responsible AI use across disciplines.

3.4 Libraries as Catalysts across the Continuum

At the centre of this model are academic libraries as catalysts. By aligning digital, information, and AI literacies within a coherent framework, libraries enable students and faculty to move fluidly across the continuum. They do so by creating participatory learning opportunities, workshops, embedded curricula, and collaborative inquiry projects that promote reflection, dialogue, and critical engagement (Rahman & Norliya, 2022; Gonzales, 2024). This position shifts libraries from being service points to pedagogical partners, actively shaping how learners construct and co-create knowledge in an AI-driven environment.

Figure 1. Literacy Continuum Model for Academic Libraries in the Age of AI

The figure presents the continuum from digital literacy to information literacy and, ultimately, AI literacy, positioning academic libraries as central mediators of this progression. The arrows illustrate the dynamic flow of competencies: the transition from digital literacy to information literacy emphasises critical evaluation and ethical application, while the shift from information literacy to AI literacy highlights advanced engagement with generative technologies. The arrows connecting libraries to each domain

underscore their role in pedagogical mediation designing instructional programs, fostering collaborative learning, and contextualising resources. Grounded in constructivist pedagogy, the model affirms that libraries are not merely support units but active partners in cultivating reflective, adaptable, and ethically informed learners in the age of AI.

IV. IMPLICATIONS AND APPLICATIONS FOR ACADEMIC LIBRARIES

The proposed literacy continuum carries profound implications for how academic libraries redefine their roles amidst the generative AI era. No longer confined to being supportive infrastructures, libraries must reposition themselves as proactive educational partners that strategically cultivate student competencies across digital, information, and AI literacies. Adopting a constructivist orientation, libraries can embed this continuum into their instructional programs, collaborative initiatives, and policy leadership, ensuring that learners engage critically with evolving digital and AI ecosystems.

4.1 Reframing and Expanding Instructional Programs

While core information literacy skills such as source evaluation and ethical application remain foundational, the rise of generative AI tools like ChatGPT and Claude demands expanded instruction. Students require capacity not only for evaluating AI-generated outputs for credibility, coherence, and bias but also for leveraging such tools responsibly in academic work (Madunić & Sovulj, 2024; Wetzel & Weber, 2024). To this end, library-led instructional programs should integrate AI literacy components, such as effective prompting, provenance tracing, and ethical engagement. Grounded in constructivist pedagogy, these sessions must be interactive, inquiry-driven, and discipline-specific, enabling learners to apply AI tools to authentic academic challenges (Tzoc, 2024; Chigwada, 2024).

4.2 Libraries as Gateways to AI Literacy

Academic libraries are uniquely positioned to act as entry points for AI literacy development. Practical initiatives might include creating AI-focused LibGuides, curating ethical guidelines for AI engagement, and hosting workshops on effective prompt engineering (Ko Chun Ru & Tang, 2025; Luo, 2025). These offerings equip users with operational know-how while foregrounding critical insight into AI's broader impact on scholarly communication and epistemic authority (Annapureddy et al., 2024). By positioning themselves as gateways, libraries ensure that AI literacy becomes an integral dimension of academic culture.

4.3 Fostering Collaborative Engagement across Campus

The complexity of AI literacy requires a whole-campus approach. Evidence suggests that literacy programs co-designed with faculty and other stakeholders foster deeper engagement and embed literacy objectives into disciplinary curricula (Iacono, 2025; IIT Delhi Committee, 2024). Librarians can co-develop assignments that integrate AI tools while addressing issues of authorship, bias, and academic integrity (Ifijeh & Yusuf, 2023; Gonzales, 2024). Such collaboration ensures that AI literacy is not siloed as a technical skill but recognized as a cross-disciplinary competency essential to critical inquiry and creative practice.

4.4 Policy Leadership and Librarian Capacity Building

Finally, libraries must assert themselves as leaders in shaping institutional policies around AI. Contributions to guidelines on plagiarism, data privacy, authorship, and equitable access highlight libraries' advocacy role in promoting ethical and inclusive AI use (UNESCO, 2023; Zhou et al., 2025). Equally important is investing in librarian capacity: professional development in AI ethics, competency frameworks such as AICOS, and hands-on training in generative AI tools must be prioritised (Markus et al., 2025; Li et al., 2025; Wheatley & Hervieux, 2024). Providing digital infrastructure and experimental spaces for AI-supported pedagogies empowers librarians to sustain their leadership role in advancing literacy for the AI age

V. CRITICAL PERSPECTIVES AND GLOBAL COMPARISONS

The integration of generative AI into higher education has been widely celebrated for its potential to enhance productivity and innovation, but it has also attracted substantial critique. For academic libraries, these debates are not peripheral; they shape how literacy frameworks are redefined and how equity is maintained in diverse educational contexts. This section examines critical perspectives on AI, drawing contrasts between trajectories in the Global North and Global South to show how regional realities influence the pathways toward AI literacy.

5.1 Critiques of Generative AI in Higher Education

Scholars caution that generative AI tools risk amplifying issues of bias, misinformation, and opacity in knowledge creation (Holmes et al., 2022; Stahl, 2023). For instance, while ChatGPT and similar platforms can assist with writing and summarization, they often lack transparency regarding data sources, thereby complicating academic standards of provenance and authorship. Critics further argue that uncritical reliance on AI may erode critical thinking, foster plagiarism, and blur intellectual ownership (Gonzales, 2024). Within libraries, these challenges highlight the need to balance functional training in AI tools with a stronger emphasis on ethical awareness and scholarly integrity.

5.2 Global North Trajectories

In the Global North exemplified by countries such as the United States, United Kingdom, and Germany, AI adoption has been rapid, supported by strong digital infrastructures and policy frameworks. Libraries in these contexts are increasingly engaged in teaching students how to interrogate AI outputs, detect embedded biases, and incorporate AI responsibly into disciplinary work (UNESCO, 2023; Lo, 2024). For example, some UK universities have introduced AI literacy modules within academic integrity programs, reflecting a shift from purely technical skill-building to critical and ethical engagement. Here, the priority is not access but ensuring that students approach AI critically and with awareness of its epistemic consequences.

5.3 Global South Trajectories

By contrast, libraries in the Global South such as in Nigeria, Kenya, and India navigate uneven infrastructural landscapes marked by bandwidth limitations, cost barriers, and gaps in digital training (Adeyemi & Alabi, 2020; Ibrahim & Musa, 2025). In such settings, AI literacy initiatives must

often begin with strengthening foundational digital and information literacies before advancing to critical interrogation of AI systems. For instance, Nigerian universities have emphasized capacity-building workshops on basic database use and responsible digital practices as steppingstones toward integrating AI (Eze & Igbo, 2023). While adoption is slower, these initiatives reveal how context shapes the trajectory of AI literacy: the focus is on access, inclusion, and adaptation rather than advanced ethical critique.

5.4 Toward Context-Sensitive Models

The global contrasts discussed above highlight that AI literacy cannot be approached as a universal blueprint. Libraries in the Global North, operating in digitally mature environments, are increasingly tasked with fostering critical interrogation of AI outputs, developing ethical safeguards, and embedding AI competencies within disciplinary practices. By contrast, libraries in the Global South must often prioritize bridging infrastructural gaps, localizing content, and strengthening basic digital and information literacies as steppingstones toward AI literacy. These distinctions underscore the need for context-sensitive models that adapt to institutional and regional realities rather than impose one-size-fits-all solutions. In this framing, libraries are not merely sites of adoption but active mediators of equity, ensuring that the transformative potential of AI strengthens educational opportunities rather than exacerbating existing divides (Prinsloo, 2023; Nguyen et al., 2024). To illustrate these trajectories more clearly, Table 1 compares how AI literacy priorities differ between the Global North and Global South, offering a concise overview of their respective challenges and areas of emphasis. These contrasts between contexts can be more clearly illustrated by comparing how Global North and Global South are charting different yet overlapping pathways in AI literacy development.

Dimension	Global North	Global South
Infrastructure & Access	Advanced digital ecosystems, stable connectivity, and strong institutional funding.	Uneven digital access, infrastructural deficits, and reliance on low-cost or mobile-first solutions
Instructional Emphasis	Moves beyond digital literacy to embed AI literacy (e.g., critical evaluation of AI outputs, algorithmic transparency).	Prioritizes foundational digital and information literacies while cautiously introducing AI literacy through contextualized initiatives
Library Role	Critical mediators addressing over-reliance on AI, ethical concerns, and student deskilling	Adaptive innovators leveraging peer-led workshops, open resources, and collaborative pedagogy within limited resources.
Key Challenges	Ethical dilemmas (bias, opacity of models), student over-dependence on automation.	Infrastructural gaps, limited staff capacity, and uneven institutional readiness

Strengths/ Innovations	Strong integration into curricula, institutionalized support, and policy frameworks.	Contextual resilience, resourcefulness, and community-driven learning approaches foster culturally aligned AI adoption.

Table 1: Global North vs. Global South trajectories in AI literacy.

This comparison underscores that while infrastructural advantages often privilege the North, the South contributes vital perspectives on contextual adaptation and equity, which enrich the broader discourse on AI literacy.

VI. METHODOLOGICAL IMPLICATIONS

The literacy continuum proposed in this paper offers several pathways for empirical exploration. Qualitative methods such as interviews, focus groups, and classroom observations can illuminate how students, faculty, and librarians negotiate AI use in academic practice, capturing the constructivist dynamics of learning (Rahman & Norliya, 2022; Eze & Igbo, 2023). Complementing this, quantitative surveys can operationalize AI literacy by assessing dimensions such as technical proficiency, critical evaluation of AI outputs, and ethical awareness (Khan & Fatima, 2022; Chowdhury, Singh, & Lin, 2025). Mixed-methods and case study designs provide additional value by linking broad patterns with contextual insights, particularly in institutions piloting AI-enabled literacy programs (Adeyemi & Alabi, 2020; Ibrahim & Musa, 2025). To guide such empirical work, AI literacy may be evaluated across five interrelated dimensions: (1) critical evaluation of AI-generated content, (2) functional competence in using AI tools for academic tasks, (3) ethical and responsible application, (4) integration with digital and information literacies, and (5) reflective, constructivist engagement (Holmes et al., 2022; Stahl, 2023; Gonzales, 2024; UNESCO, 2023). These indicators offer a practical framework for designing surveys, coding qualitative data, and benchmarking program outcomes. Given the significant disparities in digital readiness worldwide, cross-national comparative studies are particularly valuable. Libraries in Global North often operate within contexts of advanced digital infrastructure and rapid adoption of AI-driven tools, while those in Global South face challenges of limited access, infrastructure, and uneven training opportunities. To operate these methodological directions, the table below aligns proposed research strategies with the conceptual pillars of AI-integrated literacy, highlighting how each dimension can be empirically explored in diverse academic contexts. To translate this conceptual framework into actionable research, it is helpful to map methodological approaches onto the core pillars of AI-integrated literacy.

Context	**Likely Research Focus**	**Potential Indicators**
Global North (e.g. USA, UK, Germany)	Critical interrogation of AI outputs, ethical frameworks, disciplinary integration	Bias detection, provenance analysis, alignment with academic integrity policies

Global South (e.g. Nigeria, Kenya, India)	Bridging digital divides, capacity building, localized AI literacy applications	Access to infrastructure, adaptive tool use, integration of digital and information literacies as precursors

Table 2: Alignment of methodological directions with conceptual pillars for AI-integrated literacy in academic libraries

This alignment underscores how diverse methodological approaches can be combined to generate a comprehensive understanding of AI literacy, ensuring that empirical inquiry remains both context-sensitive and theoretically grounded. Framing libraries as active mediators of equity rather than passive adopters highlights their role in ensuring that the transformative potential of AI strengthens rather than exacerbates existing divides (Prinsloo, 2023; Nguyen et al., 2024). By tailoring methods to institutional and regional realities, future research can refine the literacy continuum into a flexible, context-sensitive framework capable of informing library practice worldwide. At the same time, acknowledging the provisional nature of this framework helps situate its contributions within broader scholarly and institutional debates, ensuring that its claims remain balanced and appropriately bounded

VII. LIMITATIONS

This study is not without constraints. As a conceptual contribution, it does not generate new empirical evidence, and its insights are therefore interpretive rather than statistically generalized. Moreover, the rapid pace of AI development means that some assumptions and recommendations may quickly become outdated. The framework should therefore be seen as provisional, requiring continuous refinement as tools, pedagogical practices, and policy environments evolve. Recognizing these limitations provides a foundation for broader reflections on the role of libraries in navigating technological change.

VIII. CONCLUSION

Building on these constraints, this paper has advanced a literacy continuum model that positions digital literacy, information literacy, and AI literacy as interconnected capacities essential for academic success in an AI-driven era. Anchored in constructivist learning theory, the framework emphasizes the role of academic libraries as pedagogical partners who enable learners to critically engage with digital and AI-mediated knowledge practices. By incorporating global perspectives, the discussion has also highlighted how trajectories differ between the Global North and South, underscoring both infrastructural disparities and opportunities for shared innovation. Taken together, these insights underscore the need for libraries to move beyond their traditional roles of access provision and to embrace their potential as catalysts of equitable, context-sensitive literacy development.

IX. RECOMMENDATIONS

In light of the framework and conclusions drawn, several practical directions are proposed. Academic libraries should embed AI literacy within existing digital and information literacy programs, ensuring students are equipped not

only with functional skills but also with critical and ethical awareness. Institutions must prioritize the professional development of librarians in AI pedagogy, ethics, and tool integration so that they can lead literacy initiatives with confidence. Cross-disciplinary collaboration between librarians, faculty, and technology specialists is essential to embed AI competencies within disciplinary teaching and research. At the policy level, universities and government agencies should collaborate with libraries to develop guidelines that safeguard ethical use, promote inclusivity, and ensure equitable access to AI tools. Finally, future empirical research, particularly comparative and case-based studies in the Global South should test, refine, and adapt the proposed continuum to strengthen its practical relevance across diverse educational environments.

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