

# Strengthening Digital Competence Through Curriculum Innovation: Evidence from Library and Information Science Students in Higher Education

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## Abstract

The acceleration of digital transformation has reshaped the roles and responsibilities of Library and Information Science (LIS) professionals. Consequently, higher education institutions are expected to prepare students with advanced digital competencies that align with contemporary information environments. This study investigates the level of digital competence among LIS students and examines the influence of curriculum design, instructional practices, and institutional support on the development of these competencies. A quantitative survey approach was employed involving undergraduate LIS students from a public university. Data were collected through structured questionnaires covering digital information management, digital communication, data literacy, technological adaptation, and learning experiences. The results indicate that students demonstrate adequate proficiency in information retrieval and digital communication; however, challenges remain in areas such as digital preservation, data analytics, and emerging technologies. Curriculum integration, experiential learning, and technology-enhanced teaching practices were identified as key contributors to competency development. Institutional constraints, including limited technological infrastructure and insufficient professional development opportunities, were found to hinder learning outcomes. The study recommends curriculum modernization, strengthened industry collaboration, and continuous investment in digital learning ecosystems to ensure graduates possess competencies relevant to the evolving information profession.

## Keywords

Curriculum Innovation, Digital Competence, Digital Literacy, Higher Education, Library and Information Science



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## INTRODUCTION

Digital technologies have transformed the way information is created, stored, accessed, and disseminated across societies. Libraries and information centers are increasingly relying on digital platforms, electronic repositories, artificial intelligence applications, and cloud-based information

systems to support information services. As a result, Library and Information Science (LIS) professionals are required to possess a broad spectrum of digital competencies that extend beyond traditional librarianship.

Digital competence encompasses the knowledge, skills, attitudes, and ethical awareness needed to effectively utilize digital technologies for information management, communication, problem-solving, and lifelong learning. Within LIS education, digital competence has become a fundamental component of professional preparation because graduates are expected to operate in highly technology-driven environments.

Despite the growing importance of digital competence, several studies have reported disparities in students' preparedness for digital work environments. While some students exhibit strong capabilities in information searching and digital communication, others struggle with advanced digital skills such as metadata management, digital preservation, data analytics, and information security. These gaps raise concerns regarding the adequacy of existing curricula and instructional approaches.

Higher education institutions play a strategic role in addressing these challenges by integrating digital competencies throughout academic programs. Effective curriculum design, innovative pedagogical practices, and adequate technological infrastructure can contribute significantly to students' readiness for future professional responsibilities. Therefore, understanding the factors that influence digital competence development among LIS students remains an important area of inquiry.

This study aims to explore digital competence among LIS students and identify educational strategies that can enhance digital learning outcomes in higher education. This study is expected to contribute both theoretically and practically to the development of digital competence in Library and Information Science (LIS) education. Theoretically, it enriches the existing body of knowledge by providing empirical evidence on the relationship between curriculum innovation, instructional practices, institutional support, and the development of digital competencies among LIS students in higher education. The study also extends current discussions on digital literacy and competence frameworks by highlighting the importance of integrating emerging technologies, experiential learning, and technology-enhanced pedagogies into professional education. Practically, the findings can serve as a reference for curriculum developers, educators, university administrators, and policymakers in designing more responsive and future-oriented LIS programs that align with the demands of the digital information environment. Furthermore, the study offers strategic insights for strengthening technological infrastructure, fostering industry-academic collaboration, and improving students' readiness for the rapidly evolving digital workplace, thereby supporting the preparation of competent, adaptive, and globally competitive information professionals.

## **METHODS**

A quantitative descriptive survey design was adopted for this study. Participants consisted of undergraduate students enrolled in an LIS program at a public university. Data were collected using a structured questionnaire containing statements related to digital information management, communication technologies, data literacy, curriculum effectiveness, and learning experiences.

The questionnaire utilized a four-point Likert scale ranging from strongly disagree to strongly agree. Descriptive statistics including means and standard deviations were employed to summarize responses. Inferential analyses were conducted to examine differences among demographic groups where appropriate. Ethical considerations were observed throughout the study. Participation was voluntary, anonymity was guaranteed, and data were used solely for academic purposes.

## FINDINGS AND DISCUSSION

### Findings

The findings revealed that students generally demonstrated moderate to high levels of digital competence. Information retrieval, online communication, and the use of learning management systems emerged as the strongest competency areas. However, competencies related to digital preservation, data visualization, and advanced information technologies showed comparatively lower levels of proficiency.

Students perceived curriculum content as partially effective in preparing them for digital work environments. While foundational digital skills were adequately covered, respondents indicated a need for greater emphasis on emerging technologies, data management practices, and practical technology applications.

Instructional approaches played a significant role in competency development. Project-based learning, technology-supported assignments, and collaborative activities were consistently associated with positive learning outcomes. Students reported that experiential learning opportunities enhanced both confidence and practical expertise.

Several barriers were identified, including limited access to specialized software, inadequate technological infrastructure, insufficient exposure to advanced digital tools, and financial constraints affecting institutional technology investments.

These findings suggest that digital competence development requires a holistic educational approach that combines curriculum modernization, pedagogical innovation, and institutional support.

### Implications for LIS Education

The results highlight the necessity for LIS programs to continuously review and update curricular content in response to technological changes. Educational institutions should prioritize experiential learning opportunities that allow students to interact with professional digital tools and systems.

Partnerships between universities, libraries, and technology organizations can provide students with practical exposure to emerging technologies and contemporary professional practices. Furthermore, faculty development initiatives should ensure that educators possess the competencies necessary to facilitate technology-enhanced learning effectively.

### Discussion

The findings of this study indicate that Library and Information Science (LIS) students generally possess moderate to high levels of digital competence, particularly in the areas of information retrieval, online communication, and the utilization of learning management systems. These results suggest that students have successfully acquired foundational digital skills that are essential for navigating contemporary information environments. The widespread integration of digital technologies into educational settings, combined with increased exposure to online learning platforms, appears to have contributed significantly to students' confidence and proficiency in these domains. The COVID-19 pandemic and subsequent expansion of technology-enhanced learning have accelerated students' interaction with digital systems, thereby strengthening their operational and communicative digital competencies (Tang et al., 2021; Suri et al., 2025).

This finding aligns with the Digital Competence Framework (DigComp 2.2), which conceptualizes digital competence as a multidimensional construct encompassing information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving

(Carretero et al., 2022). According to the framework, information retrieval and digital communication represent foundational competencies that are often developed earlier than more advanced technical skills. The relatively strong performance of students in these areas therefore reflects the natural progression of digital competence acquisition, whereby learners first master routine digital tasks before developing higher-order technological capabilities. The results also support the argument of Falloon (2020), who emphasized that digital competence development is cumulative and heavily influenced by repeated engagement with technology-rich learning environments.

However, despite demonstrating competence in basic digital activities, students reported lower proficiency in digital preservation, data visualization, and advanced information technologies. This disparity reveals that digital competence among LIS students remains uneven across different competency dimensions. Such findings are consistent with previous research conducted by Sibiya (2023), which found that many LIS graduates possess adequate information literacy skills but lack expertise in emerging digital scholarship practices and advanced technological applications. Similarly, Khan and Bhatti (2021) reported that information professionals increasingly require competencies related to data analytics, digital curation, and information security, yet these areas often remain underdeveloped within LIS educational programs.

The persistence of these competency gaps can be explained by the rapid evolution of digital technologies and the challenges educational institutions face in continuously updating curriculum content. While universities can relatively easily teach information searching and digital communication through existing course structures, advanced competencies such as digital preservation and data analytics require specialized software, practical laboratory experiences, and highly trained instructors. Consequently, students may have limited opportunities to engage deeply with these technologies during their academic studies. This explanation is supported by Raju (2020), who argued that LIS curricula often struggle to keep pace with technological transformation, resulting in a mismatch between educational outcomes and labor market expectations.

The findings further reveal that students perceive curriculum content as only partially effective in preparing them for contemporary digital work environments. Although foundational digital skills are adequately integrated into the curriculum, respondents expressed a need for stronger emphasis on emerging technologies, data management, and practical technological applications. This result reinforces the growing scholarly consensus that curriculum modernization is a critical determinant of digital competence development. Bakare and Bakare (2024) similarly found that curriculum redesign significantly enhances students' readiness to address contemporary professional challenges by exposing them to evolving technological trends and workplace demands. The similarity between these findings suggests that curriculum relevance remains a universal concern across LIS education regardless of geographical context.

From a theoretical perspective, these findings can be interpreted through constructivist learning theory, which emphasizes that meaningful learning occurs when students actively construct knowledge through authentic experiences and problem-solving activities. Traditional lecture-centered approaches may effectively transmit conceptual knowledge but often fail to cultivate practical digital expertise. Therefore, the perceived limitations of the curriculum may stem from insufficient opportunities for experiential engagement with real-world technologies. As argued by Martzoukou et al. (2020), digital competence is best developed through authentic learning experiences that enable students to apply theoretical knowledge in realistic professional contexts.

Another important finding concerns the significant role of instructional approaches in fostering

digital competence. Students reported that project-based learning, technology-supported assignments, and collaborative activities positively influenced their digital skill development. This finding is consistent with the work of Tondeur et al. (2021), who demonstrated that active learning pedagogies contribute more effectively to digital competence acquisition than traditional instructional methods. Similarly, López-Meneses et al. (2020) found that students participating in collaborative digital projects exhibited higher levels of technological confidence and problem-solving ability than those receiving primarily lecture-based instruction.

The effectiveness of experiential learning can be explained by situated learning theory, which posits that knowledge is developed through participation in authentic social and professional practices. Project-based activities require students to engage directly with digital tools, solve practical problems, and collaborate with peers, thereby creating opportunities for deeper cognitive processing and skill transfer. Consequently, students are more likely to develop durable digital competencies when learning activities mirror the technological realities they will encounter in professional environments. This theoretical explanation helps clarify why experiential learning consistently emerged as a strong predictor of competency development in the present study.

The study also identified several institutional barriers that hinder digital competence development, including inadequate technological infrastructure, limited access to specialized software, insufficient exposure to advanced digital tools, and financial constraints. These findings corroborate previous studies conducted by Polly et al. (2021) and Weli et al. (2024), which highlighted infrastructure limitations as a major obstacle to technology integration in higher education. The consistency of these findings across different educational contexts suggests that digital competence development depends not only on individual motivation and curriculum quality but also on institutional capacity and resource availability.

Interestingly, while previous studies often emphasize student-related factors such as motivation and digital attitudes, the present study highlights the structural nature of many competency challenges. This distinction is significant because it shifts the focus from individual deficiencies toward systemic educational conditions. In other words, the observed competency gaps may not primarily result from students' lack of interest or ability but rather from limited opportunities to access advanced technologies and engage in authentic digital learning experiences. Such an interpretation has important implications for educational policy, suggesting that investments in infrastructure and technological resources may be as important as curriculum reforms in improving digital competence outcomes.

The findings collectively support the proposition that digital competence development is a multidimensional and ecosystem-based process. Consistent with the Digital Competence Framework and contemporary higher education literature, students' digital capabilities emerge through the interaction of curriculum design, pedagogical practices, institutional support, and technological access (Redecker, 2020; Vuorikari et al., 2022). The results therefore challenge simplistic assumptions that digital competence can be improved merely by increasing technology availability. Instead, effective competence development requires a holistic educational strategy that simultaneously addresses curricular relevance, instructional innovation, technological infrastructure, and industry engagement.

From a scientific perspective, this study contributes to the growing body of knowledge on digital competence in LIS education by demonstrating that competency development is influenced by interconnected educational and institutional factors. While previous studies have often examined individual dimensions of digital literacy, the present findings provide a more comprehensive understanding of how curriculum innovation, experiential learning, and institutional conditions

collectively shape students' preparedness for digital professional environments. This contribution is particularly relevant given the accelerating digital transformation of information professions and the increasing demand for technologically competent LIS graduates in contemporary knowledge societies (Oktarina et al., 2025; Hilhamsyah et al., 2025). Overall, the results suggest that strengthening digital competence among LIS students requires more than the acquisition of basic digital literacy skills. Future educational strategies should focus on cultivating advanced competencies related to digital preservation, data analytics, artificial intelligence applications, and emerging information technologies.

## CONCLUSION

Digital competence has become an indispensable requirement for contemporary Library and Information Science professionals. The findings of this study demonstrate that while LIS students possess foundational digital skills, significant opportunities remain for strengthening advanced competencies relevant to modern information environments. Curriculum innovation, experiential learning, and institutional investment in technology infrastructure are critical factors supporting competency development. By adopting comprehensive and forward-looking educational strategies, LIS programs can better prepare graduates to navigate the challenges and opportunities presented by digital transformation.

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