



Teaching critical thinking with artificial intelligence: An information literacy training model at the Library of the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada

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Paper type:
Research Article

Article history:
Received February 20, 2026
Revised May 20, 2026
Accepted June 30, 2026
Published October 18, 2026

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Published by Unit Pelaksana
Teknis Perpustakaan
Universitas Islam Negeri
Walisongo

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Abstract

Purpose. This study investigates the integration of artificial intelligence (AI) into information literacy training in university libraries, focusing on how AI can foster critical thinking and ethical awareness among students and staff.

Methods. The research employed a qualitative descriptive approach with data collected through interviews, observations, and documentation at the Faculty of Medicine, Public Health, and Nursing Library of Gadjah Mada University. Thematic analysis was used to identify patterns in participants' experiences and in librarians' roles as facilitators.

Findings. The training model consisted of three main components: introducing AI concepts and ethical considerations, practicing the use of generative AI tools for literature searching, summarisation, and academic writing, and critically evaluating AI outputs. The training enhanced participants' ability to locate relevant sources, generate summaries, and support administrative tasks. It also highlighted challenges, including difficulties in formulating effective prompts and the need for librarians to upgrade their AI competencies continually. The findings show that AI-based literacy training not only improves technical proficiency but also nurtures reflective and critical engagement with digital tools.

Implications. The study concludes that AI-driven information literacy programs in academic libraries can serve as an innovative model for strengthening users' critical thinking, ethical responsibility, and digital literacy. Sustained librarian capacity-building and continuous training are essential to maximize the long-term benefits of AI integration in academic information services.

Keywords: Artificial Intelligence; Information literacy; Training; University library

1. Introduction

The rapid advancement of artificial intelligence (AI) has significantly transformed the landscape of education and academic libraries, particularly in the context of the Fourth

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Industrial Revolution. The integration of AI into information services is increasingly regarded not merely as a technological trend but as a strategic approach to improving accessibility, operational efficiency, and the personalization of user experiences. Academic libraries worldwide have begun adopting AI for various functions, including automated cataloging, chatbot-based reference services, and personalized information recommendation systems tailored to users' needs (Bridges et al., 2024). These developments indicate a broader transformation in library services, in which AI is increasingly integrated into the delivery and management of information rather than being treated as an emerging technology alone.

At the same time, the increasing complexity of the digital information environment has intensified the need for students to develop robust information literacy competencies. Although digital technologies provide unprecedented access to diverse electronic resources, such access does not necessarily translate into the ability to critically evaluate the authenticity, credibility, and validity of information (Head, 2020). The proliferation of misinformation, disinformation, and information overload, therefore, requires students to develop not only technical competencies but also critical and ethical information literacy skills (Michalak et al., 2017). In this context, academic libraries play an increasingly important role in supporting students' ability to navigate, evaluate, and use information responsibly in rapidly changing digital environments.

University libraries in Indonesia, including Gadjah Mada University (UGM), have responded to these challenges by developing structured and sustainable information literacy initiatives. One notable example is the Si Baper (Sinau Bareng Perpustakaan, or Learning Together with the Library) program at the Faculty of Medicine, Public Health, and Nursing (FKKMK) UGM Library, which provides a collaborative learning environment designed to strengthen students' abilities to access, evaluate, and manage scholarly information. Nevertheless, information literacy programs in Indonesia continue to face several challenges, including the reliance on conventional instructional approaches, limited adoption of adaptive technologies, and insufficient use of user data to support personalized learning experiences (Ramadani et al., n.d.). AI offers opportunities to address some of these limitations through machine learning to analyze students' information needs, recommendation systems to tailor instructional materials, and natural language processing (NLP) to develop AI-based learning companion chatbots (Katuka et al., 2024).

The growing demand for digital and AI-related literacy further reinforces the strategic role of academic libraries in supporting students' learning and research practices. Recent research has identified a positive relationship between students' information literacy and their use of AI-based text-generation tools such as ChatGPT, which are commonly employed to generate ideas, improve writing efficiency, and enhance the quality of academic drafts (Muhaemin et al., 2024). Nevertheless, the use of AI without appropriate ethical and critical guidance may undermine students' engagement with academic materials. Research conducted in Indonesian higher education institutions indicates that although tools such as Grammarly can improve writing efficiency, users may accept AI-generated outputs without sufficient critical reflection (Muhammad et al., 2025). This concern is consistent with Bridges et al. (2024), who identify several critical issues

surrounding generative AI in libraries, including algorithmic bias, academic integrity, and the implications of automation for the library profession.

The implementation of AI-based library services also requires active involvement from library professionals. A pilot study at the University of Delaware demonstrates that the participation of library staff, including librarians and reference managers, is important for developing and refining AI-based chatbots to align with users' contexts and institutional needs (Estes et al., 2024). This finding suggests that successful AI implementation in academic libraries depends not solely on technological capabilities but also on librarians' capacity to mediate between technological systems, institutional objectives, and users' information needs.

Accordingly, the integration of AI into information literacy programs represents a potential innovation for expanding the scope, effectiveness, and relevance of academic library services. Such integration, however, should not be understood simply as the modernization of existing services. AI implementation also introduces new challenges that require systematic attention. Bibliometric research has identified algorithmic bias as a significant concern, as biased algorithms can produce discriminatory outcomes in information retrieval and recommendation systems. Regular bias auditing and greater algorithmic transparency have therefore been identified as important measures for addressing these risks (Islam et al., 2025).

These challenges reinforce the importance of incorporating AI literacy into information literacy education, particularly students' ability to critically evaluate the reliability, relevance, and credibility of AI-generated information. The integration of AI into academic research consequently requires not only technological innovation but also appropriate institutional policies and ethical frameworks. Although AI can accelerate academic writing and research-related activities, systematic research on AI and research integrity indicates that institutional oversight and ethical governance remain insufficient in many contexts (Arar et al., 2025). Similarly, Emin (2025) examines innovative AI-based services in university libraries and emphasizes that effective AI implementation requires collaboration among multiple stakeholders. This collaborative approach is particularly relevant to information literacy programs, where technological systems must be integrated with pedagogical objectives and professional library practices.

Within this context, librarians remain central to the implementation of AI-based information services. They function both as intermediaries who understand users' information needs and as professionals who translate technological capabilities into meaningful library services. AI has considerable potential to transform academic library services by increasing operational efficiency, enhancing information provision, and improving user experiences through intelligent information retrieval, recommendation systems, and automation of routine tasks (Mandal, 2024). Nevertheless, its implementation is accompanied by challenges related to privacy, algorithmic bias, ethical considerations, and human resource capacity. Mandal's (2024) study provides valuable insights into AI applications in academic library services, particularly reference services. However, it gives comparatively limited attention to how AI integration can be operationalized within information literacy programs.

Further evidence is provided by Narendra et al. (2025), who demonstrate the importance of AI technologies, particularly machine learning and NLP, for improving information retrieval and enabling more personalized services tailored to user needs. Their research examines a range of AI applications in libraries, including NLP, reference chatbots, recommendation systems, automated cataloging, and digital preservation. However, the emphasis remains largely on technological applications and service functions rather than on the pedagogical integration of AI into information literacy education.

Differences also influence the implementation of AI-based library services in institutional resources and technological infrastructure. Akinwalere and Ivanov (2022) observe that although AI can stimulate innovation in higher education, disparities in infrastructure and institutional resources may create differences in universities' capacity to adopt advanced technologies. In the Indonesian context, Sugiyanti and Junandi (2023) examine the development of technology-based information literacy programs in university libraries and demonstrate that the use of digital platforms can improve students' information literacy competencies. However, their study primarily focuses on the utilization of online learning resources and does not comprehensively examine the integration of AI into information literacy instruction. The limited attention given to AI integration in previous research highlights the need to examine how AI can function not only as a technological tool but also as an instructional component within academic library information literacy programs.

Based on these considerations, this study examines an AI-based information literacy training model through a case study of the Si Baper program at the FKMK UGM Library. The study addresses three interrelated research gaps. First, empirical studies documenting AI-integrated information literacy training models in Indonesian academic libraries remain limited, particularly studies that provide explicit methodological accounts of their implementation. Second, there is limited research that connects AI-based information literacy training to established professional frameworks, such as the ACRL Framework for Information Literacy. Third, insufficient attention has been paid to librarians' evolving role as facilitators in AI-based information literacy education.

Accordingly, this study addresses the following research questions: (1) How is AI integrated into the Si Baper information literacy training model? (2) What changes in participants' knowledge, skills, and critical engagement are reported following the training? and (3) What challenges do librarians encounter in implementing the model, and how are these challenges addressed? The objectives of this study are to examine the implementation of an AI-based information literacy training model, identify strategies for implementing it in academic libraries, and formulate practical recommendations for developing AI-integrated library services. The study is expected to contribute theoretically to the growing literature on AI and information literacy, practically to academic library managers seeking to develop innovative and responsible services, and educationally to students as primary users who need to develop critical, ethical, and adaptive competencies for navigating an increasingly AI-mediated information environment.

2. Methods

This study employed a qualitative case study (Yin, 2018), appropriate for examining the processes, experiences, and meanings perceived by participants within a specific program in its real-world setting. The case under study is the Si Baper (Sinau Bareng Perpustakaan) AI-based information literacy training program at the FKMK Library, Gadjah Mada University, Yogyakarta, Indonesia. A qualitative approach was chosen because the primary aim was to understand how participants experienced the training and how librarians navigated the challenges of AI integration, a focus that required interpretive depth rather than statistical generalization.

2.1 Participants and Sampling

Purposive sampling was employed to select information-rich participants who could provide diverse and credible perspectives on the Si Baper program (Patton, 2015). A total of seven participants were recruited across three informant categories, and sampling continued until thematic saturation was reached. The first category was one key informant: SU, Head of the FKMK Library, selected for their institutional oversight and strategic decision-making role. The second category comprised four main informants who are active librarian-trainers: Ha (Mendeley module trainer), MA (AI strategy trainer), NG (Scoping Review trainer), and MU (academic writing trainer). The third category consisted of two supporting informants representing the trainee perspective: AR, a final-year S1 medical student, and RO, a PPDS2 clinical resident, selected to reflect the FKMK Library's heterogeneous user base. Each interview lasted between 35 and 55 minutes and was conducted in Bahasa Indonesia.

2.2 Data Collection

Data were collected through three complementary methods to enable triangulation. First, semi-structured in-depth interviews were conducted individually with each participant between March and April 2025, using a pre-tested interview guide. Interviews were audio-recorded with informed consent. The guide covered: perceptions of the program, observed behavioral changes among participants, implementation challenges, and recommendations for improvement. Second, non-participant observation was conducted during four consecutive Si Baper sessions, with field notes recorded immediately after each session. Third, documentation analysis was conducted, including post-session evaluation forms, promotional materials, and internal program reports.

2.3 Data Analysis and Trustworthiness

Interview recordings were transcribed verbatim, and thematic analysis was conducted following the six-phase framework of Braun and Clarke (Braun & Clarke, 2006): familiarisation, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Coding was conducted inductively, then refined deductively against the ACRL Framework for Information Literacy. Credibility was

established through methodological triangulation (interviews, observations, documentation) and member checking, in which key findings were shared with three participants for verification. Dependability was ensured through a detailed research protocol and audit trail. All participants provided written informed consent; identities are protected through coded initials throughout this report.

3. Results and Discussion

3.1 Implementation of AI Training by Librarians

Librarians provide hands-on artificial intelligence (AI) training that includes topic presentations, practical use of AI tools, and guided practical exercises. The face-to-face method allows facilitators to adjust the material's difficulty and provide immediate feedback. This approach is recommended in studies on integrating AI into higher education because it can improve participants' conceptual understanding and practical application of AI principles. (Southworth et al., 2023). Research demonstrating that task-based activities and organized practice can enhance higher-order cognitive capabilities, such as analytical and evaluative abilities, when participants engage with artificial intelligence (AI) systems is consistent with the major emphasis on practice sessions. Review studies and meta-analyses indicate that the use of AI in learning contexts is most effective when instructional design emphasizes participant practice, reflection, and evaluation of AI output. (Bond et al., 2024). This statement supports the field findings that practice sessions are crucial to training because they allow participants to test commands, evaluate output accuracy, and adjust information-search strategies.

To make the skills they acquired more useful, participants were allowed to test them on their own laptops. Testing various prompt modifications, comparing outcomes, and debating the benefits and drawbacks excited several pupils. To support this process, librarians accompanied small groups, addressed technological issues, and presented case studies pertinent to the medical sector, such as how AI can help summarize medical research findings or spot trends across numerous scientific publications. Observations show that librarians served as both active facilitators and instructors, assisting participants when they ran across technological issues. An interactive training environment was effectively established through straightforward explanations, demonstrations, individual practice, and group debates. In addition to being passive observers, participants actively tested, evaluated, and discussed their experiences with AI. This dynamic demonstrates how librarians are crucial in helping students connect new technologies to their actual requirements, ensuring that training is not only a knowledge transfer but also a means of developing critical awareness of the appropriate application of AI.

This training focuses not only on technical mastery of these tools but also on AI literacy, namely the ability to analyse the reliability, bias, and context of AI results, thereby preventing their use without academic verification. Informant NG described this facilitation philosophy as follows:

Konsepnya memang tidak menggurui, jadi kita memang belajar bareng dan sharing. Kita mulai explore dulu kasus-kasus yang terjadi pada peserta itu

seperti apa kemudian kita bahas bersama. Dan ketika pembelajaran itu berlangsung terjadi komunikasi 2 arah tidak satu arah saja dalam memberikan materi. (NG, Librarian)

This approach is also described by Informant MA, who noted that Si Baper additionally serves as a professional development opportunity for library staff themselves “*Dengan adanya pelatihan sibaper ini mau tidak mau kita akan selalu belajar untuk mengembangkan diri dan juga untuk mencari pengetahuan lebih banyak apa saja yang kira-kira bisa kita sampaikan pada mahasiswa.*” (MA, librarian)

The concept of critical AI literacy highlights the importance of participants having assessment skills that enable them to evaluate the quality and social impact of AI products, rather than just operational capabilities. According to recent research, for AI to be used responsibly in academic settings, it must incorporate ethics, source evaluation, and awareness of model bias. (Veldhuis et al., 2025). It has been shown that training practices combining technical practice, case studies, and targeted feedback from librarians can improve participants' ability to integrate artificial intelligence results into scientific work while accounting for citations, technology ethics, and scientific writing rules. These findings align with research on the role of librarians and library staff in promoting digital and information literacy in higher education. Librarians are therefore well-positioned to facilitate the development of reading and information literacy skills in the age of artificial intelligence (Mullins & Boyd-Byrnes, 2024).



Figure 1. Training activity on the use of AI by librarians

Source: Research Documentation

3.2 Learning Aspects in Training

The training material is divided into several main aspects. Overall, this training focuses on the introduction, use, and evaluation of AI work results. Details of the learning aspects are shown in the following Table 1:

Table 1. Aspects of AI Training in Academic Libraries

No.	Aspects Taught	Deskription
1	Introduction to AI	Participants were introduced to the basic concepts of AI, its development in academia, and the potential and risks of its use.
2	Use of AI	Librarians provided hands-on training on using AI to search for literature, summarize articles, and generate ideas for academic writing.
3	Evaluation of AI results	Participants were encouraged to critique and evaluate AI outputs to ensure they meet academic standards and scientific ethics.

Source: Research data processing results

This arrangement of elements is consistent with current study findings emphasizing the importance of integrating practical experience and conceptual knowledge when introducing artificial intelligence (AI) into higher education. Participants' conceptual knowledge and practical application skills are enhanced by this approach. (Crompton & Burke, 2023) The table demonstrates that the training's format emphasizes critical thinking and ethical awareness in addition to technical abilities. The ACRL Framework for Information Literacy (Association of College and Research Libraries, 2016) is precisely aligned with this three-part approach. The introductory component maps to the ACRL frame "Authority Is Constructed and Contextual": when an algorithm generates text, the traditional notion of authority as residing in a credentialed human author is fundamentally destabilized, and participants must learn to reconstruct authority through verification and critical interrogation of AI outputs. The practice component engages "Searching as Strategic Exploration," as participants learn to formulate iterative, refined prompts rather than simple keyword queries. The critical evaluation component operationalizes "Evaluating as Creating" and "Information Has Value," requiring participants to make consequential judgments about the credibility and integrity of AI-produced content. To understand the context of its use rather than merely becoming proficient with the tools, participants at the introductory level are provided with insight into AI's ideas and advancements. This phase is crucial for fostering an early understanding of the prospects and concerns associated with AI technology, including the potential for plagiarism, algorithmic prejudice, or exploitation of personal data.

In addition, controlled exercises during the implementation stage allow participants to test various search strategies using prompts, analyze the results, and refine their information-search processes. Participants develop these skills through hands-on practice, as technical proficiency requires practical application beyond theoretical understanding. Librarians act as facilitators, helping participants develop practical academic skills through book-search simulations, article summarization, and concept-based writing.

This training emphasizes critical thinking and ethics because AI outputs, though they may appear flawless, often contain biases and critical errors. Ultimately, we learn that

adopting AI in information literacy is not just about the sophistication of the tools, but about how we balance them with human cognitive and ethical factors. Participants are expected not only to be proficient in AI but also to use this technology reflectively and responsibly to promote academic integrity. This emphasis on practical and responsible AI use aligns with research on AI integration in academic libraries, which recommends a tiered training model to ensure that learning is applied in everyday academic practice (Chaudhuri & Terrones, 2025). Participants demonstrated skill improvement through an instructional approach that included theoretical presentations, guidance, question-and-answer sessions, practical assignments, reflection sessions, and feedback from librarians. In this context, the role of librarians as instructional facilitators is crucial, as their information literacy knowledge can be integrated with artificial intelligence (AI) techniques to promote ethical information seeking, evaluation, and use. The integration of librarians' information literacy expertise with AI techniques further underscores their importance as instructional facilitators who promote ethical information seeking, evaluation, and use.

3.3 Impact of AI-based Information Literacy Training on Participants

The interview results show that most participants recognize the real benefits of this course. Students reported finding it easier to identify material relevant to their study topics, especially when time constraints arose during manual source searches. These reported benefits align with research showing that artificial intelligence (AI)-based learning interventions can accelerate the identification of relevant materials and assist in selecting sources for academic research. Participants also use artificial intelligence (AI) to summarize readings to comprehend the content of books or articles more rapidly and efficiently. This conclusion is consistent with recent studies suggesting that using artificial intelligence to generate initial summaries may improve text comprehension; however, the accuracy of these results needs to be verified. (Khalifa & Albadawy, 2024). By reducing the time spent searching for and organizing information, AI-assisted learning may allow students to devote more attention to understanding reading materials and potentially support their academic performance. Participant AR, a final-year medical student, articulated this transformation clearly: "

Dulu ketika saya masih maba masa masa adaptasi dari SMA ke perkuliahan itu kerasa banget perbedaannya karena masih belum paham cara pencarian misalnya jurnal internasional yang saya butuhkan atau mencari informasi yang relevan sesuai dengan sumber yang akurat. Namun setelah saya mengikuti program ini saya bisa tau bahwa ada AI yang membantu menyelesaikan masalah itu semua. (AR, final Year medical student)

Similarly, Participant RO noted a concrete behavioural change "Ada, pasti akan diaplikasikan setelah mengikuti program ini. Contoh tadi penggunaan keyword di Scopas AI itu akan saya gunakan ketika ingin menemukan informasi ataupun referensi yang saya butuhkan." (RO, PPDS2 students of paediatrics)

In addition to the visible benefits, this training helps participants improve their digital literacy. They become more aware of the importance of understanding how technology works, especially artificial intelligence (AI), and realize that using AI is inseparable from the ability to write appropriate instructions or prompts. This discovery contributes to the field of artificial intelligence literacy, highlighting the importance of evaluation and instruction-drafting skills in preventing bias and output errors. (Chatikobo & Pasipamire, 2024). These results show that even if training has beneficial effects, much more training is still required. The ability of participants to create prompts, analyze AI output, and comprehend the ethical consequences of its use, such as the authenticity of work, data privacy, and potential algorithmic bias, needs further training. To enable participants to become capable, self-sufficient, and responsible AI users, future training should focus on teaching critical knowledge alongside technical skills.



Figure 2: Participants practicing the use of AI applications
Source: Research Documentation

3.4 Improvement of Participants' Knowledge and Skills

AI training in libraries helps participants significantly improve their knowledge and skills. The majority of participants had just a general awareness of AI technology before the course, and several had never utilized it in an administrative or academic environment. Through lectures and practical exercises, participants were introduced to a variety of AI applications pertinent to their needs, including document preparation, reading summaries, and scientific literature searches. As a result, participants acquired both conceptual knowledge and instantly applicable practical abilities. These improvements in participants' knowledge and skills align with empirical studies and reviews showing that combining conceptual instruction with practical exercises enhances understanding and supports the application of AI in administrative and academic contexts (Castillo-Martínez et al., 2024).

Table 2. Comparison before and after participating in AI training

No.	Focus	Before training	After Training	Impact
1	AI Knowledge	General overview, minimal experience	Understanding AI concepts and applications	Broader perspective
2	Technical Skills	Unable to utilize AI	Able to search for literature, create summaries, and draft documents	Work efficiency increases
3	Critical Literacy	Lack of information evaluation General instructions	Able to verify and assess credibility	Information literacy is developing
4	Prompt Composition	inaccurate results	Specific instructions, results as needed	Improved communication and problem-solving
5	Productivity	Manual work, time-consuming	Integration of AI in academic and administrative tasks	Work productivity and quality increased

Source: Research data processing results

The results of the study demonstrate that individuals are becoming more adept at incorporating artificial intelligence (AI) into their everyday lives. For instance, because the procedure is more focused and fast, students feel more at ease utilizing AI to find academic content. Participants may also use AI to create summaries of the material, saving hours of reading time. These results are consistent with other studies demonstrating that the use of AI increases the efficiency of academic tasks. The study also emphasizes the importance of additional verification to ensure accuracy and integrity. (Khalifa & Albadawy, 2024). In addition to technical skills, this program helps participants develop cognitive and critical-thinking skills. They understand that employing AI requires assessment skills in addition to rapid results. Some participants agreed that while AI can offer insightful responses, it is essential to confirm the veracity and validity of the data.

As a result, this training indirectly hones participants' information literacy skills, as they must be able to distinguish between authentic and accountable information and material and that which requires further evaluation. This observable change was captured clearly by Informant MU:

Dulu itu kita pas awal-awal menyerahkan karya itu harus melibatkan petugas untuk membantu mahasiswanya tetapi sekarang sudah menurun semakin sedikit karena dirasanya mereka sudah pada bisa sendiri. Terus dulu itu masih banyak mahasiswa yang konsul penulisan karyanya itu ada sitasinya tetapi tidak ada daftar pustakanya, ada daftar pustakanya tetapi tidak ada sitasinya; sekarang kejadian kayak begitu sudah berkurang. (MU, Librarian)

Informant Ha also expressed optimism about the sustained impact on information-seeking behavior “*Saya optimis hasil pelatihan yang kita lakukan selama ini itu juga membawa perubahan perilaku mereka dalam mencari literatur, dalam memanfaatkan AI maupun dalam penggunaan reference manager.*” (HA, Librarian)

After several training sessions, participants' ability to make better suggestions improved. Initially, many participants provided overly general instructions, resulting in AI

outputs that did not meet their requirements. However, after receiving assistance from facilitators, they realized the importance of providing explicit, clear, and focused instructions. These observations indicate that effective AI use depends not only on application proficiency but also on communication and problem-solving skills. These findings are in line with previous studies on critical AI literacy and readiness to integrate AI into information literacy teaching. They emphasize that teachers must equip students with the ability to analyze, test results, and develop quick skills so that AI becomes more ethical and accurate. (Khalifa & Albadawy, 2024).

3.5 Challenges in AI Training

The implementation of artificial intelligence (AI) training in libraries raises several issues that must be addressed for the program to run sustainably and have maximum impact. The first challenge is librarians' readiness. As facilitators, librarians must not only understand the basic concepts of artificial intelligence (AI) technology, but also have more in-depth practical skills than the participants. Since librarians are the primary point of contact for participants who encounter issues, their expertise must extend beyond technical jargon. Because not all librarians specialize in information technology, additional training is necessary to develop the practical skills required to facilitate AI adoption effectively. To put it another way, librarians' position as lifelong learners is becoming increasingly crucial, allowing them to serve as both critical conversation partners and teachers in the use of new technology. These results are consistent with earlier research demonstrating that the availability of structured professional development programs and the technical proficiency of librarians have a significant impact on their willingness to embrace artificial intelligence AI. (Shahzad et al., 2024)

As facilitators, librarians must not only understand the basic concepts of artificial intelligence (AI) technology, but also have more in-depth practical skills than participants. Since librarians are the primary point of contact for those experiencing issues, their expertise must extend beyond technical jargon. Because not all librarians specialize in information technology, additional training is needed to equip them with the practical skills required to support participants effectively. Unsatisfactory outcomes are typically produced by participants who are not used to communicating their needs in a structured way. These challenges highlight the need for training programs that go beyond explaining AI features to equip participants with effective strategies for communicating their needs to AI system. For example, through case studies, hands-on exercises, and evaluation of results, participants can learn that prompt composition requires analytical skills, precision, and creativity. A further structural challenge is the scheduling conflict between the fixed Wednesday 13:00 WIB slot and participants' clinical and academic obligations. Informant SU described the pattern:

Tantangannya adalah ketika kita mempublikasikan kegiatan sibaper itu, hanya butuh beberapa waktu kuota yang kita tetapkan misalkan 20 itu langsung terpenuhi. Tetapi masalahnya begitu nanti hari H kegiatan jumlah yang hadir itu tidak sebagaimana waktu registrasi. (SU, Head Of librarian)

The solution adopted was to add 10 reserve slots. Regarding the absence of long-term evaluation, Informant Ha acknowledged, “*Untuk jangka panjangnya saat ini belum kita lakukan. Kita cuma menyuruh peserta mengisi form kepuasan peserta.*” (HA, Librarian). This gap is significant: post-session satisfaction surveys cannot capture sustained behavioral change, and future iterations of Si Baper would benefit from validated pre- and post-assessment rubrics and follow-up evaluations at three and six months post-training.

In addition, there is also the challenge of continuing education. In the next few months, abilities that are helpful today may become obsolete as artificial intelligence (AI) continues to evolve. Participants and librarians must always improve their knowledge and abilities to stay up to date with the latest advances. The skills learned might become outdated and unable to keep up with future technological advancements in the absence of a continuous education program. To enable participants to progressively enhance their abilities from fundamental knowledge to advanced, critical use, a tiered training program must be developed. Overall, these three issues show that the application of artificial intelligence (AI) in libraries is not only related to technology, but also to human resource preparation and the long-term sustainability of the learning process. If these issues can be anticipated, AI training in libraries has the potential to become a strategic program to improve the digital literacy of the academic community and strengthen libraries' role in the era of digital transformation.

Table 3. Challenges faced by librarians

No.	Challenges	Key issues	Impact	Quick solution
1	Librarian Readiness	Not everyone understands AI, with a limited IT background	It's difficult to be an optimal facilitator	Additional training, the role of a lifelong learner
2	Formulating Prompts	Participants frequently produce vague or unfocused prompts, resulting in poor-quality AI outputs that do not meet academic requirements.	AI output is accepted uncritically, reducing training effectiveness and increasing the risk of academic integrity violations.	Case study exercises & prompt evaluation.
3	Advanced Training	AI is developing rapidly, and skills quickly become obsolete	Knowledge becomes irrelevant	Tiered curriculum & regular updates

Source: Research data processing results

This graph shows that the main obstacles to artificial intelligence (AI) training in libraries are librarians' readiness, participants' ability to formulate prompts, and the need for additional training. Librarian readiness affects facilitation effectiveness, while difficulties in formulating prompts directly impact the quality of AI output. Furthermore, without additional training, learned skills may quickly become outdated as technology advances. A tiered curriculum to ensure ongoing competency, participant practice, and evaluation of prompt writing, as well as further training for librarians, are among the recommended strategies.

3.6 The changing role of librarians in the age of AI

The development of artificial intelligence (AI) technology has not only impacted students as trainees but has also drastically changed the role of libraries. Previously, libraries only acted as facilitators in the process of searching for and using information. Still, now they are expected to become AI educators, prompt engineers, and data curators who ensure the quality of the materials used. These are the skills librarians must have to adapt to the new dynamics of the academic world. The phenomenon of changing librarian functions is documented in the literature, which highlights how libraries' roles are evolving due to artificial intelligence (AI) and how librarians' work is shifting toward collaborative tasks requiring technical skills, data mapping, and AI learning facilitation. (Cox, 2023)

In their capacity as AI educators, librarians must teach students in both conventional information literacy and effective AI use. These competencies include crafting precise prompts, evaluating the accuracy of AI-generated outputs, and demonstrating AI applications in academic writing and research. Librarians must stay abreast of the latest advancements in AI due to its rapid, dynamic growth. Librarians also uphold AI ethics. It is the moral duty of librarians to ensure that students are aware of the constraints on the use of AI in social and academic contexts. Upholding these ethical responsibilities involves maintaining integrity in scientific writing, avoiding plagiarism, and promoting academic honesty. To put it another way, librarians need to set an example for ethical AI literacy. Informant NG articulated the information dissemination dimension of this role:

Tidak semua mahasiswa atau user yang berada di perpustakaan fakultas kedokteran ini memahami dan mengetahui database yang ada. Nah di sinilah peran kami sebagai pustakawan itu untuk mendiseminasikan informasi itu. Jadi intinya dengan adanya kegiatan sibaper ini kami sangat mendukung program sibaper ini. (NG, librarian)

Informant MA further reinforced the ethics guardian dimension “AI itu dirasakan oleh peserta dapat membantu untuk penulisan tetapi dengan beberapa catatan. Catatannya adalah harus dipantau oleh tenaga yang profesional seperti pustakawan, dosen, dan pakar AI.” (MA, librarian)

This human-in-the-loop framing is what distinguishes the Si Baper model from purely technical AI training programs documented elsewhere. Furthermore, librarians can also act as collaborators in academic research involving AI. In certain situations, librarians work with lecturers and academics to develop learning modules supported by artificial intelligence (AI). These collaborative practices position librarians as active partners in educational innovation rather than peripheral contributors to the academic process. This shift in librarians' functions demonstrates the need to redefine the librarian profession in the age of artificial intelligence (AI). In response to technological advancements, librarians now need to develop new competencies alongside conventional technical skills such as collection management and reference services. Librarians can play a more significant role in the intelligent integration of artificial intelligence (AI) into the higher education setting if these problems are successfully addressed.

Table 4. Changes in the role of librarians in the AI era

No.	The Role of Librarians	The Core of Change	Impact or Brief Strategy
1	AI Educator	Teaching practical AI utilization	Need for AI knowledge & skills updates
2	Prompt Engineer & Data Curator	Assisting in compiling AI instructions & ensuring data quality	Prompt practice & data evaluation
3	AI ethics	Emphasizing honest and responsible AI usage	AI ethics & literacy socialization
4	Academic Collaborator	Participating in AI-based module development & research	Integration into academic projects
5	Redefining the Profession	Expanding traditional competencies with digital literacy	Continuous training and professional curriculum development

Source: Researchers' data analysis.

4. Conclusion

This study demonstrates that the Si Baper AI-based information literacy training model at the FKMK Library, Gadjah Mada University, constitutes a replicable and theoretically grounded innovation in academic library services. The program's three-component structure, introducing AI concepts and ethics, practicing AI tools, and critically evaluating AI outputs, is anchored in the ACRL Framework for Information Literacy and has generated participant-reported improvements in prompt formulation, database navigation, reference management, critical source evaluation, and academic writing efficiency. Librarians have evolved from traditional information custodians into AI educators, prompt engineers, ethics guardians, and academic collaborators. The study also identifies the absence of longitudinal evaluation as a structural gap that limits the program's ability to demonstrate sustained impact to institutional stakeholders.

In light of the findings, three specific suggestions are made for university libraries seeking to develop or enhance AI-integrated information literacy programs. First, include AI ethics from the start in every training module rather than treating them as an add-on. A responsible integration paradigm that is both pedagogically sound and institutionally defensible is provided by Si Baper's person-in-the-loop method, which mandates that AI outputs be consistently validated by qualified human judgment. Second, offer a tiered, modular curriculum that goes from basic AI awareness to advanced critical literacy and discipline-specific application. The type of conceptual and behavioral change that information literacy education seeks to accomplish cannot be sustained by a single-session approach, notwithstanding its advantages. Third, develop rigorous longitudinal evaluation processes, such as validated pre- and post-assessment rubrics and follow-up interviews at 3 and 6 months after training, to track behavioral change beyond immediate post-session satisfaction surveys. Demonstrating the program's effectiveness through systematic evaluation can help secure institutional support and funding for its long-term development. The knowledge of which components of this model are universally transferable would be further advanced by future studies using mixed-methods designs and comparative studies across other Indonesian university libraries.

This body of evidence is crucial for convincing institutional stakeholders of the program's efficacy and securing the funding required for long-term growth. The knowledge of which components of this model are universally transferable would be further advanced by future studies using mixed-methods designs and comparative studies across other Indonesian university libraries.

5. Acknowledgment

5.1 Declaration of Generative AI Use

During the preparation of this manuscript, the authors used Scopus AI for literature mapping and reference retrieval, Gemini 3.6 to generate initial drafts (including outlining and ideation), and Grammarly for grammar and language editing. The data analysis, interpretation, and conclusions were conducted manually by the authors to ensure academic integrity. The authors take full responsibility for the content, accuracy, and originality of the final published work.

5.2 Author Contributions

Mohammad Riqza Zulmi conceptualized the research theme and drafted the results and discussion sections. Fitri Mutia was responsible for formulating the research problems and developing the methodology. Sukirno assisted with participant recruitment and the conduct of interviews with informants. Tachiyaa Nailal Khusna contributed to synthesizing the research results and drafted the conclusion. All authors reviewed, revised, and approved the final manuscript for publication.

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