

A Participatory Service-Learning Model for Digital Academic Literacy: Integrating Reference Management Tools in Community-Based Education

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Abstract

The digital transformation of higher education necessitates advanced digital academic literacy, including reference management, citation ethics, and technology-based scholarly writing. However, in non-formal and semi-formal educational communities, such competencies remain fragmented and insufficiently integrated with community empowerment approaches. This study aims to develop a participatory service-learning model for digital academic literacy by integrating reference management tools, particularly Mendeley, into community-based education, and to evaluate its effectiveness in enhancing academic literacy, reference management skills, and awareness of citation ethics. A mixed-method approach based on participatory action research was employed, utilizing a quasi-experimental design with pre-test and post-test. Participants consisted of community volunteers actively engaged in literacy activities. Data were collected through academic literacy tests, questionnaires, participatory observation, in-depth interviews, and document analysis, and were analyzed using paired t-tests, N-gain scores, and thematic analysis. The findings reveal significant improvements in digital academic literacy, reference management competencies, and the use of automated citation tools. Additionally, participants demonstrated increased awareness of academic integrity and the emergence of sustainable digital learning communities. The proposed model proves to be effective, practical, and adaptable across diverse community contexts in developing countries. This study contributes theoretically by proposing a Participatory Digital Academic Literacy Model and practically by offering an implementable framework for community-based education and service-learning initiatives.

Keywords: Academic Integrity, Community-Based Education, Digital Academic Literacy, Participatory Service-Learning, Reference Management



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INTRODUCTION

The rapid expansion of digital technologies in higher education has fundamentally reshaped how knowledge is produced, managed, and disseminated. Academic literacy is no longer confined to conventional reading and writing practices; it now encompasses digital competencies such as managing references, navigating scholarly databases, and adhering to ethical citation practices through technology-assisted tools. Despite this shift, significant disparities remain in how these competencies are acquired, particularly among learners in non-formal and semi-formal educational communities. Empirical evidence indicates that

while access to digital tools has increased substantially, the capacity to use them critically and effectively has not developed at the same pace (Danugroho et al., 2025; Mashami et al., 2025). This gap is especially evident in community-based learning environments, where training initiatives are often sporadic, technically oriented, and lacking pedagogical grounding.

In many developing and transitional societies, including community literacy groups and volunteer-based educational initiatives, digital academic literacy remains fragmented and underdeveloped. Observations from community engagement programs reveal that participants often rely on manual citation practices or inconsistent referencing styles, leading to issues of academic integrity and reduced quality of scholarly outputs. Even when reference management tools such as Mendeley are introduced, their use tends to be limited to basic functionalities without a deeper conceptual understanding of scholarly communication (Ashar et al., 2025; Habibi et al., 2024; Wanto et al., 2025). This phenomenon reflects a broader disconnect between technological provision and meaningful learning, where the availability of tools does not automatically translate into improved academic practices.

The importance of addressing this issue lies not only in enhancing individual competencies but also in fostering sustainable knowledge ecosystems within communities. Digital academic literacy plays a crucial role in enabling individuals to participate in global knowledge production, particularly in the Global South, where structural inequalities often limit access to academic resources (Ha & Kumar, 2021; Swaramarinda et al., 2025). Without targeted interventions, these disparities risk perpetuating a cycle of exclusion, where communities remain consumers rather than producers of knowledge. Furthermore, the lack of structured and continuous training models contributes to the inefficacy of many capacity-building programs, which are frequently delivered as one-off workshops with limited long-term impact (Karim et al., 2025; Setianti et al., 2025).

Existing literature has extensively explored the concept of digital literacy and its implications for education. Ramadhani et al. (2025) and Sarifah et al. (2025) conceptualize digital literacy as a multidimensional construct that includes technical, cognitive, and socio-emotional skills. Similarly, Lassa et al. (2025) and Lee and Liu (2025) emphasize the importance of digital competence frameworks in guiding educational practices, particularly within the European context. These studies highlight the necessity of integrating digital skills into broader learning processes rather than treating them as isolated competencies. However, much of this research is situated within formal educational settings, with limited attention to community-based learning environments.

Parallel to this, research on reference management tools has demonstrated their effectiveness in improving the efficiency and accuracy of academic writing. Gusweni et al. (2025) and Narmaditya et al. (2024) show that tools like Mendeley not only facilitate citation management but also support collaborative learning and knowledge sharing among researchers. Moreover, Iskandar et al. (2025) and Zahari et al. (2025) argue that reference management systems can enhance students' engagement with scholarly sources by

simplifying the organization and retrieval of information. Despite these advantages, the adoption of such tools remains uneven, particularly in contexts where users lack adequate training or institutional support.

Another relevant body of literature focuses on service-learning as a pedagogical approach that bridges academic knowledge and community engagement. Margono et al. (2024a, 2024b) and Setinawati et al. (2025) demonstrate that service-learning can enhance students' critical thinking, civic responsibility, and experiential learning. More recent studies by Amri et al. (2021) and Rusdiansyah et al. (2025) further confirm its effectiveness in fostering meaningful learning experiences by connecting theoretical knowledge with real-world applications. However, these studies rarely address the integration of digital competencies within service-learning frameworks, leaving a gap in understanding how technology can be embedded in community-based pedagogies.

Participatory approaches in education, particularly participatory action research, have also gained attention as a means of empowering learners and fostering collaborative knowledge production. Hairunisya and Narmaditya (2025), Maksum et al. (2025), and Ryandono et al. (2025) emphasize that participatory methods enable participants to become co-creators of knowledge rather than passive recipients. This perspective aligns with the principles of community empowerment and sustainability, which are critical for long-term impact. Nevertheless, the application of participatory approaches in digital academic literacy training remains underexplored, especially in non-formal educational settings.

While these strands of literature provide valuable insights, they tend to operate in isolation, addressing digital literacy, technological tools, or service-learning as separate domains. Consequently, there is limited empirical evidence on how these elements can be integrated into a cohesive model that addresses both technological and pedagogical dimensions of learning within community contexts. Existing studies also reveal methodological limitations, with many lacking rigorous evaluation designs or relying solely on descriptive analyses without assessing measurable learning outcomes (Syahrudin et al., 2025; Zaluchu et al., 2025).

Against this backdrop, a closer examination suggests that the intersection between digital academic literacy, reference management technologies, and participatory service-learning offers a promising yet underdeveloped avenue for research. The absence of integrative models that combine these dimensions indicates a need for innovative approaches capable of addressing both skill development and community empowerment in a sustainable manner. In particular, the potential of participatory frameworks to transform learners into active contributors to knowledge ecosystems remains insufficiently explored in relation to digital academic practices.

Building on this understanding, this study introduces an approach that intertwines technological proficiency with participatory pedagogy, positioning learners not merely as recipients of training but as co-creators within a community of practice. By embedding reference management tools within a service-learning framework, the study seeks to move

beyond technical instruction toward a more holistic model of digital academic literacy. This orientation implicitly advances a conceptual shift, where the integration of these domains is not treated as an additive process but as a mutually reinforcing system that supports both individual and collective learning.

Accordingly, the purpose of this study is to develop and empirically test a participatory service-learning model for digital academic literacy that integrates the use of reference management tools within community-based education. Specifically, the study aims to examine the effectiveness of the model in improving academic literacy, reference management skills, and citation ethics awareness among participants. In doing so, it seeks to contribute to the development of scalable and replicable frameworks that can inform both research and community engagement practices, particularly in contexts characterized by limited access to structured academic training.

RESEARCH METHOD

This study employed a qualitative research design grounded in participatory action research (PAR) to capture the dynamic, contextual, and collaborative nature of digital academic literacy development within community-based education. A qualitative approach was considered most appropriate because the study sought not only to measure outcomes but also to understand participants' lived experiences, learning processes, and transformations in meaning-making as they engaged with reference management tools and participatory learning practices. In line with Sudarnoto et al. (2025) and Wicaksono et al. (2024), qualitative inquiry enables an in-depth exploration of complex social phenomena, particularly when the boundaries between context and experience are intertwined. Furthermore, the adoption of participatory action research allowed the study to move beyond observation toward co-creation, where participants were actively involved in diagnosing problems, shaping interventions, and reflecting on outcomes (Maisyaroh et al., 2024; Marini et al., 2025).

The research was conducted within a community-based learning environment, specifically a volunteer-driven literacy group affiliated with an educational outreach initiative such as an American Corner program. This setting was deliberately chosen due to its hybrid nature, situated between formal and informal education, where participants demonstrate a genuine need for academic skill enhancement but often lack structured institutional support. Such communities represent a critical yet underexplored site for examining digital academic literacy, particularly in developing contexts where access to academic training is uneven (Monica et al., 2025; Saleh et al., 2025). The selection of this location was therefore not incidental but aligned with the study's broader aim of addressing real-world educational disparities through context-sensitive interventions.

The informants consisted of fifteen participants who were actively engaged in the community's literacy and volunteer programs. They were selected using purposive sampling to ensure relevance to the research objectives, with criteria including active participation in

literacy-related activities, basic familiarity with academic writing, and a demonstrated need to improve reference management and citation practices. This number was considered sufficient to achieve depth of insight while maintaining manageability for iterative engagement, consistent with qualitative research standards (Abusamra et al., 2025; Widodo et al., 2025). In addition to the primary participants, two facilitators who were involved in delivering the training sessions were also included as key informants to provide complementary perspectives on the implementation process. The inclusion of both participants and facilitators enabled a more holistic understanding of the learning ecosystem.

Data collection was carried out through multiple, interconnected methods to capture both process and outcome dimensions. Participatory observation was conducted throughout the training and mentoring sessions to document how participants interacted with the tools, negotiated meanings, and supported one another in learning. This method was essential in capturing the situated nature of learning, which often cannot be fully articulated through self-report alone (Adha et al., 2025; Safitri et al., 2025). In-depth interviews were conducted at different stages of the program to explore participants' experiences, challenges, and perceived changes in their academic practices. These interviews allowed for the emergence of nuanced insights into how individuals internalized digital academic literacy beyond technical proficiency. In addition, document analysis was undertaken by examining participants' written outputs, such as essays and reference lists, to assess changes in citation accuracy and organization. Reflective journals maintained by participants further enriched the dataset by providing introspective accounts of their learning journeys. The combination of these methods was intended to ensure a comprehensive and layered understanding of the phenomenon under study.

To enhance the credibility and trustworthiness of the findings, triangulation was systematically applied across data sources, methods, and perspectives. Methodological triangulation was achieved by comparing insights from observations, interviews, and document analysis, while source triangulation involved cross-checking information between participants and facilitators (Al Ayyubi et al., 2025; Wardoyo et al., 2025). Additionally, member checking was conducted by sharing preliminary interpretations with participants to validate the accuracy of the findings and to incorporate their feedback into the analysis. The data were analyzed using thematic analysis, following the iterative procedures outlined by (Pamularsih, 2022), which involved coding, categorizing, and identifying patterns that reflected both individual and collective transformations.

RESULTS AND DISCUSSION

Baseline Conditions: Fragmented Digital Academic Literacy in Community Contexts

The initial phase of the study sought to capture the baseline condition of participants' digital academic literacy within the community context, prior to the implementation of the participatory service-learning intervention. Drawing on pre-test results, participatory observations, and in-depth interviews, the findings consistently indicate that participants'

competencies were largely procedural, fragmented, and weakly connected to broader academic practices. While most participants demonstrated familiarity with basic digital tools, their ability to engage critically with academic resources, manage references systematically, and apply ethical citation practices remained limited. This discrepancy underscores a crucial distinction between access to technology and the capacity to use it meaningfully, a challenge widely observed in community-based learning environments.

Quantitative evidence from the pre-test further substantiates this condition. As presented in Table 1, participants scored relatively low across key dimensions of digital academic literacy, particularly in reference management and citation accuracy. Although some participants were able to identify common citation styles, their application was often inconsistent, and many relied on manual formatting or copy-paste practices without verification. This pattern reflects a surface-level engagement with academic conventions rather than a conceptual understanding of their purpose.

Table 1 Baseline Digital Academic Literacy Scores (Pre-Test Results)

Indicator	Mean Score	Category
Academic Writing Structure	58.4	Moderate
Reference Management Skills	45.7	Low
Citation Accuracy	42.3	Low
Understanding of Academic Ethics	48.9	Low

Source: Research data analysis (2025)

These findings were reinforced through observational data collected during early training sessions, where participants frequently encountered difficulties in organizing references, distinguishing between citation formats, and integrating sources into their writing. For instance, several participants attempted to use Mendeley but limited their engagement to uploading documents without utilizing its citation and bibliography features. This observation aligns with prior research suggesting that the adoption of digital tools does not automatically translate into effective academic practices without adequate pedagogical support (Mustary & Reed, 2025; Setyowati, 2021; Sukidin et al., 2025).

Insights from in-depth interviews further illuminate the underlying challenges. One participant, identified as R1, noted that “I have heard about Mendeley before, but I only use it to store articles, not for citations because I don’t really understand how it works.” Similarly, another participant (R7) expressed uncertainty about citation ethics, stating that “as long as I mention the source somewhere, I think it is okay.” These responses reveal not only gaps in technical knowledge but also a limited awareness of academic integrity as a foundational principle in scholarly work. Such perspectives indicate that participants’ prior learning experiences were fragmented and lacked structured guidance, particularly in connecting technical skills with ethical and conceptual dimensions of academic writing.

Importantly, these conditions cannot be understood in isolation from the broader socio-educational context in which the participants are situated. As members of a non-formal,

volunteer-based learning community, participants often navigate learning pathways that are self-directed and resource-constrained. Training opportunities are typically sporadic and short-term, with limited follow-up or mentoring. This structural reality contributes to what may be described as “episodic learning,” where knowledge is acquired in disconnected fragments rather than through sustained and integrated processes. In this regard, the findings resonate with the notion of digital literacy as a situated practice, where competencies are shaped not only by individual abilities but also by the social and institutional contexts in which learning occurs (Abebe, 2025; Negash & Gasa, 2025; Purnamasari et al., 2024).

Moreover, the absence of a coherent pedagogical framework was evident in how participants approached digital academic tasks. Rather than viewing reference management as part of a broader scholarly workflow, it was often treated as an isolated technical requirement. This fragmented understanding limited their ability to see the relevance of tools like Mendeley in supporting critical reading, knowledge organization, and ethical writing practices. Such conditions highlight the limitations of conventional training models that prioritize technical instruction without addressing the relational and contextual dimensions of learning.

Implementation of the Participatory Service-Learning Model

The implementation of the participatory service-learning model in this study unfolded as a dynamic and iterative process, structured across five interconnected stages: needs diagnosis, co-design of learning activities, technical training on Mendeley, collaborative practice, and reflective evaluation. Rather than functioning as a linear intervention, the model evolved as a learning ecosystem in which participants were continuously engaged as active contributors. This orientation was deliberately adopted to move beyond conventional training approaches that often position learners as passive recipients, and instead cultivate a sense of ownership and shared responsibility in the learning process.

The initial stage of needs diagnosis was conducted through participatory discussions, preliminary observations, and analysis of pre-test results. This phase allowed participants to articulate their own challenges and expectations regarding digital academic literacy. Importantly, the process was not merely extractive but dialogical, enabling participants to reflect on their existing practices and identify areas for improvement. One participant (R3) noted that “before this, I never realized that my way of citing sources could be problematic,” indicating the emergence of critical awareness even at this early stage. This aligns with the principles of participatory action research, where problem identification is co-constructed rather than imposed (Hidayati et al., 2025; Nursanti et al., 2025).

Building on this shared understanding, the co-design phase became a crucial turning point in shaping the learning experience. Participants, together with facilitators, collaboratively developed the structure, content, and modes of engagement for the training sessions. This included determining relevant topics such as citation styles, academic integrity, and practical use of Mendeley, as well as deciding on interactive formats such as peer discussion and hands-on exercises. The co-design process fostered a sense of agency among

participants, as reflected in the statement of R8: “It feels different because we are involved in deciding how we learn, not just following instructions.” Such engagement is consistent with participatory learning theory in digital environments, which emphasizes that meaningful learning emerges when individuals actively shape their learning trajectories (Aripin & Zuhriyah, 2025; Maksum, 2021; Putera et al., 2025).

The training phase on Mendeley was then implemented as a guided yet flexible process, integrating technical instruction with conceptual explanation. Rather than focusing solely on procedural steps, the sessions emphasized the underlying logic of reference management, including how citations function within scholarly communication. Observational data indicate that participants gradually transitioned from initial confusion to more confident and purposeful use of the tool. However, this transformation was not instantaneous; it required continuous scaffolding and opportunities for practice. For instance, participants were encouraged to bring their own writing projects and apply Mendeley directly, thereby situating learning within their immediate needs. This approach reflects the notion that digital skills are best developed through contextualized and practice-oriented learning experiences (Ho et al., 2022; Nurhasanah et al., 2025; Septiana et al., 2025).

The collaborative practice stage further reinforced this learning by fostering peer interaction and mutual support. Participants worked in small groups to review each other’s work, troubleshoot technical issues, and share strategies for organizing references. This collective engagement not only enhanced technical proficiency but also strengthened social bonds within the community. One participant (R11) remarked that “when I get stuck, I can ask others, and sometimes they explain it better because they face the same problem.” Such peer-based learning dynamics illustrate how knowledge is co-constructed through interaction, a key principle in participatory and social learning frameworks.

To capture the progression of engagement across these stages, Table 2 summarizes key indicators observed during the implementation process.

Table 2 Progression of Participant Engagement Across Implementation Stages

Stage	Key Characteristics of Engagement
Needs Diagnosis	Awareness of gaps, articulation of learning needs
Co-Design	Active contribution to learning design, increased ownership
Training	Gradual skill acquisition, contextualized tool usage
Collaborative Practice	Peer learning, problem-solving, shared knowledge
Reflective Evaluation	Critical reflection, conceptual understanding, self-awareness

Source: Research data analysis (2025)

The final stage, reflective evaluation, served as a space for participants to critically assess their learning experiences and articulate changes in their understanding and practices. Through guided reflections and interviews, participants expressed a deeper appreciation of academic integrity and the role of reference management in supporting credible scholarship. For example, R5 stated that “now I understand why citations matter, not just how to do

them,” signaling a shift from procedural to conceptual knowledge. This reflective dimension is essential in consolidating learning, as it enables participants to internalize and transfer their knowledge to future contexts.

Quantitative Outcomes: Improvement in Academic Literacy and Reference Management Skills

The quantitative findings of this study provide a compelling indication that the participatory service-learning model contributed to measurable improvements in participants’ digital academic literacy, particularly in the domains of reference management, citation accuracy, and the effective use of automated tools such as Mendeley. Drawing on pre-test and post-test data analyzed through paired sample t-tests and N-gain scores, the results demonstrate not only statistically significant differences but also meaningful educational gains that reflect deeper cognitive and functional development.

As illustrated in Table 3, all assessed indicators showed a consistent upward trend from pre-test to post-test. The most notable improvements were observed in reference management skills and citation accuracy, which were initially the weakest areas identified during the baseline phase. The paired t-test results indicate that these improvements are statistically significant ($p < 0.05$), suggesting that the observed changes are unlikely to be due to chance. Furthermore, the N-gain scores fall within the moderate to high categories, indicating that the intervention was effective in facilitating substantial learning gains within a relatively short period.

Table 3 Comparison of Pre-Test and Post-Test Scores with N-Gain Analysis

Indicator	Pre-Test Mean	Post-Test Mean	N-Gain	Category
Academic Writing Structure	58.4	76.2	0.43	Moderate
Reference Management Skills	45.7	78.5	0.61	High
Citation Accuracy	42.3	80.1	0.65	High
Understanding of Academic Ethics	48.9	74.8	0.51	Moderate

Source: Research data analysis (2025)

These numerical improvements reflect more than technical proficiency; they signal a shift in how participants engage with academic tasks. During the early stages of the study, participants often approached referencing as a mechanical requirement, frequently relying on trial-and-error methods. However, the post-test results suggest that participants developed a more systematic and informed approach to managing sources and applying citation conventions. This transition is particularly evident in the sharp increase in citation accuracy, which indicates that participants were not only able to use Mendeley but also understood how to integrate it effectively into their writing processes.

The statistical findings are further supported by qualitative insights that help explain the nature of these improvements. For instance, one participant (R9) reflected that “before, I always guessed the format of citations, but now I can rely on the system and also check if it is correct.” This statement highlights the dual role of technology as both a practical tool and

a cognitive scaffold that supports learning. Similarly, another participant (R12) noted that “using Mendeley makes my work faster, but more importantly, I now understand why the format matters,” suggesting that efficiency gains were accompanied by conceptual clarity. These reflections reinforce the interpretation that the observed quantitative gains are indicative of deeper learning processes rather than superficial skill acquisition.

From a broader perspective, these findings contribute to ongoing discussions on the effectiveness of technology-enhanced learning. While previous studies have emphasized the potential of digital tools to improve learning outcomes, they also caution that technology alone is insufficient without appropriate pedagogical integration (Mufanti et al., 2024; Taufik et al., 2025). The results of this study support this argument by demonstrating that the structured integration of Mendeley within a participatory service-learning framework can lead to significant and meaningful improvements. In other words, it is not merely the presence of technology but the way it is embedded within a learning design that determines its impact.

Moreover, the relatively high N-gain scores in reference management and citation accuracy suggest that these domains are particularly responsive to interventions that combine hands-on practice with collaborative learning. The participatory nature of the model allowed participants to learn not only from facilitators but also from peers, creating a supportive environment that encouraged experimentation and problem-solving. This aligns with contemporary perspectives on digital learning, which emphasize the importance of social interaction and active engagement in fostering effective learning outcomes (Arnab et al., 2025; Yarmi, 2025).

At the same time, the moderate gains observed in academic writing structure and understanding of academic ethics indicate that these areas may require longer-term interventions to achieve higher levels of mastery. Unlike technical skills, which can be acquired relatively quickly through guided practice, conceptual and ethical dimensions of academic literacy involve more complex processes of internalization and reflection. Nevertheless, the improvements recorded in these areas suggest that the model has begun to lay a strong foundation for continued development.

Transformation of Practices: From Technical Use to Conceptual Understanding

Beyond the measurable improvements captured through quantitative analysis, a more nuanced transformation emerged in how participants understood and engaged with digital academic practices. This shift became particularly visible through in-depth interviews, reflective notes, and document analysis, which together reveal a movement from procedural engagement toward conceptual understanding. In the early stages of the program, participants tended to approach tools such as Mendeley as purely technical instruments—useful for formatting citations or storing references, but largely disconnected from broader academic reasoning. However, as the intervention progressed, their engagement evolved into a more reflective and meaning-oriented practice, indicating a deeper level of learning.

This transformation can be observed in how participants began to articulate the purpose and logic behind citation practices. For instance, one participant (R2) explained, “At first, I thought citations were just about avoiding mistakes in format, but now I see that they show where ideas come from and how knowledge is connected.” Such reflections suggest that participants were no longer merely replicating citation formats but were beginning to understand citations as part of an intellectual dialogue within academic communities. Similarly, another participant (R10) noted that “using Mendeley is not just about making things easier, but about organizing knowledge so that it can be used again,” highlighting an emerging awareness of knowledge management as a core academic skill.

Document analysis further corroborates these shifts. Early writing samples often displayed inconsistent citation styles, incomplete references, and minimal integration of sources into the text. In contrast, later submissions showed more coherent structuring of arguments, accurate and consistent citation practices, and a clearer relationship between sources and claims. Participants demonstrated an increased ability to synthesize information rather than merely compile it, suggesting a transition toward higher-order academic competencies. This progression reflects not only improved technical execution but also a more sophisticated understanding of how knowledge is constructed and communicated.

To illustrate these qualitative changes, Table 4 summarizes key dimensions of transformation observed during the study.

Table 4 Transformation of Learning Practices from Procedural to Conceptual Engagement

Dimension	Initial Condition	Post-Intervention Condition
Use of Mendeley	Limited to storage and basic functions	Integrated into writing and citation process
Citation Practice	Inconsistent, format-oriented	Accurate, purpose-driven
Understanding of Sources	Surface-level use	Critical engagement and synthesis
Academic Integrity Awareness	Minimal, compliance-based	Reflective and principle-oriented

Source: Research data analysis (2025)

These findings can be meaningfully interpreted through the concept of epistemic engagement in digital learning, which emphasizes learners’ active role in constructing knowledge rather than passively following procedures (Endriana et al., 2025; Juhaidi et al., 2025; Nurbayani et al., 2025). In this study, epistemic engagement was fostered through participatory learning processes that encouraged dialogue, reflection, and collaborative problem-solving. Rather than being instructed to follow predefined steps, participants were invited to question, experiment, and make sense of their learning experiences. This approach created space for deeper cognitive engagement, allowing participants to internalize not only how to perform academic tasks but also why those tasks matter.

The participatory dimension of the model played a crucial role in facilitating this transformation. Through peer discussions and collaborative activities, participants were

exposed to diverse perspectives and alternative ways of understanding academic practices. For example, during group sessions, participants frequently debated the appropriateness of certain citation styles or the credibility of sources, leading to more critical and reflective engagement. One participant (R6) reflected that “when we discuss together, I realize that there is not just one way to do things, and I need to think about why I choose a certain approach.” Such interactions highlight the importance of social learning environments in supporting epistemic development.

Importantly, this shift from technical use to conceptual understanding also has implications for the sustainability of digital academic literacy. Technical skills, while essential, are often susceptible to decay if not continuously practiced or updated. In contrast, conceptual understanding provides a more durable foundation, enabling learners to adapt to new tools, contexts, and challenges. Participants who understand the principles of citation and knowledge organization are more likely to transfer these skills across different platforms and academic tasks. This adaptability is particularly critical in rapidly evolving digital environments, where specific tools may change but underlying academic practices remain relevant.

Moreover, the emergence of conceptual understanding contributed to a noticeable increase in participants’ confidence and autonomy. Several participants reported feeling more capable of engaging with academic tasks independently, without relying heavily on external guidance. As noted by R13, “now I feel more confident writing because I know how to manage my sources and explain my ideas properly.” This sense of empowerment reflects a broader transformation in learners’ identities, from hesitant users of technology to active participants in academic discourse.

Emerging Awareness of Citation Ethics and Academic Integrity

An important dimension of the learning transformation observed in this study lies in the gradual emergence of participants’ awareness of citation ethics and academic integrity. While initial findings indicated that participants’ engagement with citations was largely procedural and compliance driven, the later stages of the intervention revealed a notable shift toward more reflective and principled understandings of ethical scholarly practices. This transformation was captured primarily through in depth interviews and reflective journals, which provided insight into how participants began to internalize the values underlying academic work, rather than merely adhering to its formal requirements.

At the outset, many participants perceived citation as a technical necessity rather than an ethical responsibility. For example, one participant identified as R4 admitted that “I usually just add references at the end so it looks complete, but I do not always think about where the ideas really come from.” This statement reflects a common misconception in non formal learning contexts, where citation is often reduced to a formatting exercise. Similarly, another participant, R8, noted that “as long as I mention a source, I think it is already safe,” indicating a limited understanding of plagiarism and attribution. These perspectives illustrate that prior to the intervention, awareness of academic integrity was relatively superficial and lacked

critical depth.

However, as the participatory service learning process unfolded, participants began to develop a more nuanced understanding of ethical citation practices. This shift was particularly evident during reflective sessions, where participants were encouraged to critically examine their own writing practices and discuss ethical dilemmas related to source use. One participant, R1, reflected that “now I realize that citing is not just about avoiding plagiarism, but about respecting the original author’s work.” Another participant, R12, expressed a similar sentiment, stating that “I used to think copying was normal if we change the words, but now I understand that ideas also need to be acknowledged.” These reflections suggest a movement from rule based compliance toward value based reasoning, where ethical considerations become an integral part of the learning process.

The integration of ethical discussions within practical training sessions played a crucial role in facilitating this transformation. Rather than treating academic integrity as a separate or abstract topic, the model embedded ethical considerations directly into activities involving Mendeley and academic writing. For instance, when participants practiced inserting citations using the software, facilitators simultaneously prompted them to consider why certain sources should be cited, how to evaluate the credibility of references, and what constitutes responsible paraphrasing. This approach helped bridge the gap between technical skill development and ethical awareness, allowing participants to see the relevance of integrity in their everyday academic practices.

Reflective journals further reveal how participants’ attitudes evolved over time. Several entries indicate a growing sense of responsibility and caution in handling sources. One participant, R9, wrote that “after learning this, I feel more careful when writing because I do not want to take someone else’s idea without proper credit.” Another participant, R6, noted that “it is not only about writing correctly, but also about being honest in our work.” These expressions point to an internalization of ethical values that goes beyond external enforcement, suggesting that participants were beginning to develop ethical self regulation in their academic behavior.

This transformation can be understood within the broader framework of digital ethics in education, which emphasizes the need to integrate ethical reasoning into the development of digital competencies (Antasari, 2025; Lemana II et al., 2024). In this perspective, digital literacy is not only about mastering tools, but also about understanding the ethical implications of how those tools are used. The findings of this study support this view by demonstrating that ethical awareness can be effectively cultivated when it is embedded within participatory and practice based learning environments. By engaging participants in dialogue, reflection, and real world application, the model created conditions for ethical learning that are both meaningful and sustainable.

Moreover, the participatory nature of the intervention contributed significantly to this process. Through peer discussions and collaborative activities, participants were exposed to different viewpoints and collectively negotiated their understanding of ethical practices. This

social dimension of learning helped normalize conversations about plagiarism, attribution, and intellectual responsibility, making them less intimidating and more accessible. As one participant, R11, observed, “when we discuss together, I realize that others also have the same confusion, and we can learn the correct way together.” Such interactions highlight the importance of community in shaping ethical awareness, particularly in contexts where formal instruction on academic integrity may be limited.

Formation of Sustainable Digital Learning Communities

The implementation of the participatory service learning model did not only produce individual learning gains but also generated a broader collective impact, reflected in the emergence of a sustainable digital learning community. This transformation became increasingly visible during the later stages of the intervention, where learning activities extended beyond structured sessions and evolved into ongoing, self-initiated practices among participants. Evidence from observations, interviews, and reflective accounts indicates that participants began to engage in peer mentoring, collaborative problem solving, and continuous knowledge sharing, suggesting that the learning process had moved from a facilitated activity to a community-driven ecosystem.

One of the most notable developments was the emergence of peer mentoring practices. Participants who initially struggled with using Mendeley or understanding citation formats gradually assumed supportive roles for others. This shift was not formally assigned but developed organically as participants gained confidence in their skills. For example, one participant, identified as R5, shared that “when I started to understand how to use the citation features, I felt responsible to help my friends who were still confused.” Similarly, R9 explained that “sometimes it is easier to learn from peers because we face similar problems and can explain in simpler ways.” These interactions illustrate how knowledge circulation within the group became decentralized, reducing dependence on facilitators and strengthening collective learning capacity.

In addition to peer mentoring, collaborative problem solving became a central feature of the learning environment. Participants frequently worked together to address technical challenges, interpret citation rules, and evaluate sources. Observational data revealed that these interactions often occurred spontaneously, both during and after formal sessions. For instance, participants formed small discussion groups, either face-to-face or through messaging platforms, to troubleshoot issues related to reference management. This pattern suggests that learning was no longer confined to scheduled activities but embedded within everyday interactions. Such findings resonate with the idea that meaningful learning is sustained through social engagement and shared practice rather than isolated instruction (Tien et al., 2024; Wahyuni & Triatmanto, 2025; Wen et al., 2022).

The role of digital tools in supporting this emerging community should also be noted. While Mendeley initially functioned as a technical tool for managing references, it gradually became a shared platform that facilitated collaboration and knowledge exchange. Participants began to share reference libraries, recommend sources, and discuss strategies

for organizing academic materials. This collective use of technology contributed to the formation of what can be described as a digitally mediated community of practice, where tools are not merely instruments but enablers of social learning. One participant, R2, reflected that “before, I used Mendeley only for myself, but now we use it together to share articles and help each other.” This indicates a shift from individual to collective engagement with digital resources.

Another important aspect of this transformation is the continuity of learning beyond the duration of the program. Follow up observations and participant reflections suggest that the practices introduced during the intervention were sustained over time, with participants continuing to apply and develop their skills independently. For example, R11 noted that “even after the training ended, we still discuss our writing and check each other’s references.” This continuity highlights the emergence of a self sustaining learning ecosystem, where motivation and engagement are maintained internally rather than relying on external facilitation. Such sustainability is a key indicator of successful community based education, as it reflects the capacity of learners to take ownership of their development.

From a conceptual perspective, these findings align with recent discussions on community based learning sustainability, which emphasize the importance of social networks, shared practices, and ongoing interaction in maintaining learning processes (Melani et al., 2025; Purnamasari et al., 2025). In this view, learning is not a one time event but a continuous and evolving process embedded within a community. The participatory nature of the model played a crucial role in fostering this environment, as it encouraged collaboration, mutual support, and collective responsibility from the outset. By involving participants as co creators, the model helped establish a sense of belonging and commitment that extended beyond the formal boundaries of the program.

Furthermore, the emergence of a sustainable learning community has significant implications for long term capacity building. In contexts where access to formal education and structured training is limited, the ability of a community to sustain its own learning processes becomes particularly valuable. The findings of this study suggest that participatory approaches can effectively cultivate such capacity by strengthening both individual competencies and social connections. Participants not only acquired technical skills but also developed the confidence and collaborative mindset necessary to support one another’s growth.

Model Validation: Effectiveness, Adaptability, and Scalability

The validation of the participatory service learning model in this study emerges from a careful synthesis of both quantitative and qualitative findings, revealing a framework that is not only effective in improving digital academic literacy but also adaptable and scalable across diverse community contexts. Rather than evaluating the model solely through statistical gains, this analysis considers how the integration of participatory pedagogy and reference management tools reshaped learning practices, social dynamics, and long term engagement within the community. In doing so, the model is positioned as a practical

response to the persistent gap between access to digital tools and their meaningful use in academic contexts.

From an effectiveness standpoint, the model demonstrates strong empirical support. The quantitative results, particularly the significant differences between pre test and post test scores and the moderate to high N gain values, indicate that participants experienced substantial improvements in academic literacy, reference management, and citation practices. However, these gains are further strengthened by qualitative evidence showing shifts in participants' understanding, attitudes, and behaviors. For instance, one participant, R3, reflected that "now I can not only use the tools, but I also understand how they help me organize my thinking." This statement captures the dual impact of the model, which addresses both technical competence and conceptual clarity. Such outcomes suggest that the model's effectiveness lies in its ability to integrate skill development with reflective learning, rather than treating them as separate processes.

The adaptability of the model becomes evident when examining how it responds to the specific characteristics of the community based learning environment. Throughout the implementation, the model was not applied as a rigid framework but was continuously adjusted based on participants' needs, feedback, and contextual constraints. For example, during the co design phase, participants contributed to shaping the learning activities, ensuring that the content remained relevant to their experiences. This flexibility allowed the model to accommodate varying levels of prior knowledge, learning preferences, and technological access. One participant, R8, noted that "the way we learn here feels different because it follows what we need, not a fixed plan." This adaptability aligns with contemporary perspectives on learner centered design, which emphasize responsiveness and contextual sensitivity as key elements of effective educational interventions (Amalia et al., 2025; Yudianti et al., 2025).

In addition to effectiveness and adaptability, the model also demonstrates strong potential for scalability, particularly in contexts characterized by limited institutional support and uneven access to formal training. The emergence of peer mentoring, collaborative learning, and sustained community engagement indicates that the model does not rely heavily on external facilitators once the initial structure is established. Instead, it fosters internal capacities that enable the community to continue learning independently. This is particularly important for developing countries, where educational resources are often constrained and programs need to be both cost effective and sustainable. As noted by participant R11, "even without the trainers, we can continue because we already know how to help each other." Such statements highlight the model's capacity to generate self sustaining learning mechanisms, which are essential for scalability.

Moreover, the use of widely accessible digital tools such as Mendeley enhances the model's transferability across different settings. Because the tool is freely available and relatively user friendly, it lowers the barrier for adoption in other communities. However, the study's findings suggest that the success of the model does not depend solely on the tool

itself, but on how it is integrated within a participatory and context sensitive learning design. This reinforces the argument that technology must be embedded within meaningful pedagogical frameworks to achieve its full potential (Rahmawati et al., 2025; Vuori, 2025). In this sense, the model offers a replicable structure that can be adapted to various community contexts while maintaining its core principles of participation, collaboration, and reflection.

Importantly, the validation process also highlights how the model contributes to bridging the gap between technological availability and its effective academic use. Prior to the intervention, participants had access to digital tools but lacked the knowledge and confidence to use them meaningfully. The model addressed this gap by creating a supportive environment where participants could explore, practice, and reflect on their use of technology in relation to academic tasks. This approach not only improved technical skills but also fostered a deeper understanding of how digital tools can enhance knowledge production and dissemination. As one participant, R6, expressed, “before, the tools felt complicated and not useful, but now they are part of how I work and learn.” This transformation illustrates the model’s ability to translate access into meaningful engagement.

In a broader sense, the model can be understood as a practical contribution to ongoing efforts to democratize academic literacy in developing contexts. By combining participatory service learning with digital tools, it offers a framework that is both theoretically grounded and practically applicable. The findings suggest that such integrative approaches are particularly effective in addressing complex educational challenges, where technological, pedagogical, and social factors intersect. As argued by recent studies, sustainable educational innovation requires not only new tools but also new ways of organizing learning processes and relationships (Juhaidi et al., 2024; Marzuki et al., 2024; Rachmawati et al., 2023).

CONCLUSION

This study demonstrates that the development and implementation of a participatory service-learning model integrating reference management tools within community-based education effectively addresses the fragmented nature of digital academic literacy in non-formal learning contexts. The findings confirm that when digital tools such as Mendeley are embedded within a participatory and context-sensitive pedagogical framework, they not only enhance technical competencies in reference management and citation practices but also foster deeper conceptual understanding and ethical awareness related to academic integrity. More importantly, the model facilitates a shift from individual, procedural learning toward collaborative and sustained knowledge practices, as reflected in the emergence of self-organizing digital learning communities. This indicates that digital academic literacy can be meaningfully strengthened when learning is positioned as a socially embedded and participatory process rather than a purely technical intervention. In this regard, the study offers a conceptual contribution through the articulation of a Participatory Digital Academic Literacy Model that integrates technological, pedagogical, and community empowerment dimensions into a cohesive framework. At the practical level, the model provides an

adaptable and scalable approach for enhancing academic literacy in community settings, particularly in developing contexts where access to structured training remains limited. Overall, the study affirms that bridging the gap between technological availability and its effective academic use requires not only tools, but also participatory structures that enable learners to actively construct, apply, and sustain their knowledge within a supportive community environment.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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