

From Digital Literacy to AI Literacy: A New Direction for Community Service in Responding to Technological Transformation

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Abstract

Artificial Intelligence (AI)-based technological transformation has expanded the competencies required by society from digital literacy toward AI literacy. This study aims to analyze the conceptual development from digital literacy to AI literacy and its implications for the future direction of community service. The study employs a Systematic Literature Review (SLR) using the PRISMA approach and the Theory–Context–Characteristics–Methodology (TCCM) framework. Of the 286 articles identified through Scopus, Web of Science, and Google Scholar, 30 articles published between 2020 and 2026 met the criteria for analysis. The findings indicate that AI literacy represents an extension of digital literacy that encompasses the ability to understand, use, evaluate, and utilize AI critically, ethically, and responsibly. The review also finds that AI literacy research remains predominantly concentrated in formal education contexts, while its application in community empowerment remains relatively limited. This study proposes a shift in the orientation of community service from technology-oriented training toward capability-oriented community empowerment, positioning AI literacy as a capability to support problem-solving and sustainable community empowerment.

Keywords: Digital Literacy, AI Literacy, Community Service, Community Empowerment, Technological Transformation

Dari Literasi Digital menuju Literasi AI: Arah Baru Pengabdian kepada Masyarakat dalam Menghadapi Transformasi Teknologi

Abstrak

Transformasi teknologi berbasis AI telah memperluas kebutuhan kompetensi masyarakat dari literasi digital menuju literasi AI. Penelitian ini bertujuan menganalisis perkembangan konseptual literasi digital menuju literasi AI serta implikasinya terhadap arah pengabdian kepada masyarakat. Penelitian menggunakan *Systematic Literature Review* (SLR) dengan pendekatan PRISMA dan kerangka *Theory–Context–Characteristics–Methodology* (TCCM). Dari 286 artikel yang teridentifikasi melalui Scopus, Web of Science, dan Google Scholar, sebanyak 30 artikel periode 2020–2026 memenuhi kriteria untuk dianalisis. Hasil penelitian menunjukkan bahwa literasi AI merupakan perluasan literasi digital yang mencakup kemampuan memahami, menggunakan, mengevaluasi, dan memanfaatkan AI secara kritis, etis, dan bertanggung jawab. Kajian juga menemukan bahwa penelitian literasi AI masih didominasi konteks pendidikan formal, sementara penerapannya dalam pemberdayaan masyarakat relatif terbatas. Penelitian ini mengusulkan perubahan orientasi pengabdian dari *technology-oriented training* menuju *capability-oriented community empowerment*, dengan menempatkan literasi AI sebagai kapabilitas untuk mendukung pemecahan masalah dan pemberdayaan masyarakat secara berkelanjutan.

Kata kunci: Literasi Digital, Literasi AI, Pengabdian kepada Masyarakat, Pemberdayaan Masyarakat, Transformasi Teknologi

INTRODUCTION

The development of digital technology has transformed the ways in which people obtain information, communicate, learn, work, conduct business, and make decisions in everyday life. In recent years, this transformation has entered a new stage with the increasingly widespread use of Artificial Intelligence (AI), particularly following the development of generative AI, which enables users to generate text, images, analyses, recommendations, and various forms of content through relatively simple interactions. AI has therefore become increasingly integrated into everyday activities. This transformation means that the ability to adapt to technology can no longer be understood merely as the ability to use digital devices and platforms. People also need the ability to understand how AI-based technologies work, use them appropriately, evaluate the outputs they generate, and recognize the risks and consequences associated with their use. Recent literature indicates that AI literacy is increasingly regarded as an important competency because AI has become embedded in various aspects of life, education, and work (Biagini, 2025; Casal-Otero et al., 2023).

Before the widespread development of AI, society's need to respond to technological transformation was largely discussed through the concept of digital literacy. Digital literacy essentially encompasses the ability to access, understand, evaluate, communicate, and use information appropriately through digital technologies. Over time, digital literacy has also incorporated aspects of security, privacy, ethics, communication, and responsible technology use. Digital literacy has therefore become an important foundation for societal participation in increasingly digitalized social and economic life. However, the emergence of AI introduces different technological characteristics. Users are increasingly interacting with systems capable of predicting, recommending, generating content, and influencing decision-making processes. These conditions expand the competencies previously emphasized within digital literacy and have encouraged the development of the concept of AI literacy (Long & Magerko, 2020; Memarian & Doleck, 2026). Recent studies even suggest that AI literacy can be understood as an extension of the foundations of digital literacy rather than as an entirely separate concept.

In this context, AI literacy has become increasingly important because the ability to use AI applications does not necessarily indicate that an individual adequately understands AI. Long & Magerko (2020) position AI literacy as a set of competencies that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI across various contexts of life. Subsequent research has further expanded this concept. A systematic review of AI literacy research conducted between 2019 and 2023, for example, identified six major competencies: recognize, know and understand, use and apply, evaluate, create, and navigate ethically (Casal-Otero et al., 2023). This means that AI literacy cannot be developed merely through training on how to use AI tools. Individuals also need to understand AI's capabilities and limitations, assess the accuracy of its outputs, understand the ethical implications of its use, and determine when AI should or should not be used. Broader studies also demonstrate that AI literacy is

increasingly moving beyond technical abilities toward issues of ethics, social impact, and the use of AI in real-life contexts (Biagini, 2025).

This transformation becomes particularly important when considered in the context of community service. During the era of digital transformation, various community empowerment programs have been directed toward improving people's ability to use technology, ranging from social media utilization, digital marketing, e-commerce, and productivity applications to various other forms of digital skills. Such approaches remain relevant, but the development of AI requires an expansion of the orientation of community service. Communities now need to understand how AI can be used to help solve the problems they encounter. At the same time, they need critical capabilities so that they do not simply accept AI-generated outputs without evaluation. Research on AI literacy indicates that operational aspects remain more dominant than sociocultural and critical dimensions, even though the ability to understand the social and ethical consequences of AI is becoming increasingly important as the technology is used by broader segments of society (Atias & Mawasi, 2025; Deng et al., 2026; Xu & Mohd Kamil, 2025).

In this context, higher education institutions occupy a strategic position. Community service can provide a space that connects developments in knowledge and technology within academic environments with the real needs of communities. AI literacy-based community service programs have begun to demonstrate progress in this direction. In Indonesia, for example, community service activities have begun using training programs and webinars to introduce the use of AI to support learning and productivity, including practical activities involving the use of AI applications as well as the evaluation of their outputs. Herlawati et al. (2026), through a community service program involving 345 participants from various institutions across eight provinces, demonstrated improvements in several indicators related to AI utilization and evaluation following the implementation of the AI literacy program. Beyond formal education, research on community-based AI literacy training has also begun to develop, including through non-formal learning involving communities and volunteers as part of the process of developing societal AI capabilities. These findings demonstrate that AI literacy is beginning to move from the discourse of formal education into community learning spaces, although its development remains at an early stage.

Although attention to AI literacy is growing rapidly, the existing literature shows that research remains highly concentrated within educational contexts. Previous systematic reviews have extensively discussed AI literacy among K–12 students, university students, teachers, curricula, and learning processes. Casal-Otero et al. (2023), for example, found that AI literacy research has developed in terms of conceptualization, program implementation, and assessment instrument development. Biagini (2025) also demonstrates the strong attention given in the literature to K–12 education, curriculum development, higher education, and the workplace. More recent reviews have even specifically examined AI literacy for children and adolescents, educators, language learning, and STEAM education (Atias & Mawasi, 2025). This concentration indicates

that understanding of AI literacy has developed considerably, but most studies still examine it from a teaching and learning perspective within formal educational environments.

This is where an important area for further investigation emerges. The population encountering AI is much broader than students, university students, teachers, or professionals. MSME actors, rural communities, community organizations, youth, workers, older adults, and people with varying levels of digital capability are also increasingly interacting with AI-based technologies. However, studies specifically connecting the shift from digital literacy toward AI literacy with the orientation of community engagement and community empowerment remain relatively limited compared with AI literacy studies in formal education. Several studies have begun to demonstrate the potential application of AI literacy through community engagement, community-based learning, and non-formal education, but this evidence remains dispersed across specific contexts (Zhao et al., 2026). This condition demonstrates the need for a synthesis that asks not only “what AI competencies need to be developed?” but also “how should the development of AI literacy transform the way higher education institutions design community service?”

This gap also demonstrates that the shift from digital literacy toward AI literacy should not be understood as the replacement of one form of literacy by another. Digital literacy remains an important foundation, while AI literacy extends it by incorporating the capabilities required to interact with increasingly autonomous, generative, and data-driven systems. Memarian & Doleck (2026), through a systematic review of 72 studies, demonstrate the need to bridge digital literacy frameworks with developments in AI literacy and to view AI literacy as an extension of existing literacy constructs. From the perspective of community service, this idea has important implications. Program orientation can evolve from merely developing digital access and digital skills toward strengthening the ability to understand AI, use AI, critically evaluate AI outputs, understand AI ethics and risks, and utilize AI to address community problems. Thus, the success of community service can be measured by the increased capacity of communities to use technology independently, critically, productively, safely, and responsibly.

Based on these issues, this study aims to analyze the conceptual development from digital literacy toward AI literacy and formulate its implications for a new direction of community service in responding to technological transformation. Specifically, the study addresses four questions: (1) how has the concept of digital literacy developed toward AI literacy in the literature; (2) what competencies distinguish and extend AI literacy beyond conventional digital literacy; (3) how can AI literacy transform the orientation and approaches of community service; and (4) what conceptual framework can be used to develop AI literacy-based community service? To address these questions, the study employs a Systematic Literature Review (SLR) using the PRISMA approach for literature identification and selection and the Theory–Context–Characteristics–Methodology (TCCM) framework to support the mapping and synthesis of existing research.

This study is expected to contribute in two areas. Conceptually, it seeks to bridge the literature on digital literacy, AI literacy, and community engagement, which has tended to develop along separate lines of discussion. Practically, the study is expected to produce a framework that can assist higher education institutions, governments, community organizations, and community service practitioners in designing technology literacy interventions that are more appropriate for the AI era. The new direction of community service therefore focuses on developing communities' ability to understand, use, evaluate, and utilize AI critically and responsibly to strengthen their capacity and address the real problems they encounter. Within this framework, AI literacy can be positioned as part of community capacity to remain adaptive, empowered, and in control when responding to technological transformation.

Digital Literacy

Digital literacy is one of the fundamental competencies that has developed alongside the increasingly widespread use of digital technology in society. The concept refers to the ability to access, understand, evaluate, produce, and communicate information effectively through technology. Therefore, an individual who can use smartphones, social media, or digital applications cannot necessarily be considered digitally literate if they are unable to assess the credibility of information, protect data security, understand the risks associated with technology use, and use technology productively and responsibly. This development demonstrates that digital literacy encompasses technical as well as cognitive and social dimensions. Memarian & Doleck (2026), for example, employ Ng's digital literacy framework, which categorizes digital literacy into technical, cognitive, and social-emotional dimensions, demonstrating that digital competence cannot fundamentally be limited to operational skills alone.

Within the community context, digital literacy is also closely associated with the ability of individuals and groups to participate in increasingly digitalized social and economic transformations. Technology can expand community access to information, public services, education, social networks, and economic opportunities, but these benefits depend greatly on communities' ability to use it. Setiadi et al. (2023), for example, position digital literacy within the context of youth empowerment in responding to Society 5.0, while Wahid et al. (2024) demonstrate that community-based digital literacy programs can improve participants' ability to access digital public services. In the latter study, 90% of participants experienced improvements in their skills after the program was implemented. This demonstrates that digital literacy can become an instrument of community empowerment when developed according to the needs and problems encountered by communities.

However, the characteristics of the digital environment continue to evolve. During the early stages of digital transformation, people's interaction with technology primarily involved device use, information searching, digital communication, electronic transactions, and the utilization of various applications. The presence of AI changes this pattern because digital systems are increasingly capable of generating content, providing

recommendations, making predictions, and supporting decision-making. Users can interact with machine-generated information and decisions. These changing technological characteristics mean that digital literacy remains necessary but is not always sufficient to explain the full range of capabilities required when individuals interact with AI. On this basis, the concept of Artificial Intelligence Literacy has developed as an extension of societal competencies within an increasingly intelligent and algorithm-driven technological environment.

Artificial Intelligence Literacy

Artificial Intelligence Literacy, or AI literacy, has developed in response to the increasingly widespread interaction between humans and AI-based systems. (Long & Magerko, 2020) are among the early references widely used in developing this concept. AI literacy is understood as a set of competencies that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI across various contexts of life. This understanding demonstrates that AI literacy differs from merely being able to operate AI applications. An individual may be able to use generative AI to produce writing, images, or analyses but may not necessarily understand the limitations of the technology, the quality of the underlying data, the potential for erroneous outputs, or the social and ethical implications of its use. AI literacy therefore positions humans as users who are capable of understanding and evaluating the technology they use.

Subsequent research has produced an increasingly multidimensional understanding of AI literacy. Casal-Otero et al. (2023), based on a systematic review of 47 articles published between 2019 and 2023, identified six major AI literacy constructs: Recognize, Know and Understand, Use and Apply, Evaluate, Create, and Navigate Ethically. These six dimensions illustrate a broader range of competency development. Recognize relates to the ability to identify the presence and use of AI; Know and Understand concerns an understanding of AI principles and characteristics; Use and Apply indicates the ability to utilize AI; Evaluate relates to the ability to assess AI outputs and consequences; Create refers to the ability to use or develop AI to produce something; while Navigate Ethically concerns the ability to consider ethical issues in the use of the technology. AI literacy therefore integrates technical, cognitive, critical, creative, and ethical capabilities.

Pinski & Benlian (2024) reinforce this perspective by positioning AI literacy as a capability that enables the purposeful, efficient, and ethical use of AI. Based on a review of 68 publications, they developed a framework connecting learning methods → AI literacy components → effects of AI literacy, while also demonstrating that literacy requirements may differ among user groups. This is particularly important for community service because communities are not homogeneous groups. MSME actors may require AI capabilities for marketing and customer analysis; teachers may need them for learning activities; village officials may utilize AI for services and administration; while the general public may require greater capabilities to recognize deepfakes, misinformation, privacy risks, algorithmic bias, and AI security issues. AI literacy programs should therefore avoid

a one-size-fits-all approach and instead consider the characteristics, needs, and real-world problems of their target groups.

This critical aspect is becoming increasingly important because AI literacy research continues to demonstrate an imbalance between operational capabilities and social and critical understanding. A recent systematic review of AI literacy programs found that the operational dimension remains more dominant, while sociocultural and critical dimensions are relatively underdeveloped (Atias & Mawasi, 2025). Yet, as AI plays a greater role in society, there is an increasing need to understand issues such as algorithmic bias, privacy, transparency, accuracy, hallucination, misinformation, and human responsibility in using AI-generated outputs. AI literacy therefore needs to address not only the question “how should AI be used?” but also “when should AI be used?”, “can its outputs be trusted?”, “who may be affected?”, and “who remains responsible for the resulting decisions?”

Digital Transformation and Society

Digital transformation is fundamentally not merely a process of technological change, but also a transformation in how individuals, organizations, and societies conduct activities and create value. Previous research presents a similar perspective by positioning digital capabilities as part of broader economic, institutional, and ecosystem transformations (Elkhoudary et al., 2026). This perspective is relevant to the present study because the development from digital literacy toward AI literacy cannot be separated from the changing characteristics of technology in society. As digital technology evolves from information and communication systems toward systems capable of generating content, learning from data, making predictions, and providing recommendations, the relationship between humans and technology also changes.

These changes create both opportunities and risks. AI can help communities obtain information, increase productivity, expand creativity, support learning, assist business activities, and perform various tasks that previously required considerably more time. However, the ability to benefit from these opportunities is not automatically or equally distributed. Research on AI literacy in higher education and among adults indicates that the growing presence of AI in everyday life increases the need for non-expert users to possess at least a basic understanding of AI in order to interact effectively with the technology. A review that began with 902 records and ultimately selected 30 studies also concluded that research on AI literacy for adults remains at a developmental stage and requires greater clarity regarding the competencies that should be taught to non-expert users (Laupichler et al., 2022).

This issue is also related to digital inequality. When some members of society are able to use AI to increase productivity, obtain information, develop businesses, or enhance learning capabilities, while others remain passive users or do not understand the technology, the digital divide may evolve into an AI literacy divide. Research involving adult learners in community settings has also begun to highlight that unequal development of AI capabilities has the potential to widen inequality in the process of digital

transformation (Lu & Hou, 2026). Technological transformation therefore cannot be addressed merely by providing access to technology. Communities also require the capacity to use it meaningfully. In this context, AI literacy can be regarded as a form of human capability required to ensure that technological transformation strengthens communities' ability to benefit from technology.

This perspective places humans at the center of technological transformation. Technology ultimately has value when it enhances people's ability to solve problems, create value, and improve quality of life. Therefore, the success of digital transformation should not be measured solely by the number of applications or AI technologies being used, but also by the extent to which communities are able to understand, control, evaluate, and utilize these technologies according to their needs. This perspective establishes a strong relationship between AI literacy and community empowerment because the ultimate objective is to strengthen community capacity to make decisions and utilize technology more independently.

Community Engagement and Community Empowerment

Community engagement can be understood as a process of interaction among institutions, academics, organizations, and communities in identifying needs, sharing knowledge, and developing solutions to problems encountered by communities. Within the context of higher education in Indonesia, this approach is strongly related to community service because community service essentially serves as one of the mechanisms through which academic knowledge and capabilities can be translated into tangible benefits for society. A community service approach oriented toward empowerment differs from activities that merely involve one-way knowledge transfer. Communities are not positioned simply as recipients of technology or participants in training programs, but as actors with their own needs, experiences, local knowledge, and capabilities to participate in problem-solving processes.

Digital literacy has provided an example of how technology can be positioned within such an empowerment framework. Digital literacy-based empowerment programs can improve communities' ability to obtain information and access public services (Wahid et al., 2024). Research on youth in the context of Society 5.0 also connects digital literacy with community empowerment (Setiadi et al., 2023). This means that technology training becomes more meaningful when the digital capabilities acquired do not stop at the ability to operate applications but instead help communities improve access, participation, productivity, and problem-solving capabilities.

The same principle can be extended to AI literacy. Several recent studies have begun to demonstrate that AI literacy development does not have to take place within formal educational settings. Zhao et al. (2026), for example, examined AI literacy training conducted through community-led non-formal education, with student volunteers involved as instructors in AI learning for K–12 participants within community environments. The study explicitly demonstrates that the implementation of AI literacy in community-based non-formal environments remains underexplored compared with

formal education. This development provides a foundation for higher education institutions to expand AI literacy beyond classroom learning toward community engagement activities that reach broader segments of society.

However, AI literacy-based community service should not stop at training people to use ChatGPT, Gemini, Copilot, or particular AI applications. An approach that is overly tool-oriented risks becoming quickly outdated because AI technology changes very rapidly. A more sustainable orientation is to develop community capabilities: recognizing AI, understanding its functions and limitations, using it to address real needs, verifying its outputs, protecting data and privacy, understanding ethical considerations, and determining when human decision-making should remain central. Through this approach, the measure of community service success shifts from “communities are able to use AI applications” toward “communities are able to utilize AI independently, critically, safely, productively, and responsibly.”

From Digital Literacy to AI Literacy: A Conceptual Transition

The relationship between digital literacy and AI literacy should not be understood as a process in which one form of literacy replaces another. Digital literacy remains the foundation that enables individuals to access information, use devices, communicate, evaluate digital information, and participate in digital environments. AI literacy emerges as the characteristics of these environments evolve and communities begin interacting with systems capable of learning from data, generating content, providing recommendations, and supporting decision-making. Memarian & Doleck (2026), through a systematic literature review of 72 studies obtained through a PRISMA process from an initial 516 publications, explicitly bridge digital literacy frameworks with AI literacy and conclude that AI literacy can be developed as an extension of core literacy constructs. Based on this synthesis, the competency transition can be understood as follows:

Table 1. Conceptual Transition from Digital Literacy to AI Literacy

Dimension	Digital Literacy	Extension toward AI Literacy
Awareness	Understanding the presence of digital technology	Recognizing the presence and role of AI
Technical	Operating digital devices and applications	Using and interacting with AI systems
Cognitive	Searching for and understanding information	Understanding the principles, capabilities, and limitations of AI
Information Evaluation	Evaluating the credibility of digital information	Verifying and evaluating AI-generated outputs
Creative	Creating digital content	Collaborating with AI to generate and develop content or solutions
Critical	Assessing digital information and risks	Understanding bias, <i>hallucination</i> , manipulation, and algorithmic influence
Ethical	Understanding digital privacy, security, and ethics	Understanding data privacy, fairness, transparency, accountability, and responsible AI
Empowerment	Using technology to support participation and productivity	Using AI to solve problems and strengthen community capabilities

The table demonstrates that the transition toward AI literacy essentially represents an expansion in the depth of competencies. The framework of (Casal-Otero et al., 2023), for example, illustrates competency development from Recognize to Navigate Ethically. Meanwhile, Pinski & Benlian (2024) demonstrate that AI literacy needs to be distinguished from previous forms of technological literacy because the characteristics of AI and the needs of different user groups influence the competencies that must be developed. AI literacy therefore cannot be reduced merely to advanced digital skills. Elements of critical capability, human–AI interaction, output evaluation, and ethical considerations provide it with additional characteristics that are becoming increasingly important in an AI-based society.

Within the context of community service, this transition produces a change in orientation that can be formulated as follows:



Figure 1. Stages of the Transition from Digital Literacy to AI Literacy for Community Empowerment

This framework positions community empowerment, rather than AI adoption, as the ultimate objective. This distinction is important. Community service programs should not be considered successful merely because communities begin using AI. AI use acquires empowerment value only when the technology helps communities strengthen their ability to obtain information, make decisions, improve productivity, develop creativity, solve problems, or enhance the quality of their economic and social activities. At the same time, communities must retain the ability to question AI-generated outputs and preserve human judgment when decisions have consequences for themselves or others.

Thus, this article views the shift from digital literacy toward AI literacy as an evolution of community capabilities in responding to the changing characteristics of technology. Digital literacy provides the technical, cognitive, and social foundations required to participate in digital environments, while AI literacy extends these foundations through AI understanding, the ability to interact with AI, critical evaluation, creativity, and the ethical and responsible use of AI. This perspective also provides a conceptual foundation for shifting community service from technology-oriented training toward capability-oriented community empowerment. Community service in the AI era ensures that communities possess sufficient knowledge, critical capabilities, and independence to determine how, when, and for what purposes AI should be used.

METHOD

Research Design

This study employs a Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize the development of the literature concerning the shift from digital literacy toward AI literacy and its implications for the future direction of community service. The SLR approach was selected because this study does not aim to statistically test relationships among variables, but rather to map the development of concepts, competencies, application contexts, findings from previous studies, and research gaps related to AI literacy and community empowerment. The literature search and selection process refers to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020, which emphasizes transparency in the identification, selection, and synthesis of studies (Page et al., 2021). PRISMA 2020 provides a 27-item checklist and flow diagram to support systematic and transparent reporting of systematic reviews.

In addition to PRISMA, this study employs the Theory–Context–Characteristics–Methodology (TCCM) framework to organize and analyze the selected articles. TCCM is used to map the theories applied in previous studies, research contexts, key characteristics or concepts examined, and methodological approaches employed. The integration of PRISMA and TCCM enables this study to conduct a systematic literature selection process while producing a synthesis that reveals research developments, dominant patterns, limitations, and opportunities for future research.

Literature Search Strategy

The literature search was conducted through three academic databases: Scopus, Web of Science (WoS), and Google Scholar. Scopus and Web of Science were used as the primary databases because of their broad coverage of peer-reviewed scientific publications, while Google Scholar was used as a supplementary source to broaden the identification of relevant articles. The search focused on articles published between 2020 and 2026. The year 2020 was selected as the starting point because the conceptual development of AI literacy began to receive more systematic attention during this period. Keywords were developed based on three major groups of concepts: digital literacy and AI literacy, community engagement and community empowerment, and artificial intelligence and

digital transformation. Searches were conducted within titles, abstracts, and keywords using combinations of the Boolean operators AND and OR. The primary search string used was:

("digital literacy" OR "AI literacy" OR "artificial intelligence literacy") AND ("community engagement" OR "community empowerment" OR "community education" OR "community training" OR "community development") AND ("artificial intelligence" OR "digital transformation" OR "generative AI")

The search string was adjusted to the characteristics of each database without changing the main search concepts. The initial search identified 286 articles, consisting of 112 articles from Scopus, 79 articles from Web of Science, and 95 articles from Google Scholar.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were established to ensure that the articles used were consistent with the objectives of the study. Included studies were peer-reviewed journal articles published between 2020 and 2026 with substantive relevance to digital literacy, AI literacy, AI competencies, community engagement, community capability development, or community empowerment. Studies conducted in educational contexts were retained when they provided conceptual contributions to the understanding of AI literacy that could be used to explain the development of societal competencies.

Table 2. Inclusion and Exclusion Criteria

Aspect	Inclusion Criteria	Exclusion Criteria
Period	2020–2026	Before 2020
Publication Type	Peer-reviewed journal articles	Books, theses, dissertations, editorials, news articles, and conference proceedings
Language	English and Indonesian	Languages other than English and Indonesian
Focus	Digital literacy, AI literacy, AI competencies, community engagement, and community empowerment	Studies unrelated to literacy or human capability development
Context	Education, communities, MSMEs, workers, youth, society, and social organizations	Studies focusing solely on technical aspects of AI
Access	Full text available	Full text unavailable
Relevance	AI/digital literacy constitutes a substantive component of the study	AI is only mentioned in general terms

Articles that discussed only technical aspects of AI, such as algorithm development, machine learning performance, model architecture, or programming without any connection to human capabilities, were excluded. These criteria were applied to ensure that the literature analyzed remained focused on the relationship between technological development and societal capabilities.

Literature Selection Process Using PRISMA

The article selection process was conducted according to the PRISMA 2020 stages, including identification, screening, eligibility assessment, and determination of studies included in the analysis. PRISMA was used to ensure that the selection process could be reported transparently and that readers could understand why particular articles were included in or excluded from the review.

At the identification stage, 286 articles were obtained, consisting of 112 articles from Scopus, 79 from Web of Science, and 95 from Google Scholar. Following examination, 54 duplicate articles were identified and removed, leaving 232 articles. At the screening stage, the titles and abstracts of the 232 articles were examined according to the inclusion and exclusion criteria. A total of 157 articles were excluded because they did not demonstrate sufficient relevance to the research focus, leaving 75 articles for full-text assessment.

At the eligibility stage, 75 articles were examined in greater depth based on their full content. Of these, 45 articles were excluded, consisting of 18 articles that did not substantively focus on AI literacy or AI competencies, 12 articles that discussed only technical aspects of AI, 9 articles that did not demonstrate sufficient relevance to the development of human or community capabilities, and 6 articles that did not provide sufficient information for analysis. After the entire selection process was completed, 30 final articles met all criteria and were used as the basis for analysis in this study.

Table 3. Summary of the Literature Selection Process

Stage	Process	Number of Articles
Identification	Scopus	112
	Web of Science	79
	Google Scholar	95
	Total articles identified	286
Duplicate Removal	Duplicate articles removed	54
	Articles remaining after duplicate removal	232
Screening	Articles excluded based on titles and abstracts	157
	Articles included for full-text assessment	75
Eligibility	No substantive focus on AI literacy/competencies	18
	Focused solely on technical aspects of AI	12
	Not relevant to community capability development	9
	Insufficient information for analysis	6
	Total full-text articles excluded	45
Included	Final articles included in the analysis	30

Thus, the selection process can be summarized as follows:

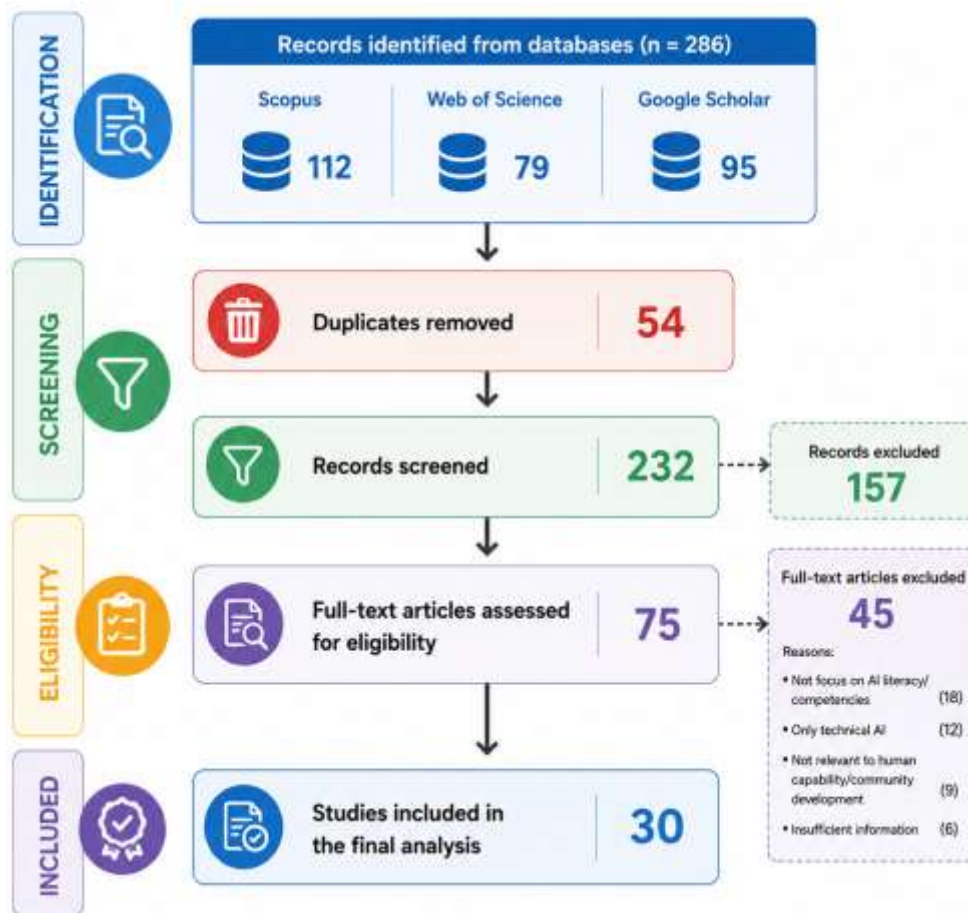


Figure 2. Flow Diagram of the Literature Selection Process

Data Extraction and TCCM Analysis

The 30 articles that passed the selection process were subsequently extracted using a structured coding sheet. The information collected included authors and publication year, country or research region, research objectives, theory or conceptual framework, research context, target groups, literacy concepts or dimensions examined, research methods, and major findings. This process was conducted to ensure that each article could be systematically compared and to enable the identification of patterns in the development of research on digital literacy and AI literacy.

The articles were then analyzed using the TCCM framework, which consists of four dimensions: Theory, Context, Characteristics, and Methodology. The Theory dimension was used to identify theories or conceptual frameworks employed to explain digital literacy, AI literacy, technology adoption, and empowerment. Context was used to map countries, target groups, education, communities, MSMEs, workers, and other social contexts. Characteristics was used to identify major concepts and capabilities such as digital skills, AI knowledge, AI use, critical evaluation, ethical awareness, responsible AI use, problem solving, and community empowerment. Meanwhile, Methodology was used to map the research approaches and designs employed in previous studies.

Table 4. TCCM Analysis Framework

No.	Dimension	Focus of Analysis
1	Theory	Digital Literacy Framework, AI Literacy Framework, technology adoption, human capability, and empowerment
2	Context	Education, communities, MSMEs, workers, youth, society, countries, and research regions
3	Characteristics	Digital skills, AI understanding, AI use, critical evaluation, ethics, responsible AI use, problem solving, and community empowerment
4	Methodology	Surveys, experiments, qualitative studies, case studies, training/interventions, mixed methods, and literature reviews

Synthesis and Conceptual Framework Development

The final stage involved a thematic synthesis of the 30 selected articles. The synthesis was directed toward identifying patterns in the development from digital literacy toward AI literacy, the key competencies that constitute AI literacy, the benefits and risks associated with AI use, and how these capabilities can be applied within the context of community service and community empowerment. The analysis was also used to identify areas that have been extensively studied and areas that remain relatively underexplored, thereby providing a basis for determining research gaps and future research agendas.

The synthesis results were subsequently used to evaluate and refine the conceptual framework developed in the literature review. Specifically, the analysis examined the conceptual relationship between Technological Transformation → Digital Literacy → AI Literacy → Responsible AI Adoption → AI-Assisted Community Problem Solving → Community Empowerment. Thus, the SLR not only maps the development of the literature but also provides a foundation for formulating a new direction for AI literacy-based community service.

FINDING AND DISCUSSION

Overview of the Analyzed Literature

Based on the PRISMA selection process, 30 articles published between 2020 and 2026 met the criteria and were included in the final analysis. Overall, publication trends indicate that attention to Artificial Intelligence Literacy increased particularly after 2022, alongside the increasingly widespread use of AI and generative AI in education, work, and everyday life. This pattern is consistent with developments in the international literature. A recent review of AI literacy in school environments, for example, found that publications remained at approximately one to two articles per year during 2016–2020, before increasing to five articles in 2022 and 15 articles in 2024 (S. Feng & Carolus, 2026). This increase indicates a shift in the position of AI literacy within academic discourse, from being primarily viewed as a specialized competency associated with computer science toward becoming a capability that is increasingly relevant to non-technical users. The development of generative AI has further accelerated this shift because people can interact directly with AI systems without requiring programming skills. Thus, the increasing number of AI literacy publications reflects not only technological development but also

the growing need to prepare people to understand, use, and evaluate technologies that are becoming increasingly integrated into everyday activities.

Of the 30 articles analyzed, 18 articles (60%) focused on educational contexts, 4 articles (13.3%) examined workplace and organizational environments, 3 articles (10%) addressed communities and non-formal education, 3 articles (10%) examined society or general users, and 2 articles (6.7%) focused on MSMEs or entrepreneurship. The dominance of educational contexts demonstrates that the development of AI literacy continues to be largely constructed through the perspective of formal learning. This finding is consistent with various previous reviews that have focused extensively on K–12 students, university students, teachers, curricula, and AI learning. Casal-Otero et al. (2023), for example, analyzed 47 studies concerning the conceptualization and implementation of AI literacy, while reviews of K–12 contexts have demonstrated strong attention to learning experiences and the development of AI literacy frameworks. The dominance of education is understandable because schools and higher education institutions provide structured learning environments, participants, curricula, and evaluation mechanisms that enable AI literacy programs to be developed and measured more systematically. However, this pattern also reveals an imbalance in research contexts because people who use AI are not limited to those within formal education systems.

Table 5. Distribution of Articles by Research Context

Context	Number of Articles	Percentage
Education	18	60.0%
Workplace and Organizations	4	13.3%
Community and Non-Formal Education	3	10.0%
General Public/Users	3	10.0%
MSMEs and Entrepreneurship	2	6.7%
Total	30	100%

This distribution provides an initial indication of the research gap addressed in this study. The issue is not that AI literacy has never been examined outside education, but rather that community-based AI literacy has received considerably less attention than educational AI literacy. A recent study on community-based AI literacy training even explicitly stated that the implementation of AI literacy in community-led non-formal environments remains underexplored (Zhao et al., 2026). This imbalance is important because societal capabilities for responding to AI cannot always be developed through formal education. MSME actors, informal workers, rural communities, social organizations, and particular age groups have different needs, levels of digital capability, and AI-related challenges. Therefore, there is an opportunity to expand the discussion of AI literacy from classroom-oriented literacy toward community-oriented capability development, an approach that develops communities' capabilities to use AI in addressing problems relevant to their lives.

Results of the TCCM Analysis

Theory

Analysis of the Theory dimension shows that research on digital literacy and AI literacy employs a relatively diverse range of conceptual foundations. Of the 30 articles, 11 articles (36.7%) used or developed an AI Literacy Framework, 6 articles (20%) employed a Digital Literacy/Digital Competence Framework, 4 articles (13.3%) used learning and educational theories, 3 articles (10%) applied technology adoption or acceptance perspectives, and 2 articles (6.7%) employed empowerment or human capability approaches. Meanwhile, 4 articles (13.3%) did not explicitly state a theoretical foundation. This composition demonstrates that theoretical developments in AI literacy remain largely directed toward defining the competencies individuals need when interacting with AI, while attention to the broader consequences of these competencies remains relatively limited. In other words, the literature is more mature in explaining the structure of AI literacy than in explaining how such literacy translates into social, economic, or empowerment capacities.

Table 6. Mapping of the Theory Dimension

Theoretical Foundation/Framework	Number of Articles	Percentage
AI Literacy Framework	11	36.7%
Digital Literacy/Digital Competence Framework	6	20.0%
Learning/Educational Framework	4	13.3%
Technology Adoption/Acceptance	3	10.0%
Empowerment/Human Capability	2	6.7%
Not Explicitly Stated	4	13.3%
Total	30	100%

These findings indicate that AI literacy remains an evolving concept without a fully standardized theoretical foundation. Differences in AI literacy definitions and dimensions have also been identified in recent reviews, including the use of terms that sometimes overlap with digital literacy, AI competency, and AI thinking (S. Feng & Carolus, 2026). Memarian & Doleck (2026) attempt to bridge this issue by employing the technical, cognitive, and social-emotional dimensions of digital literacy to develop an understanding of AI literacy and conclude that AI literacy can be viewed as an extension of existing literacy constructs. This finding is important because it indicates that the development of AI literacy does not necessarily need to begin with an entirely new framework. Instead, existing digital competencies can provide a foundation that is subsequently expanded through algorithmic understanding, the ability to evaluate AI outputs, human–AI interaction, and ethical considerations. This perspective also explains why digital literacy and AI literacy should be understood as a continuum of capabilities rather than as two concepts that replace one another.

What remains relatively underrepresented is the use of community empowerment and human capability perspectives. Yet, if AI literacy is to be developed through community service, the key question is not only what individuals know about AI, but also whether these capabilities make communities better able to solve problems and strengthen their

independence. A literacy perspective explains the competencies possessed, whereas an empowerment perspective helps explain what changes in community capacity after those competencies are acquired. This distinction is important because people may possess the ability to use AI without obtaining meaningful benefits in their lives. Therefore, this study proposes that the development of AI literacy within community service should not rely solely on literacy and technology adoption perspectives but should also connect AI literacy with community empowerment so that literacy outcomes can be assessed through improved decision-making capability, productivity, independence, and problem solving.

Context

The Context dimension reveals a concentration of research on groups within educational systems. Of the 30 articles, 10 studies focused on school students, 8 on university students, and 4 on teachers or educators, while studies involving the general public, communities, workers, and business actors were more limited. This means that 22 of the 30 articles were directly situated within educational ecosystems. This pattern demonstrates that current understandings of AI literacy are largely shaped by the characteristics of groups with relatively structured access to learning. Consequently, the needs of groups that learn about AI informally, experience limited access, or use AI directly for work and economic purposes have not received comparable attention.

Table 7. Mapping of the Context Dimension

No.	Target Group	Number of Articles
1	School Students	10
2	University Students	8
3	Teachers/Educators	4
4	Workers/Professionals	3
5	General Public/Communities	3
6	MSME Actors/Entrepreneurs	2
Total		30

This pattern is consistent with developments in international research. A 2026 review of AI literacy in schools found that, of 58 studies analyzed, 55% focused on students and 36% on teachers, while other groups accounted for only approximately 9% (S. Feng & Carolus, 2026). A review of K–12 AI literacy also demonstrates strong attention to how students acquire conceptual, technical, and applied AI skills (Casal-Otero et al., 2023). Even a review of AI literacy in primary schools emphasizes that the development of existing frameworks has been strongly influenced by educational and computer science perspectives (Yue Yim, 2024). The consistency of this pattern indicates that the dominance of educational contexts is not merely a characteristic of the dataset used in this study but represents a broader tendency in the development of the AI literacy field. Consequently, existing AI literacy concepts and indicators may also be more appropriate for learning environments than for the needs of communities using AI in real-life contexts.

This dominance is not a weakness in itself, but it reveals an opportunity to broaden the research context. People who encounter AI extend far beyond students and educators.

MSME actors, workers, community organizations, youth, rural communities, older adults, and the general public are also increasingly interacting with AI. However, each group has different purposes for AI use and different levels of risk. MSME actors may require AI for marketing and productivity, while the general public may have a greater need for capabilities to verify information and recognize AI-based manipulation. Community service can therefore serve as a bridge for bringing AI literacy beyond formal educational environments to groups that have received relatively limited access to AI education, while simultaneously testing whether literacy frameworks developed within education remain relevant when applied to more diverse social contexts.

Characteristics

Within the Characteristics dimension, the synthesis demonstrates that AI literacy is a multidimensional concept. The most frequently identified competencies can be grouped into six major categories: AI awareness and understanding, AI use and application, critical evaluation, creation and problem solving, ethical awareness, and responsible AI use. These dimensions demonstrate that AI literacy cannot be adequately understood merely as the ability to use AI-based applications. Competency development progresses from relatively basic capabilities, such as recognizing and understanding AI, toward more complex capabilities involving evaluation, creation, consideration of consequences, and responsible AI use. Thus, AI literacy represents a combination of functional literacy, critical literacy, and ethical literacy in human interaction with technology.

Table 8. Key Characteristics of AI Literacy

No.	Dimension	Core Capability
1	AI Awareness	Recognizing AI and its presence in everyday life
2	AI Understanding	Understanding the principles, capabilities, and limitations of AI
3	AI Use & Application	Using AI according to specific purposes and needs
4	Critical Evaluation	Evaluating the accuracy, bias, quality, and limitations of AI-generated outputs
5	Creation & Problem Solving	Using AI to generate ideas and content and to support problem solving
6	Ethical & Responsible Use	Understanding privacy, security, fairness, transparency, and responsibility in AI use

These findings are consistent with Casal-Otero et al. (2023), who identified six AI literacy constructs: recognize, know and understand, use and apply, evaluate, create, and navigate ethically. A review of generative AI literacy also demonstrates that the required competencies include personal, interpersonal, ethical, and critical thinking capabilities (Reicho et al., 2026). These findings demonstrate that improvements in AI literacy should not merely produce more technically skilled users but also users who are increasingly aware of the limitations and consequences of technology. Therefore, the stronger an individual's AI literacy, the further their orientation should move beyond simply operating applications toward determining whether AI is relevant, trustworthy, safe, and appropriate for a particular situation.

The implications for community service are relatively clear. Training that only teaches “how to use ChatGPT” cannot yet be regarded as a comprehensive AI literacy program. Communities also need to learn why AI can generate incorrect answers, how information should be verified, what types of data should not be entered into AI systems, how bias can be recognized, and when human decision-making remains necessary. This becomes increasingly important because AI's ability to generate convincing responses may lead users to assume that AI outputs are always correct. Therefore, the focus of programs needs to shift from tool proficiency toward informed and responsible use. Literacy indicators should consequently move beyond merely “being able to use” AI toward being able to use it, evaluate it, understand its risks, and determine the appropriate boundaries of AI use.

Methodology

The methodological analysis demonstrates variation in research approaches, although quantitative methods and literature reviews remain relatively dominant. Of the 30 articles, 9 articles (30%) employed quantitative surveys, 7 articles (23.3%) used systematic/scoping reviews, 5 articles (16.7%) employed experiments or learning interventions, 4 articles (13.3%) used qualitative approaches, 3 articles (10%) employed mixed methods, and 2 articles (6.7%) used participatory or community-based approaches. This composition demonstrates that the AI literacy field has developed considerably in answering questions concerning the dimensions of AI literacy and how these dimensions can be measured, but remains relatively limited in explaining how these competencies are formed and developed within real social environments.

Table 9. Mapping of the Methodology Dimension

Method	Number of Articles	Percentage
Quantitative Survey	9	30.0%
Systematic/Scoping Review	7	23.3%
Experiment/Intervention	5	16.7%
Qualitative/Case Study	4	13.3%
Mixed Methods	3	10.0%
Participatory/Community-Based	2	6.7%
Total	30	100%

This pattern demonstrates that AI literacy research has advanced in competency measurement and learning evaluation, but studies employing participatory and community-based approaches remain relatively limited. Instrument development has even progressed quite rapidly; a review of AI literacy scales identified 22 studies validating 16 instruments among populations such as the general public, university students, secondary school students, and teachers (Lintner, 2024). However, the ability to measure AI literacy does not automatically explain how these capabilities can be developed and utilized to empower communities. Surveys can indicate an individual's level of literacy but may not adequately explain how communities negotiate AI-related risks or use AI to solve everyday problems. Participatory, longitudinal, and community-based approaches are

therefore important for understanding processes of change rather than merely measuring competency levels at a single point in time.

From Digital Literacy to AI Literacy

The synthesis demonstrates that AI literacy has developed not as a replacement for digital literacy but as an extension of existing digital capabilities. Digital literacy provides fundamental capabilities involving access to technology, information search and evaluation, digital communication, security, and device use. As digital environments become increasingly influenced by AI, communities require an additional layer of competencies to understand how AI systems generate information, evaluate their outputs, recognize their limitations, and interact with them responsibly. Memarian & Doleck (2026), based on 72 studies selected from an initial 516 publications, explicitly demonstrate that AI literacy can be understood as an extension of digital literacy constructs. This relationship demonstrates the cumulative nature of literacy development: new capabilities do not eliminate previous competencies but add the capabilities required as the characteristics of technology change. Thus, communities with strong digital literacy possess an important foundation for developing AI literacy but still require additional competencies to address the generative, predictive, and increasingly autonomous characteristics of AI.

The distinction lies in the characteristics of the technology encountered. In digital literacy, users primarily learn to search for, select, process, and disseminate information. In an AI environment, technology can also generate information that appears convincing even when it is not necessarily accurate. The user's position therefore changes from simply being a consumer and producer of digital information to becoming an actor who must interact and collaborate with, while simultaneously overseeing, systems that participate in generating information. Evaluation capability consequently becomes increasingly important. The development of AI literacy can be described as a progression from digital access → digital skills → information evaluation → AI understanding → AI application → critical AI evaluation → ethical and responsible AI use. This shift demonstrates an important paradox: the more intelligent the technology becomes, the greater the need for human critical capability. The increasing ease of AI use does not reduce the need for literacy; instead, it increases the need for human verification and judgment.

These findings also demonstrate that AI literacy has a sociotechnical character. AI literacy concerns the relationship among humans, technology, information, values, and social consequences. Recent reviews have even found that AI literacy competencies encompass cognitive, emotional, psychological, and behavioral aspects and emphasize the importance of adaptation to the contexts of different user groups (S. Feng & Carolus, 2026; Jalil et al., 2025; Lee et al., 2026; Xie et al., 2026). This means that AI literacy cannot be separated from who the users are, the purposes for which AI is used, and the social environments in which the technology is applied. AI literacy programs for MSME actors do not necessarily need to be the same as programs for students, teachers, rural

youth, or other community groups. Contextualization is therefore not merely a strategy for delivering training but an important component of AI literacy effectiveness itself.

AI Literacy as a New Community Capability

The analysis demonstrates that AI literacy needs to be positioned as a community capability rather than merely a technological skill. This distinction is important because skills generally refer to the ability to perform particular tasks, whereas capabilities indicate a broader ability to use knowledge and resources across different situations. As AI applications continue to change, the ability to use a particular platform may quickly become irrelevant. In contrast, the ability to understand the characteristics of AI, formulate needs, interact with AI, evaluate outputs, and consider ethical dimensions has more sustainable value. From a capability perspective, individuals are not considered AI literate merely because they can produce effective prompts, but because they can determine which problems AI can assist with, select appropriate ways to use it, evaluate its results, and maintain control over final decisions.

This perspective is also consistent with AI literacy research on users, which demonstrates that AI literacy needs to be understood through the relationship among learning approaches, literacy components, and the effects resulting from such literacy (Mahadewi et al., 2025; Peng et al., 2026; Pinski & Benlian, 2024; Shafiq et al., 2026; Yang et al., 2025). In other words, AI literacy does not end with the learning process. The more important question concerns what communities can do after acquiring such literacy. In the context of community service, its impacts may include improved ability to search for information, increase productivity, generate ideas, develop businesses, communicate, or solve problems more effectively. Therefore, the relationship between literacy and impact should not be assumed to occur automatically. AI-related abilities become capabilities only when communities can convert their knowledge and skills into benefits that are relevant to their circumstances and objectives.

This concept extends the discussion toward AI empowerment. Recent research has begun to develop measures of AI empowerment encompassing dimensions such as impact, AI self-efficacy, creative AI self-efficacy, and meaningfulness (Kong & Yang, 2024). This indicates that the relationship between AI literacy and empowerment is beginning to receive attention. However, much of this research remains focused on students and university students. Therefore, developing the concept of AI empowerment at the community level represents a promising area for research and community service. At the community level, empowerment refers to the increased ability of groups to utilize technology collectively, maintain autonomy, improve productivity, and avoid new forms of technological dependency. This perspective shifts the objective of AI literacy from mere technology adoption toward meaningful technology appropriation.

Changing the Direction of Community Service in the AI Era

The SLR findings demonstrate the need for a shift in the orientation of community service. During earlier stages of digital transformation, community service programs were frequently directed toward improving people's abilities to use digital devices, social media,

e-commerce, productivity applications, and digital marketing. This model remains relevant, but the development of AI has made community needs increasingly complex. Community service programs can no longer focus solely on helping people use technology; they also need to develop people's capabilities to understand, evaluate, and determine how technology should be used. This shift occurs because AI possesses characteristics that differ from conventional digital tools: it can generate content and recommendations that potentially influence user decisions. Community service in the AI era therefore requires a combination of technical capability and critical capability.

This change can be explained as a shift from technology-oriented training toward capability-oriented community empowerment. Technology-oriented training generally centers on the question “how do we use this application?”, whereas a capability-based approach begins with the question “what problems do communities face, and how can AI help without reducing human control?” This distinction makes community service programs more contextual. Technology is not the objective of the program but a tool for helping communities address problems. Under this approach, technology is selected after community problems have been understood, rather than the other way around. This is important to prevent community service from becoming trapped in technology push, where technology is introduced simply because it is popular without ensuring its relevance to community needs.

Initial evidence of this possibility has begun to emerge through AI literacy training in community-based non-formal education. Zhao et al. (2026), for example, examined the implementation of K–12 AI literacy training within community environments in China involving university students as volunteer instructors. The study emphasizes that AI literacy practices in community-based non-formal environments remain underexplored. This finding is relevant to higher education institutions because it demonstrates that university students and academics can act as bridges between developments in AI knowledge and community literacy needs. The position of higher education institutions can therefore evolve from merely being knowledge providers toward becoming knowledge intermediaries, namely actors that translate complex AI developments into knowledge and practices that communities can understand, test, and utilize according to their contexts.

Based on this synthesis, AI literacy-based community service programs can be developed through six major stages:

- AI Awareness: communities recognize AI and its presence in everyday life.
- AI Understanding: communities understand the basic capabilities and limitations of AI.
- AI Application: communities are able to use AI according to their needs.
- Critical AI Evaluation: communities are able to examine the accuracy, bias, and quality of AI outputs.
- Ethical and Responsible AI Use: communities understand privacy, security, ethics, and responsibility in AI use.
- AI-Assisted Problem Solving: communities are able to use AI to help address real-world problems.

These six stages demonstrate that AI literacy-based community service needs to progress gradually from awareness toward empowerment-oriented application. Communities should not immediately be directed to use AI without first understanding its characteristics and limitations. Similarly, the ability to use AI is insufficient if it is not accompanied by the ability to evaluate and take responsibility for its use. The AI-Assisted Problem Solving stage is particularly important because it is at this point that literacy begins to be converted into practical capability. Thus, the model represents not merely a sequence of training materials but a process through which communities develop greater maturity in their interaction with AI.

Under this approach, the indicators of community service success also need to change. Success cannot be adequately assessed only through the number of participants or their ability to use applications after training. Evaluation should examine whether communities experience improvements in AI understanding, critical evaluation, responsible use, problem-solving capability, self-efficacy, and independence in using technology. This shift in indicators is important because participant numbers and technical abilities only represent program outputs, whereas empowerment requires assessment at the outcome level. Successful community service programs should leave communities with capabilities that remain useful after the program has ended, including when the AI platforms used during training have changed.

A New Framework for AI Literacy-Based Community Service

Based on the literature synthesis, the initial conceptual framework developed in Chapter 2 can be expanded into a model of AI literacy-based community service. This model positions technological transformation as the driver, digital literacy as the foundation, and AI literacy as an advanced capability. AI literacy must subsequently be translated into responsible AI use before it can be applied to help communities address the problems they encounter. This relationship demonstrates that empowerment does not occur directly simply because communities gain access to AI. There is a conversion process from access to literacy, from literacy to responsible use, and from use to problem-solving capability. Thus, this framework avoids the assumption that technology adoption will automatically result in empowerment.

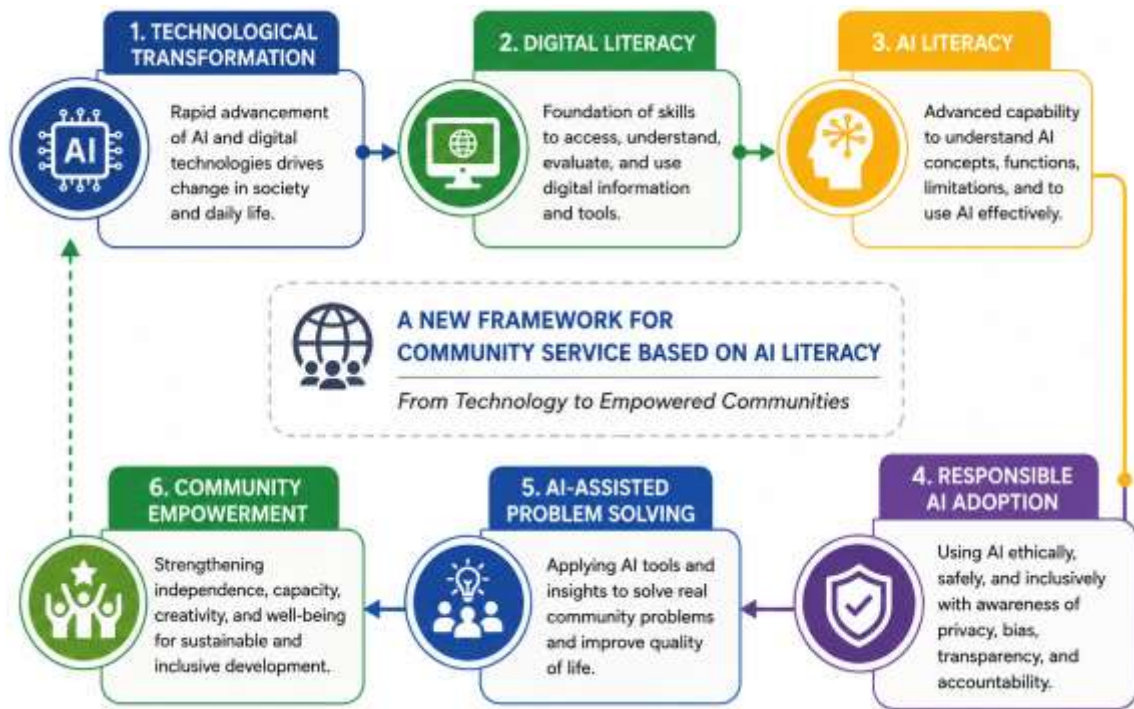


Figure 3. A New Framework for AI Literacy-Based Community Service

The framework demonstrates that AI adoption is not the ultimate objective of community service. AI use needs to generate capabilities that have meaningful value in people's lives. For example, AI may help MSMEs increase productivity, assist communities in accessing and understanding information, support educational activities, improve the administrative capabilities of community organizations, or help community groups generate alternative solutions to problems. However, this process must continue to preserve human judgment because communities need to maintain control over decisions and understand the limitations of the technologies they use. Within this framework, AI is positioned as an augmenting technology—a technology that strengthens human capabilities rather than replacing the human capacity to evaluate and make decisions. Empowerment may instead be weakened when communities become increasingly dependent on AI without understanding its processes, risks, and limitations.

The model also demonstrates that AI literacy-based community service should not apply the same approach to every group. The literature emphasizes the importance of personalization and contextual adaptability in developing AI literacy (S. Feng & Carolus, 2026; Z. Feng et al., 2025; Fortuna et al., 2025; Merino-Campos, 2025). Therefore, the AI literacy needs of MSME actors may focus on productivity and marketing, teachers may require AI literacy for learning activities, community organizations may need it for administration and information management, while the general public may have greater needs related to recognizing AI manipulation, deepfakes, misinformation, privacy, and security. This demonstrates that community service design should begin with a community needs assessment, followed by determining relevant AI competencies, learning methods, appropriate applications, and impact indicators. Thus, the proposed

framework is flexible in implementation while maintaining the fundamental principles of literacy, responsibility, problem solving, and empowerment.

Research Gaps and Future Research Agenda

The TCCM analysis and thematic synthesis reveal several important research gaps. First, from the Theory dimension, research remains dominated by AI literacy and digital literacy frameworks, while the use of community empowerment and human capability perspectives remains limited. Second, from the Context dimension, the literature is concentrated in formal education, particularly among students, university students, and teachers. Third, from the Characteristics dimension, research has extensively explained AI knowledge and AI use, but the relationship between AI literacy and community problem solving, autonomy, participation, and empowerment requires further development. Fourth, from the Methodology dimension, surveys, reviews, and educational interventions are more frequently used than participatory action research, community-based research, or longitudinal studies. These four gaps are interconnected: the dominance of educational contexts also influences the theories employed, characteristics measured, and methodologies used. Therefore, expanding research into community settings requires more than simply changing the respondent group; it also requires broader theoretical perspectives, outcome indicators, and methodological designs.

Table 10. Research Gaps and Future Research Agenda

Dimension	Research Gap	Future Research Agenda
Theory	Dominance of AI literacy and educational frameworks	Integrating AI literacy with empowerment, human capability, and community development
Context	Dominance of school students, university students, and teachers	Expanding research to MSMEs, rural communities, workers, youth, older adults, and community organizations
Characteristics	Strong focus on AI knowledge and use	Expanding toward critical literacy, responsible use, problem solving, autonomy, and empowerment
Methodology	Dominance of surveys and educational contexts	Applying participatory action research, community-based interventions, mixed methods, and longitudinal studies
Outcome	AI literacy is often treated as the final outcome	Examining its impacts on productivity, independence, and community empowerment

These gaps are also supported by developments in existing AI literacy reviews. Memarian & Doleck (2026) connected digital literacy with AI literacy but explicitly situated their analysis within an educational context. Other AI literacy reviews have similarly focused heavily on K–12 education, primary schools, teachers, and learning environments (S. Feng & Carolus, 2026). Even a recent review of generative AI literacy demonstrates that empirical evidence remains limited; of the 206 studies analyzed, only approximately 33% of educational studies and 29% of business studies were based on empirical research (Reicho et al., 2026). This condition reveals two gaps simultaneously: a context gap and an evidence gap. The literature is not only concentrated within particular contexts, but part of the discussion surrounding AI literacy also remains conceptual.

Empirical research involving community groups is therefore important to examine whether AI literacy constructs developed in the literature actually generate meaningful benefits when applied outside formal education.

Based on these conditions, future research agendas need to move from the question “what is AI literacy?” toward “how does AI literacy create capabilities and empowerment for different community groups?” Future studies can examine how AI literacy influences problem-solving capabilities, productivity, creativity, technological independence, and community empowerment. Community-based research is also needed to understand whether AI literacy programs generate changes that persist after training has ended. Longitudinal research is particularly important because increases in literacy scores immediately after training do not necessarily demonstrate sustainable behavioral change. Thus, the future research agenda needs to move from the measurement of literacy toward the evaluation of transformation, examining whether literacy actually changes the way communities use technology and strengthens their capacities over the long term.

The findings of this study demonstrate a clear development from digital literacy toward AI literacy, but this development has not yet been fully accompanied by a shift in focus from formal education toward community empowerment. The literature provides a relatively strong explanation of what individuals need to know and do to become AI literate, but remains comparatively limited in explaining how these capabilities are translated into empowerment at the community level. Therefore, the new direction of community service needs to position AI literacy not merely as new training content but as a capability that enables communities to understand, control, and utilize AI to address real-world problems critically and responsibly. The central shift proposed by this study is therefore not only from digital literacy toward AI literacy, but from literacy toward capability and subsequently from capability toward community empowerment. This perspective places humans and communities, rather than technology, at the center of transformation in the AI era.

CONCLUSION

This study aims to analyze the development from digital literacy toward AI literacy and its implications for a new direction of community service in responding to technological transformation. Based on a Systematic Literature Review of 30 articles published between 2020 and 2026, the findings demonstrate that AI literacy does not replace digital literacy but rather expands the competencies required by communities to respond to the development of artificial intelligence-based technologies. Digital literacy remains the foundation for accessing, using, understanding, and evaluating digital technologies and information. However, the development of AI requires additional capabilities, including an understanding of how AI works and its limitations, the ability to use and critically evaluate its outputs, and awareness of ethical issues, security, privacy, bias, and responsibility in AI use.

The TCCM analysis demonstrates that AI literacy research has predominantly developed within formal educational contexts, particularly among school students,

university students, teachers, and learning processes. Meanwhile, research positioning AI literacy within community, MSME, general public, and community empowerment contexts remains relatively limited. In terms of characteristics, the literature demonstrates that AI literacy is multidimensional and encompasses the ability to recognize, understand, use, evaluate, create with, and engage with AI ethically and responsibly. These findings demonstrate that the ability to use AI applications alone is insufficient to characterize an AI-literate society. Critical and ethical capabilities are becoming increasingly important because people interact not only with technology as a tool but also with systems capable of generating information, recommendations, and content that may not always be accurate or appropriate to users' needs.

Within the context of community service, the findings demonstrate the need for a shift in orientation from technology-oriented training toward capability-oriented community empowerment. Community service programs should not stop at training people to use particular AI applications but should help communities understand when and how AI can be used, evaluate the outputs generated, recognize the risks associated with its use, and utilize AI to address real-world problems. Therefore, the success of AI-based community service should be measured not only by participants' ability to use technology after training but also by improvements in communities' ability to use AI independently, critically, safely, productively, contextually, and responsibly.

Based on the literature synthesis, this study proposes the following developmental framework: Technological Transformation → Digital Literacy → AI Literacy → Responsible AI Adoption → AI-Assisted Community Problem Solving → Community Empowerment. This framework positions community empowerment as the ultimate objective rather than AI adoption itself. Through community service, higher education institutions can act as a bridge between technological developments and community needs by providing AI literacy programs tailored to the contexts of target groups. MSME actors, rural communities, youth, workers, community organizations, and other groups may have different needs regarding AI use. Therefore, AI literacy-based community service needs to be contextual, human-centered, and problem-oriented rather than merely technology-oriented.

This study has several limitations because the analyzed literature was restricted to the 2020–2026 period and Scopus, Web of Science, and Google Scholar were used as the literature search sources. In addition, AI is developing rapidly, meaning that AI literacy concepts, applications, and competencies are likely to continue evolving. Future studies can expand the research context to community groups that remain relatively underexplored, including MSMEs, rural communities, older adults, informal workers, community organizations, and communities with varying levels of digital literacy. Empirical studies using community-based interventions, participatory action research, mixed methods, and longitudinal designs are also needed to examine whether improvements in AI literacy actually lead to changes in problem-solving capability, productivity, technological independence, and community empowerment.

Overall, technological transformation requires community service to move beyond the agenda of improving digital literacy toward the development of critical and responsible AI literacy. The central challenge for the future is not merely to ensure that communities can use AI, but to ensure that they retain the knowledge, critical capabilities, independence, and control required to utilize AI appropriately. From this perspective, AI literacy can become a new direction for community service that enables higher education institutions not only to introduce new technologies but also to help communities understand, evaluate, and utilize technology to strengthen their capacities and address the problems they encounter.

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