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Unveiling AI Literacy: User Competences and Perceptions of Pre-Service Teachers

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Abstract. Artificial intelligence has been widely adopted and used by both teachers and learners for several purposes in language education. However, at first, teacher candidates are required to be qualified in AI literacy in order to nurture and cultivate the success of their future learners, thereby further improving language education. Therefore, there is a need to identify whether they are ready for AI-infused education, at which points they are (in)competent, and what they need in training regarding AI literacy, specifically in relation to their domain-specific contexts. Then, this study aimed to analyze to what extent teacher candidates are AI literate in terms of awareness, usage, evaluation, and ethics, and explore how they perceive and experience AI in teaching/learning. Based on the convergent mixed-methods-design, this study collected data from 104 pre-service ELT teachers. As the research instruments, scale and open-ended questions were employed through Google Forms. The analysis revealed a moderate level of AI literacy overall. It also indicated the restricted AI ability to integrate, critical evaluation, and ethical use. Although awareness was high, AI tool repertoire and knowledge were very limited. Moreover, AI was used more for educational purposes compared to daily life, and despite some challenges, perceived it as beneficial. Since AI is considered as the future, the pre-service teachers explicitly stated a need for AI training compatible with their professional competence and practices. Hence, this study demonstrates the requirement of AI training in teacher education programs to foster various competences of AI literacy.

Keywords: Artificial intelligence; AI literacy; foreign language education; perceptions; pre-service teacher

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1. Introduction

In recent years, artificial intelligence (AI) has become an essential component of daily life. People have been surrounded by various AI-driven technologies including medical services, banking, entertainment, transportation, and smart home gadgets (Almatrafi et al., 2024; Stolpe & Hallstrom, 2024). However, following the release of ChatGPT in 2022, AI and specifically Generative AI (GenAI) have attracted huge attention around the world, and the use of AI has subsequently become much more popular (Moorhouse, 2024).

As for education, since the 1960s, AI has already been employed through adaptive learning platforms, educational games, and intelligent tutoring systems (Mohamed, 2024; Tzirides et al., 2024). Hence, the incorporation of AI with other digital technologies into education has triggered certain modifications for teachers, learners, and other stakeholders. For example, teaching models, teacher-student roles, instructional materials, and learning environments have been changed greatly to become more personalized, resourceful, interactive, adaptive and supportive (Chenqi et al., 2023; Pei et al., 2025).

Foreign language education (FLE) is one of the fields in which AI has already been integrated into a number of teaching and learning practices, historically beginning with the inclusion of computers, followed by intelligent tutoring systems, automated writing evaluation, and, finally, chatbots and GenAI (Jeon, 2025). Crompton et al. (2024) present that AI is employed in ELT for several purposes such as skill development (i.e., speaking, pronunciation), pedagogical practices (i.e., explanations, feedback), and self-regulation (i.e., goal setting, enjoyment). However, they find that technology breakdowns, limited capabilities, fear of the unknown and standardized languages and ideologies are the main challenges of AI in ELT (Crompton et al., 2024). Therefore, despite challenges, it can be argued that AI has occupied an important position in FLE, GenAI tools in particular have accelerated its inclusion more recently.

Consequently, understanding and using AI have become much more important, thereby requiring people to have certain knowledge and skills if they are to participate effectively in this AI-age (Kong et al., 2021). As such, there is an urgent need to develop a specific competence, AI literacy, in order to facilitate better engagement. AI literacy can be defined as recognizing AI and using it properly and ethically through critical evaluation (Wang et al., 2023). Particularly, it has become increasingly critical for teachers to be AI literate to support and improve language learning/teaching more. Thus, there is a demand for AI literacy education beginning with the training of teacher candidates who will shape future education (Chenqi et al., 2023; Kong et al., 2025).

However, globally, many institutions, including Turkish universities, have not provided AI literacy education to teacher candidates yet (Kohnke et al., 2025; Ozer-Altinkaya & Yetkin, 2025). For this reason, examining to what extent future teachers are AI literate, and how they approach AI and its integration into FLE may be considered as a first step to provide some insights into AI literacy teacher education grounded in domain expertise. Therefore, building on the AI literacy

framework of Wang et al. (2023), this study investigated AI literacy levels and perceptions of pre-service ELT teachers at a Turkish state university.

2. Literature Review

The use of AI and GenAI, as a subset of AI, has been embraced by a number of teachers and learners to assist in them carrying out their tasks more quickly and efficiently. AI acts like human intelligence by learning, identifying patterns, and making relationships by processing the given data to perform intellectual skills and tasks (Mohamed, 2024). These characteristics have attracted many teachers and learners due to their increasingly widespread usage, making it a key element of contemporary education. Considering FLE, there are many AI-powered tools employed to teach, learn, and assess different languages.

For example, Syuhra et al. (2025) classify English ones based on their functions, citing tools such as those for personalized learning (e.g., DALL-E), developing pronunciation and speaking skills (e.g., Speechace), listening comprehension (e.g., Google Assistant), and writing abilities (e.g., Quillbot). In addition, Moorhouse (2024) specifies the uses of GenAI tools according to being conversational (e.g., ChatGPT), generative in visuals, audio and video (e.g., Midjourney), and having embedded AI functions (e.g., Mentimeter). Furthermore, Sharma et al. (2024) exemplify assessment functions of AI tools such as automated scoring and interactive real-time feedback about language skills and sub-skills like grammar and vocabulary.

Regardless of their purposes of use, AI-enabled applications are acknowledged to be helpful in language learning/teaching for several reasons. The common benefits can be summarized as:

- saving time and effort,
- reducing workload by automating tasks,
- supporting with various accessible resources,
- providing language input and interaction,
- supplying personalized learning experiences through adaptive learning,
- real-time and instant feedback,
- boosting motivation, autonomy and self-regulation,
- promoting flexibility for deeper engagement,
- facilitating to prepare and apply effective practices (e.g., creating materials, constructing assessments, planning lessons),
- sustaining more equal opportunities to learning owing to wider accessibility, especially when there is a lack of native speakers with whom to interact for practice (Crompton et al., 2024; Kohnke et al., 2023; Kristiawan et al., 2024; Mohamed 2024; Ng et al., 2021; Sharma et al., 2024).

Despite such merits, however, there are some challenges of AI that affect language education negatively. The overriding problems associated with teachers, learners, institutions, and AI itself include:

- overreliance on AI data sources, and their accuracy,
- lack of authenticity and creativity,
- deficiency in cultural understandings and emotional depth,

- absence of human interaction,
- generating biased and deceptive content,
- concerns about ethics, data privacy, and security,
- copyright violations,
- academic breaches and improper use (e.g., plagiarism, cheating),
- shortage of available devices and connections due to sometimes being costly,
- being worried about the loss of jobs,
- lack of appropriate policies, regulations, and support (Crompton et al., 2024; Kohnke et al., 2023; Kristiawan et al., 2024; Mohamed 2024; Ng et al., 2021; Sharma et al., 2024).

Above all, many teachers have felt unprepared to integrate AI into education due to the scarcity of training (Ayanwale et al., 2024; Hur, 2025; Kristiawan et al., 2024). Hence, it can be concluded that not only learners but also teachers need to understand what AI is, its strengths and weaknesses, and how to use it effectively and purposefully while coping with its problems in education, all of which are linked to being AI literate.

2.1 The Meaning and Frameworks of AI Literacy

AI literacy has been defined by numerous researchers, scholars, and organizations based on their field knowledge. Therefore, there is no universally accepted definition due to various interpretations of cross-disciplinary perspectives (e.g., computer science, linguistics, psychology) (Ma & Chen, 2024; Sperling et al., 2024). Nonetheless, the suggested definitions share similar notions such as competences, knowledge, abilities, skills, communication, collaboration, critical thinking and evaluation, ethical and effective application depending on the context of use (e.g., personal, professional, educational) (Laupichler et al., 2023; Long & Magerko, 2020; Ng et al., 2021; Tzirides et al., 2024). Wang et al. (2023) have afforded one of the most extensive and theoretically confirmed definitions, emphasizing the user competences, stating "AI literacy refers to the ability to properly identify, use, and evaluate AI-related products under the premise of ethical standards." (Wang et al., 2023, p. 1324). Accordingly, AI literacy means understanding and recognizing AI concepts and technologies, assessing them critically, and using them purposefully, contextually and ethically.

Considering the definitions of AI literacy, several researchers have proposed certain frameworks to establish its dimensions or competences. Some have presented conceptual frameworks derived from existing literature or built on their approaches for diverse educational settings and groups. For example, in terms of different literacies like digital, data, and computational, Long and Magerko (2020) identified 16 competencies such as recognizing AI, critically interpreting data, and ethics, all aimed at non-technical learners and educators. In addition, Ng et al. (2021) classified dimensions under four categories: "know and understand AI; use and apply AI; evaluate and create AI; and AI ethics" (p. 4). Their framework was assembled based on Bloom's Taxonomy and Technological, Pedagogical, and Content Knowledge (TPACK) framework adapted from previous studies conducted in various educational levels and with different stakeholders. Moreover, through their systematic review, Almatrafi et al. (2024) demonstrated

six constructs targeted for K-12 and higher education: "recognize (be aware); know and understand; use and apply; evaluate; create; and navigate ethically" (pp. 9-15). Rather than concentrating on literature, some organizations have designed their conceptual frameworks through their approaches to AI. To exemplify, UNESCO (2024) suggested AI competency frameworks for teachers and learners separately to serve as blueprints for guiding in AI literacy development based on a human-centered approach. In their framework for teachers, there are five dimensions: "human-centered mindset; ethics of AI; foundations and applications of AI; AI pedagogy; and AI for professional development" (p. 21) under which many competencies are described.

Likewise, DEC (2025) provided an AI literacy framework for faculty and students, particularly addressing the need for field-specific competences and AI-human collaboration. Their framework also consists of five dimensions: "understanding AI and data (how AI works); critical thinking and judgment (how to evaluate AI output); ethical and responsible use (how AI is used ethically and responsibly); human-centricity, emotional intelligence, and creativity (how humans remain at the core), and domain expertise (how to apply AI in a specific context)" (p. 8), all of which underlie the foundations of AI literacy.

In addition to such frameworks, other researchers have constructed empirical frameworks based on theories and measurable AI literacy competences intended for any AI users, ranging from students to teachers at any level of education. Most of these are scale development studies in which their frameworks were validated and found to be reliable. For instance, Laupichler et al. (2023) constructed a scale to assess non-experts of AI literacy who merely make use of AI systems and do not receive any instruction on AI. They identified three competency factors for AI literacy as being "technical understanding, critical appraisal, and practical application" (p. 6). Additionally, Ma and Chen (2024) designed a scale to measure AI literacy for undergraduate university students from various departments, producing a four-dimensional AI literacy framework which encompasses evaluation, ethics, awareness, and usage factors.

Moreover, Wang et al. (2023) developed a theoretically driven scale to measure user competences of AI users based on multiple digital literacy frameworks. Having tested their instrument, they proved a four factorial AI literacy framework for non-technical contexts and any users of AI. Their framework comprises awareness, usage, evaluation, and ethics constructs (see Figure 1). Awareness is about being able to distinguish and understand AI-facilitated systems and tools; usage denotes employing and integrating AI applications effectively to perform tasks; evaluation means being capable of choosing AI products reasonably and critically assessing their consequences; and ethics pertains to being conscious about proper and improper uses of AI technologies and examining associated moral issues (Wang et al., 2023).

Furthermore, they also examined the relationships among AI literacy, attitudes towards AI, and daily usage of AI, and found a high level of AI literacy correlated with positive attitudes and abilities to engage in AI daily usage. Since this framework has validated and reliable psychometric properties and consists of fundamental competences targeted for AI users who do not have technical expertise, the present study applies this framework as the theoretical background. Also, when education is considered, especially FLE, learners and teachers act as the users, not the developers (Luckin et al., 2022) and therefore, this framework is regarded to suit their non-technical contextual knowledge.

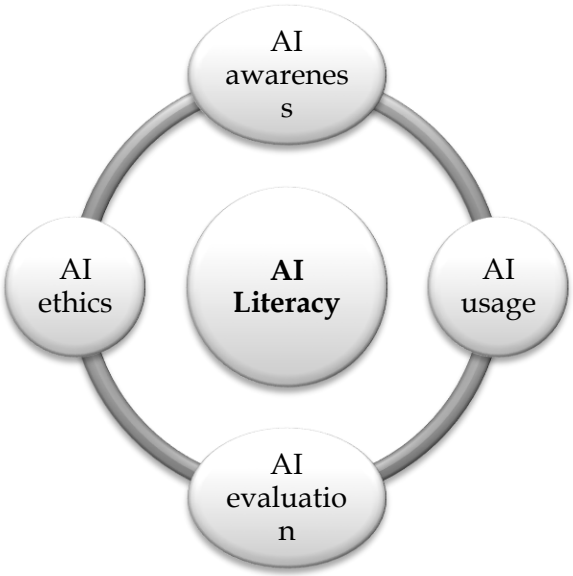

Figure 1: AI Literacy Framework: User Competences (Source: The authors' own elaboration based on Wang et al.'s (2023) framework)

As illustrated, there are a number of conceptual or empirical AI literacy frameworks, most of which have been proposed for general users and domains irrespective of educational levels, whether a teacher or learner. Thus, it seems there is no agreed framework, particularly for the discipline-specific ones in education. Moreover, the suggested competences are grouped into four in general: AI knowledge/awareness, ability/skills/use, evaluation, and ethics. Additionally, most researchers have presented common ideas about the meaning and components of AI literacy.

For example, AI literacy is not equal to digital literacy; rather, digital literacy is just a requirement (Chiu et al., 2024; Wang et al., 2023). Furthermore, the competences do not demand the knowledge of programming and code-writing while using AI (Kong et al., 2021; Long & Magarko, 2020). Instead, other characteristics have been discussed considering the dimensions of AI literacy frameworks. Therefore, in the light of the definitions, frameworks and other arguments about AI literacy, general characteristics expected of being AI literate can be outlined as follows:

- being knowledgeable about different AI concepts and applications as well as their pros and cons,

- being capable of using AI tools efficiently, ethically, and reasonably,
- being able to compare, select, and employ AI tools depending on the needs and context,
- distinguishing ethical AI practices from unethical ones,
- being aware of the effects of AI tools in daily life and education (Almatrafi et al., 2024; Kong et al., 2021; Moorhouse, 2024; Ng et el., 2021; Wang et al., 2023).

Therefore, teachers and other stakeholders are assumed to possess such characteristics to be AI literate for effective educational practices in this AI-era.

2.2 Studies on AI Literacy and Perceptions

Generally, AI literacy studies have analyzed competence levels of pre-service teachers from various training departments at university through the use of surveys, and various influencing factors on their literacy. For example, Chenqi et al. (2023) found a high level of AI ethics and awareness, moderate level of AI knowledge but low level of AI ability which indicated the deficiency in integrating AI. Similarly, Shi (2024) revealed an overall moderate level of AI literacy with a high level of AI awareness; nevertheless, AI knowledge and AI ability received lower means. The researcher concluded that AI knowledge was inadequate and AI ability was poor because most of the departments did not provide AI courses for their trainees.

In addition, Ayanwale et al. (2024) reported that understanding AI and having AI knowledge were the basis for AI use, ethics, creation, and problem-solving. They also noted AI ethics was linked to AI persuasion literacy and emotion regulation, illustrating the importance of including ethical training in teacher education. Lastly, Pei et al. (2025) found pre-service teachers had a fundamental understanding of AI terms but were not aware of AI system, showing lower levels of confidence in AI knowledge and ethics. Such studies have indicated that certain competences of AI literacy, such as ability and knowledge, are still open to improvement. It can also be inferred that the development of AI literacy begins with understanding and awareness of AI itself, there enabling it to be used effectively (Ayanwale et al., 2024).

Concerning the perceptions of pre-service teachers about AI, its uses, and integration as well as needs for AI literacy and its training, there are more studies with pre-service teachers within FLE, especially the ELT field, compared to AI literacy competences research. Different research designs have been adopted to explore AI-related opinions, experiences, and needs, mostly involving those who did not receive any training about AI. Almost all such studies demonstrated that pre-service teachers had positive perceptions of AI and its applications in education, especially for the future (Castillo-Cuesta, et al. 2025; Harakchiyska & Vassilev, 2024; Hartono et al., 2023; Karaduman, 2025; Kushmar et al., 2022; Ozer-Altinkaya & Yetkin, 2025; Pei et al., 2025; Pokrivcakova, 2023; Suharno et al., 2025).

Similarly, many future teachers agreed on the importance of AI in teaching/learning on account of its effectiveness (Kohnke et al., 2025; Ozer-Altinkaya & Yetkin, 2025). Particularly, AI was regarded as beneficial in providing

ideas for teaching sources and learning activities (Karina & Kastuhandani, 2024), maintaining personalized and adaptive learning (Hartono et al., 2023; Kushmar et al., 2022), giving immediate feedback (Hartono et al., 2023; Kushmar et al., 2022), supporting lesson planning and materials design (Karaduman, 2025; Temiz et al., 2024), and saving time (Karina & Kastuhandani, 2024). However, a few studies showed pre-service teachers did not think AI made teaching easier (Harakchiyska & Vassilev, 2024) and they still needed to modify what AI generated for them to fit the characteristics of students and teaching (Karina & Kastuhandani, 2024).

Likewise, AI was considered to require a culturally and contextually appropriate use depending on the features of instructional settings (Suharno et al., 2025). Nevertheless, a number of teacher trainees wanted to use AI in their profession mostly because of keeping up with future classes and the belief of it improving education (Ozer-Altinkaya & Yetkin, 2025; Temiz et al., 2024). Some studies indicated ChatGPT was the most favored AI tool for daily use and teaching/learning activities (Suharno et al., 2025; Temiz et al., 2024). In addition to ChatGPT, Grammarly, language apps like Duolingo, and some image generators were used by teacher candidates for several purposes in these studies.

On the other hand, some pre-service teachers were found to have serious concerns about AI and its use in education. For instance, they worried about the accuracy of AI data (Castillo-Cuesta, et al., 2025; Pei et al., 2025), privacy and security of personal data (Kohnke et al., 2025; Kushmar et al., 2022), ethical issues like plagiarism (Pei et al., 2025), cultural bias in outputs (Karina & Kastuhandani, 2024), lack of creativity due to the generated repetitive similar data (Castillo-Cuesta et al., 2025; Kushmar et al., 2022; Pei et al., 2025; Temiz et al., 2024), deteriorating some skills owing to overdependence, leading to laziness (Karina & Kastuhandani, 2024; Kohnke et al., 2025; Pei et al., 2025; Pokrivcakova, 2023), and loss of the human factor (Kohnke et al., 2025; Kushmar et al., 2022; Suharno et al., 2025). All such findings were acknowledged to affect education negatively. Yet, an interesting contrast in their perceptions about their professions was uncovered. While some pre-service teachers feared that AI would replace them (Pei et al., 2025), others did not have such a concern; instead, they believed that AI and humans together could better support education (Pokrivcakova, 2023).

Apart from these studies, some researchers revealed certain barriers to AI integration. For example, pre-service teachers admitted they had little knowledge about AI, its applications, and found themselves incompetent to integrate AI in their future classes due to the absence of AI training courses and thereby, not feeling ready (Hartono et al., 2023; Karaduman, 2025; Kohnke et al., 2025; Ozer-Altinkaya & Yetkin, 2025; Pei et al., 2025; Pokrivcakova, 2023). Thus, they suggested that more practical AI courses to foster their experiences should be offered in their programs (Karaduman, 2025; Karina & Kastuhandani, 2024; Kohnke et al., 2025; Ozer-Altinkaya & Yetkin, 2025). Moreover, other researchers recommended including more ethical side of AI in such training courses because of pre-service teachers' concerns and insufficient understanding of this issue (Karaduman, 2025; Kohnke et al., 2025).

Considering all the arguments and findings about AI literacy and perceptions, it is clear that AI literacy has been acknowledged as a vital qualification for education across different domains and levels to keep up with this AI-powered century regardless of challenges (Almatrafi et al., 2024; Stolpe & Hallstrom, 2024). However, as a first step, teachers should be equipped with the necessary knowledge and skills to integrate AI so as to promote the success of their future learners. Thus, for pre-service teachers, it is much more important to be AI literate so that they are ready for the future (Ayanwale et al., 2024). However, there is a dearth of research studies about the AI literacy of future teachers (Kohnke et al., 2025; Sperling et al., 2024). There are even more limited studies specifically based on domain expertise like ELT where the understandings and practices of AI are expected to be in line with the target field characteristics such as teaching grammar, improving pronunciation and developing writing skills (Crompton et al., 2024; Kristiawan et al., 2024).

Moreover, AI courses to develop literacy have not been offered in several teacher education programs (Hur, 2025; Kohnke et al., 2025). Likewise, within the Turkish context, pre-service ELT teachers have not yet received any training on AI and its integration (Karaduman, 2025; Ozer-Altinkaya & Yetkin, 2025). Although there is a strategic plan that targets the development of AI competencies and there have been recent initiatives to include AI courses at university programs, AI literacy education has still not been included in the national curricula of education faculties of Turkish universities (CoHE, 2023). Therefore, firstly, there is a need to find out whether teacher candidates are AI literate so as to reveal what they may need in practice about AI training.

As a result, a better understanding of AI literacy competences of pre-service teachers can be obtained, especially by identifying in which areas they are competent and incompetent to plan potential training. This is because AI literacy training is required to be consistent with learning/teaching particular subjects such as English language (Shi, 2024). Also, whether pre-service teachers consider AI to be positive or negative will likely affect their future decisions, which may influence their motivation to learn and apply AI (Pei et al., 2025). Therefore, it is also imperative to find out how they perceive AI to discover their opinions, experiences, and needs about AI literacy and integration.

Then, the current study aimed to investigate to what extent pre-service ELT teachers are literate in terms of AI awareness, usage, evaluation, and ethics. The other purpose was to explore what, why, and how they use AI tools and their perceptions of AI regarding its contributions to their learning/teaching. Accordingly, two research questions were addressed:

- What are the levels of AI literacy competences of pre-service ELT teachers?
- What are the perceptions of pre-service ELT teachers about AI?

3. Methodology

3.1 Research Design

This study employed a convergent mixed-methods-design. This design is used to collect both quantitative and qualitative data concurrently and then these are compared in terms of their similarities and differences for the interpretation and explanation of the research problem (Creswell & Guetterman, 2019). Since this study aimed to investigate AI literacy levels and explore AI-related perceptions of pre-service teachers, this research design was chosen to gather quantitative and qualitative data at the same time for the purpose of triangulation. That is, as a result of the interpretation of convergences and divergences between both types of data, a fuller understanding of AI literacy and the perceptions of pre-service teachers can be obtained and described.

3.2 Participants

In this study, 104 undergraduate students from a Turkish state university participated on a voluntary basis. They were selected through convenience sampling because they were accessible and available to be studied and volunteered to take part in this study (Onwuegbuzie & Collins, 2007). They comprised teacher candidates studying ELT in the teacher education program where a four-year training was provided. Thus, they were recognized as pre-service teachers. There were 59 female and 44 male participants, and one participant preferred not to state their gender. Their age range was between 19 and 26. Also, the sample consisted of the students in their second year (n=32), third year (n=33), and fourth year (n=39) of their study at the university. Lastly, the sample did not receive any training about AI in their program.

3.3 Instruments

There were two types of instruments to collect quantitative and qualitative data corresponding to the research questions:

First, the Artificial Intelligence Literacy Scale (AILS) developed by Wang et al. (2023) was used to identify AI literacy levels and to measure user competences in AI under four categories: Awareness, Usage, Evaluation, and Ethics. In AILS, there are 12 closed-ended items rated on a 7-point Likert scale from strongly disagree to strongly agree, and each factor has three items respectively. It was validated and found reliable as result of their empirical research. Since this scale provides a theoretical foundation to understand AI literacy from a user perspective in non-technical contexts like FLE, it was selected to gauge AI literacy of pre-service ELT teachers. Therefore, it was adopted as proposed by Wang et al. (2023) without any changes.

Second, open-ended questions were utilized to find out the perceptions of AI. The questions were generated by the researchers based on the related literature and considering the scale factors. There were six questions inquiring about what kind of AI tools they used, the reasons they utilized AI, pros and cons, whether it was ethical to use and why, how it supported ELT, and whether they need training and why. The questions were reviewed by another researcher doing research in AI to obtain expert opinion about their suitability and clarity, thereby ensuring

the appropriateness through peer examination (Merriam & Tisdell, 2016). Accordingly, some modifications were made to the wording.

In addition to these two tools, there was a section to collect demographic information to describe the sample. An informed consent form was also provided to explain the current research content in a transparent way and guarantee willingness, which is important for ethical considerations. All these instruments were transferred to Google Forms and controlled for any mistakes before data collection.

3.4 Data Collection and Analysis

Pre-service teachers were invited to participate by the researchers through visiting them in their regular class hours. After clear explanations about the research, the link to Google Forms was shared and those who did not want to complete were excluded from the study. Both the scale and open-ended questions were distributed online and responded to in English. It took nearly 10 minutes to answer the questions, and approximately one week to collect the whole data.

Subsequently, the gathered data were organized by the researchers according to different analysis methods. First, the reliability of the overall scale was calculated through Cronbach's alpha in the SPSS program and found acceptable (a=.72) (Pallant, 2020). Since the number of items in the subscales is small, including only three items per sub-scale, mean inter-item correlations were calculated (Pallant, 2020). The means ranged from .24 to .56, which suggested the items were conceptually related and reliable (Pallant, 2020). Second, the descriptive statistics (means and standard deviations) were computed for the scale data to demonstrate AI literacy levels. For descriptive purposes, the grouping of high, moderate, and low levels was determined by using the distribution of responses based on the overall mean and standard deviation of the sample.

The results showed that the overall mean was high (M=5.33) and the standard deviation was small (SD=.70), which means the ratings to the scale were grouped in the upper part. Therefore, to categorize and assign the labels for better discrimination and more meaningful variation, M ± 0.5 SD criterion was used. Following Pallant's (2020) principles of transforming continuous data into categorical values, the cutpoints to describe the levels were established based on the sample's M and SD as follows:

- High level : M > 5.68 [7.0-5.69]
- Moderate level : 5.68 < M < 4.98 [5.68-4.98]
- Low level : M < 4.98 [4.97-1.0]

Finally, reflexive thematic analysis was conducted inductively to reveal the perceptions of AI in line with the proposed framework by Braun and Clarke (2022). Their six-step-analysis process of qualitative data begins with data recognition, initial code extraction, and ends with reporting the findings. It is considered to have a flexible but systematic analysis process that can be adapted according to various studies, and themes as patterns are expected to show shared

meanings (Nowell et al., 2017). Concerning the coding process, Braun and Clarke (2022) proposed that it can be done alone or in collaboration because researcher subjectivity is an important source in reflexive thematic analysis. In this study, collaborative coding was employed to improve the interpretation rather than coming to an objective agreement in coding (Braun & Clarke, 2022). Accordingly, the co-researcher, acting as a critical friend, reviewed the data, commented and discussed about code-theme relation with the main researcher throughout the analysis. The analysis was performed manually using Microsoft Office Word program. Through repeated readings and annotations, themes were decided and shaped in relation to the codes. Consequently, the findings were arranged for the reporting, and sample quotations from the data were reported anonymously to exemplify the themes.

4. Results and Findings

4.1 Perceived Levels of AI Literacy Competences

The purpose of the first research question was to investigate to what extent pre-service ELT teachers perceived themselves AI literate in terms of user competences. For that, the responses given to AI literacy scale were analyzed quantitatively. The results revealed that the sample demonstrated a moderate level of AI literacy overall (see Table 1). When the competences of AI literacy are considered, there are different levels (see Table 1). For example, the sample was highly aware of AI technologies. However, the results for the usage and evaluation showed a moderate level. Among the other competences, though, ethics received the lowest mean score, which indicates the sample was not sufficiently conscious about the ethical principles when using AI.

Table 1: The descriptive statistics for the levels of AI literacy competences

	M	SD	Category Level
Awareness	5.78	.89	High
Usage	5.46	1.08	Moderate
Evaluation	5.43	1.08	Moderate
Ethics	4.67	1.20	Low
Overall	5.33	.70	Moderate

Note. N=104. The scoring is based on 1-7 Likert scale. The criteria for high, moderate, and low classification are as follows: High = M > 5.68; Moderate = 5.68 > M > 4.98; Low = M < 4.98.

When each item on the scale was analyzed closely, similar results were obtained (see Table 2). To begin with the awareness, the sample reported they were highly able to identify AI applications and differentiated the ones that use AI systems. This showed they perceived themselves to be quite knowledgeable while using AI-powered products. As for the usage, although the sample had a moderate level, they indicated they were capable of using AI both for their daily needs and work efficiency, and it was relatively easy to learn new AI applications. That is, they regarded themselves as somewhat skillful in accessing and incorporating AI tools in their daily tasks and work productivity. Similarly, for the evaluation, it

was revealed that the sample could assess and select relatively which AI tool to use depending on their purposes and which AI-generated information was useful for them. This demonstrated they viewed themselves as having some degree of analysis and synthesis abilities in choosing and using AI applications. However, for the ethics, they reported they only had partial knowledge and skill to use AI systems ethically. Specifically, they were not very careful about confidentiality and data protection. These showed they were not very attentive of ethical and unethical uses of AI.

Table 2: The descriptive statistics of AI literacy items

		M	SD
Awareness			
	1) I can distinguish between smart devices and non-smart devices.	6.52	.78
	2) I do not know how AI technology can help me. *	5.70	1.45
	3) I can identify the AI technology employed in the applications and products I use.	5.13	1.48
Usage			
	4) I can skillfully use AI applications or products to help me with my daily work.	5.49	1.35
	5) It is usually hard for me to learn to use a new AI application or product. *	5.17	1.69
	6) I can use AI applications or products to improve my work efficiency.	5.72	1.10
Evaluation			
	7) I can evaluate the capabilities and limitations of an AI application or product after using it for a while.	5.51	1.32
	8) I can choose a proper solution from various solutions provided by a smart agent.	5.53	1.24
	9) I can choose the most appropriate AI application or product from a variety for a particular task.	5.26	1.28
Ethics			
	10) I always comply with ethical principles when using AI applications or products.	4.79	1.73
	11) I am never alert to privacy and information security issues when using AI applications or products. *	4.43	1.77
	12) I am always alert to the abuse of AI technology.	4.80	1.66

Note. N=104. The scoring is based on 1-7 Likert scale. The criteria for high, moderate, and low classification are as follows: High = M > 5.68; Moderate = 5.68 > M > 4.98; Low = M < 4.98.
** Reverse-scored items.*

4.2 Perceptions of AI

The objective of the second research question was to figure out the AI-related perceptions of pre-service ELT teachers. For that, the responses to the open-ended questions were analyzed by means of reflexive thematic analysis. The findings revealed three major themes with some minor themes (see Figure 2).

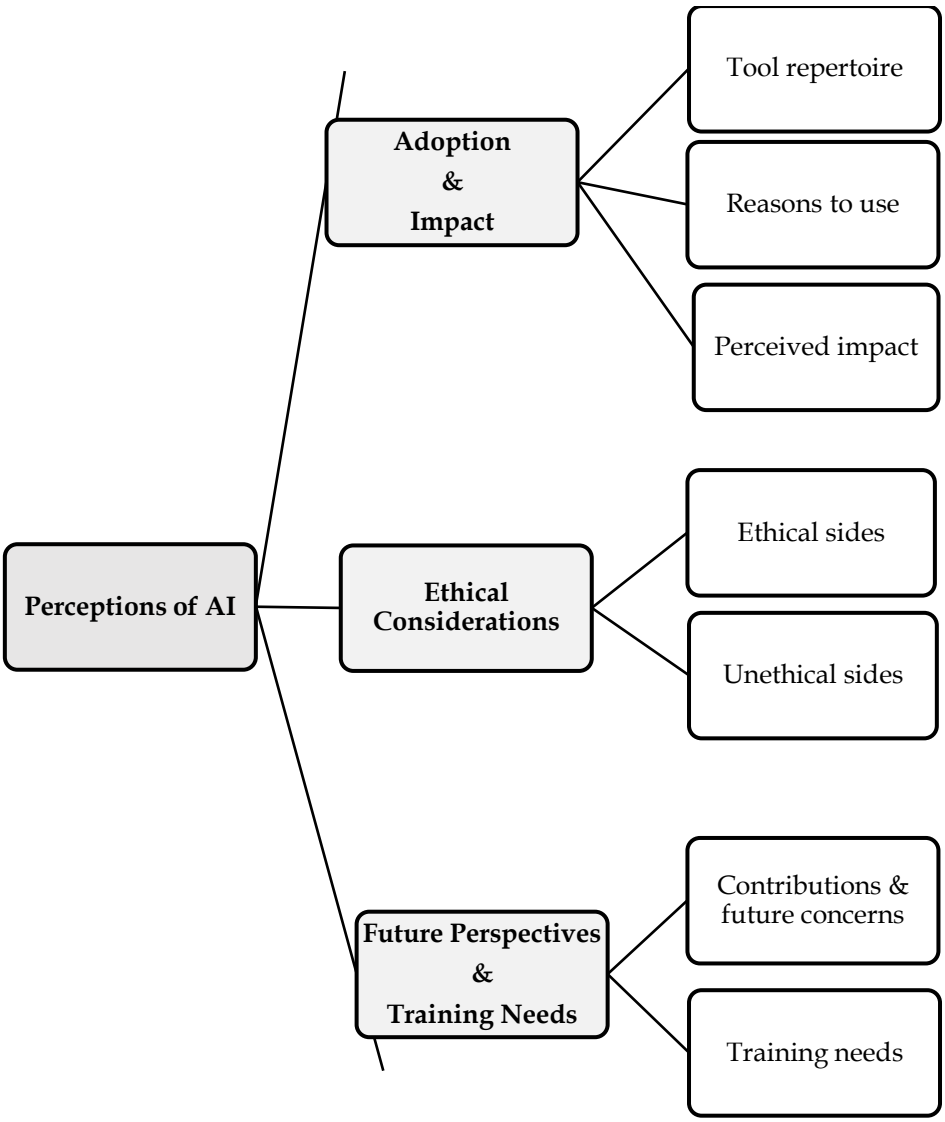

Figure 2: The thematic map of AI perceptions of the sample

4.2.1 Adoption and impact of AI

The first major theme is the adoption and impact of AI. This theme represents what kind of AI tools the sample knows and uses, namely tool repertoire, for which purposes or reasons, and how they recognize their effects under three minor themes. Considering the AI tool repertoire, nearly all stated the use of ChatGPT the most. After ChatGPT, other AI tools were often mentioned such as Gemini, Copilot, DeepL, and DALL-E. In addition, some other AI-powered applications such as Midjourney, Quillbot, Grammarly, Google Assistant, Notion AI, Character AI, Dream Generator and Copy AI were given as examples but less

frequently. Also, few examples of partial AI tools were shared such as Canva, Powtoon, Padlet, and Gamma. Yet only five of them stated they knew some AI tools but did not use any. It was found that the sample knew and used one or two AI tools with ChatGPT as dominant, which shows they emphasized more GenAI tools.

There were general reasons and educational purposes given to use AI technologies, which illustrates their usage patterns and engagement in AI. However, educational purposes outweighed general reasons, which means they used AI more for their learning/teaching activities compared to daily life issues. Concerning the general reasons, most of them exploited AI to access information easily and fast, find examples, solutions and answers, and get ideas on what to do. Especially, they reported using ChatGPT as a new search engine instead of Google. For instance, one participant said:

> *"I only use ChatGPT as another search tool just like Google. Sometimes it helps better. I also use it to find more examples about a topic that I am thinking about. I usually cannot come up with many different examples, so I use ChatGPT to give me more. ''* (Participant 41)

Moreover, most mentioned that AI is time-saver and helps them to get the work done quickly, particularly with complex, repetitive and lengthy tasks. Furthermore, some employed AI for more personal and daily issues such as learning about culture, getting creative ideas for drawing, generating pictures, making videos, and dubbing, asking for advice about the problems of one's daily life or social media, chatting like a friend, and creating fake identities. For example, two participants stated:

> *"... when I don't have any friend to talk, I use them."* (Participant 44)
> *"... I use it for some advice about my daily problems."* (Participant 83)

Regarding the educational purposes, nearly all emphasized the use of AI in their university lessons and homework for several reasons. To illustrate, they mentioned AI makes learning easier and improves their university work and lessons. Likewise, they used AI to get ideas for assignments, projects, and presentations, and receive help for proofreading and summarizing. Besides, they employed AI for teaching purposes such as preparing and creating teaching materials for their lesson plans (e.g., videos, visuals, activities, texts) and generating contexts for topics to teach. For instance, one of them exemplified:

> *"... to help with lengthy tasks, complete assignments, prepare lessons and materials, and get help with coding and writing functions."* (Participant 102)

When it comes to the perceived impact, AI was regarded to have both beneficial and harmful effects depending on the intentions to use and the users themselves. But most of the participants thought it advantageous to use whereas very few expressed their doubt as to whether current helpful AI would evolve into malicious AI in the future. Considering the beneficial aspects, many participants

mentioned that AI is useful to obtain information effortlessly and quickly, save time, reduce workload, and support idea generation. Also, it is very effective due to having more capacity compared to the human brain. To illustrate the benefits, one stated:

> *"Extremely beneficial for creating autonomy. It reduces workload a ton, so I can focus on some other things with extra time. ''* (Participant 61)

Nonetheless, the sample exemplified certain harmful aspects such as making people lazier and less skillful, decreasing creativity and critical thinking, and being overdependent on it. Accordingly, they argued AI just gives the illusion of success; people do not internalize what they learn or do via AI. Few also mentioned other detrimental effects like providing incorrect information, causing more cheating, disrespecting for privacy of data shared, and leading to the loss of some jobs. As an example, two participants indicated:

> *"If we used it to do all the work, we wouldn't participate in it. In the end, we wouldn't learn anything about the work we did."* (Participant 56)

> *"I think too much use of AI can make people lazy and less skilled overall."* (Participant 57)

However, as a whole, the sample perceived AI as both advantageous and disadvantageous because they thought it depends on how and why it is used and to what extent it is exploited. For example, one participant reported:

> *"AI is a great tool, but its benefits and harms depend on the intentions of the people using it."* (Participant 99)

4.2.2 Ethical considerations of AI

The second major theme is ethical considerations. This theme consists of examples and opinions about AI ethics under two minor themes. With regard to ethical sides, the sample illustrated under which conditions it would be ethical to use AI. For example, when AI is utilized for getting help, inspiration, and personal use, or someone reports they use AI explicitly, it is considered ethical. Additionally, they thought it is not stealing because the information that AI uses is everywhere on the Internet. Also, some participants underlined AI is the future, and ethics can change according to the generation expectations and thus, it was perceived as ethical. For example, one stated:

> *"It is ethical to use. It basically provides the already existing knowledge in a form you want."* (Participant 88)

On the other hand, regarding unethical sides, the participants associated them more with academic integrity situations. For instance, if someone copies and pastes everything AI suggests, claims AI works as original work, and uses it to create fake papers, then it is unethical to use AI. In addition, few participants indicated AI lacks transparency about data privacy and security, and it gathers

personal information to generate new information without consent, all of which were recognized as unethical. For instance, one said:

> *"It's not ethical if they find the idea from AI and present them as they found the idea."* (Participant 66)

Nonetheless, most of the sample agreed that the context in which AI is used determines whether it is ethical or unethical. Also, they placed responsibility on the humans for its ethical application because they stated AI is just a tool that is accessed and used by everybody, which gives a sense of equality. To illustrate, one stated:

> *"[Whether it is ethical to use AI or not] Depends on the context. If I am using the AI to find information, it is ethical, but if I just copy and paste information the AI gives me, it's unethical."* (Participant 26)

4.2.3 Future perspectives and training needs regarding AI

The last theme is the future perspectives and training needs. This theme includes general ideas and some future concerns about how AI contributes and will contribute to FLE, especially the ELT field, and the arguments about the need for training under two minor themes. To begin with its contributions to FLE, most of the sample maintained positive remarks and common benefits from different perspectives (e.g., teacher-learner). For example, many participants reported AI makes English language learning easier, sustains more personalized learning, supports comprehension, helps to get extensive input in English, and provides real-time feedback, all of which were considered as positive contributions, especially for learning and learners. Additionally, they mentioned AI is a useful and easy way to practice English regarding language skills and areas (e.g., speaking, writing, pronunciation) and can act as an assistant. For instance, one illustrates:

> *"AI is a technology that improves every day. It may help learners develop four skills. AI may become a friend who the learner speaks or listens to. It may be also like a pen friend that the learner can communicate."* (Participant 63)

Concerning the teacher and teaching perspective, many participants indicated AI aids to create materials (e.g., reading texts, visuals, dialogs), find authentic materials, give ideas about activity types and contents, and search and generate appropriate exercises. They also pointed out AI is practical in saving time and reducing workload related to paperwork. Thus, they mostly emphasized its help in lesson planning, material development and design. They believe that teachers will use AI more to get help with such tasks in the near future. One example:

> *"AI can be used in various ways; first of all, it is amazing to adapt and create materials, you can ask for ideas, and you can even ask it to create lesson plans. It is also an amazing tool to chat with for students."* (Participant 102)

Many participants thought such contributions would increase but that AI will not take over the teaching profession itself. However, only six were not sure about its future, and a few of them raised some concerns. For instance, they stated schools and teachers would not be necessary because AI would become the new teacher, and learners may learn foreign languages on their own. For that, one said:

> *"Maybe there will be no need for schools; people will sit and listen, watch AI and learn a language."* (Participant 38)

Considering the need for training, nearly all of them agreed AI training is required in teacher education programs. Though very few of them found AI training unnecessary thanks to self-learning, almost everyone reported they needed a training course for several reasons such as keeping up with the new generation, being up-to-date and ready for the future, and being aware of harmful aspects and misuses. For example, one of the participants stated:

> *"It is inevitable to have exclude it from our lives now. Therefore, we could try our best to learn and integrate it to our life."* (Participant 92)

Moreover, they stated that since ELT is their field of study and profession, they should learn, know, and use AI appropriately. Specifically, they underlined there are many AI tools available and will be many more, and as such, learning all these will take time, and as a teacher, they believed they should know how to integrate them efficiently. For that, they mentioned more practical skills could be introduced. Therefore, according to them, such training should cover both learning AI tools and how they can be integrated into teaching English. To exemplify, one stated:

> *"A training course for AI is necessary for teacher education programs because it can help teachers understand how to effectively use AI in the classroom, enhance student learning, and critically evaluate and implement AI tools responsibly and ethically."* (Participant 101)

5. Discussion

The present study examined the levels of AI literacy competences and AI-related perceptions of pre-service ELT teachers. In general, they were found to have a moderate level of AI literacy, which means they generally perceived themselves to be partly competent in AI topics and its proper uses. This result is congruent with Shi's (2024) study where pre-service teachers were found somewhat AI literate. As for each competence level, AI awareness received the highest mean, which shows the sample regarded themselves as highly aware of AI technologies and able to recognize and distinguish AI applications. Chenqi et al. (2023) and Shi (2024) also found similar results, which indicated pre-service teachers had high levels of AI awareness.

In parallel to awareness, the participants exemplified their AI tool repertoire by particularly emphasizing GenAI tools with the dominance of ChatGPT. This finding is similar to findings by Suharno et al. (2025) and Temiz et al. (2024) in which ChatGPT was the most favored tool. Although other AI tools were rarely

reported and few partial AI applications were mentioned by the participants, they highlighted ChatGPT as the chief one. This implies that their AI tool repertoire is very limited though their awareness is high. So, it is questionable to what extent they are knowledgeable about and familiar with diverse AI technologies. This can be attributed to the fact that AI is a new phenomenon for them, and they have discovered AI tools on their own, most probably due to their popularity, without searching and evaluating to any great extent through conscious knowledge. While Chenqi et al. (2023) and Shi (2024) found moderate levels of AI knowledge, this study revealed limited knowledge and familiarity with different AI applications. This finding overlaps with Pei et al. (2025) who concluded pre-service teachers were not very familiar with AI mechanisms, possessing low levels of AI knowledge. However, as Ayanwale et al. (2024) highlighted, AI knowledge and understanding are prerequisite for other AI literacy dimensions and therefore, it is evident there is a need to enrich AI knowledge about different AI technologies, and comprehension of AI concepts.

Concerning AI usage, the participants were found to be somewhat capable of using, applying, and integrating AI tools. But their responses showed that beyond acceptance, they took advantage of AI-powered tools extensively in their educational lives compared to daily life so as to improve work efficiency, especially for their university works, learning, and preparing teaching materials. Also, reinforcing the previous findings of many studies (e.g., Crompton et al., 2024; Kohnke et al., 2023; Mohamed et al., 2024), they used AI for more practical purposes highlighting its advantageous sides such as saving time, reducing workload, getting ideas and help. Nevertheless, it seems they were engaged in AI only at the surface level because as they stated, they mostly used it like a search engine to complete tasks quickly.

Although there were some attempts to integrate AI in teaching/learning, they did it without understanding how AI works and how to integrate it into language education effectively. This can be ascribed to insufficient knowledge about how and why various AI tools can be exploited depending on their contexts of use. Therefore, it can be inferred that their abilities and skills to use and integrate AI are adequate to some degree. This moderate finding contradicts with the studies of Chenqi et al. (2023), Pei et al. (2025), and Shi (2024) in which low levels of AI ability were reported. This may stem from the fact that pre-service teachers in this study were eager to use and apply AI in education, both currently and in the future. Still, since there are a moderate level and superficial involvement in AI, it is clear there is a demand to make them more capable of applying AI tools and to improve their ability to integrate it skillfully through understanding and assessing what they are doing.

When it comes to AI evaluation, pre-service teachers rated themselves at the average level, which shows they were partly competent in their abilities to choose relevant AI tools by analyzing their capacities and limitations carefully. As previously mentioned, they only used a few AI technologies despite there being many existing tools. Thus, it is apparent there is much to learn about AI, the pros and cons of each tool, and effective ways to apply them for particular tasks, all of

which require the ability to critically evaluate the qualities of AI applications. As nearly all the frameworks have presented critical evaluation is one of the dimensions of AI literacy (Almatrafi et al., 2024; Wang et al., 2023), and this study demonstrated further development of critical evaluation skills regarding AI is required for future teachers.

Considering AI ethics, there was a low level, particularly about alertness to privacy and information security. This means they did not have adequate knowledge about ethical principles while using AI technologies, which is also supported by Pei et al.'s (2025) study that showed pre-service teachers were not familiar with ethical issues about AI. Their responses to the questions also demonstrated their inadequacy in AI ethics. For example, the participants exemplified in which conditions using AI is ethical (e.g., getting help) or unethical (e.g., copying pasting everything) rather than what principles are essential. Moreover, most of their examples concentrated on academic integrity (e.g., plagiarism, cheating) but only a very few on transparency and confidentiality, which signals the limited knowledge about further ethical considerations.

However, apart from academic integrity, other ethical principles are also required to be AI literate such as understanding the abuse of AI technologies, bias, diversity, their impact on society, using AI responsibly and being aware of institutional policies about AI ethics (Almatrafi et al., 2024; DEC 2025; UNESCO, 2024). Therefore, it can be inferred that their ethical perceptive is very narrow because they were not aware of which other practices can be accepted ethically/unethically and what to do to prevent unethical behaviors. Such narrow perspectives and limited knowledge can result from the lack of awareness and understanding of AI ethics and the absence of training on it as pointed out by Ayanwale et al. (2024) and Pei et al. (2025). Similarly, the participants expressed that they needed to receive training on how to learn about the misuses of AI. Since AI ethics is acknowledged as one of the indispensable competences in several AI literacy frameworks (e.g., Ng et al., 2021; Wang et al., 2023), there is a necessity to enhance users' awareness and understanding to enable them to acquire a more ethical eye.

In general, the participants held positive perceptions of AI as found in many previous studies (e.g., Harakchiyska & Vassilev, 2024; Hartono et al., 2023). As Wang et al. (2023) have proposed, positive attitudes towards AI can promote more robust AI literacy, particularly regarding the involvement in AI applications; this is a noteworthy outcome that signals they are open to AI engagement. In addition, most underlined the importance of AI in education due to the fact that AI is the future and it has/will have beneficial contributions to FLE. This finding corresponds to the studies by Kohnke et al. (2025), and Ozer-Altinkaya and Yetkin (2025) in which there was a general consensus on the effectiveness of AI in education.

While the participants thought AI can be both beneficial and harmful depending on the intentions, they believed it is very useful to exploit AI in ELT owing to certain advantages such as helping lesson planning and materials creation,

supplying resources for teaching/learning activities and opportunities to practice, as also shown in previous studies (e.g., Karaduman, 2025; Karina & Kastuhandani, 2024; Temiz et al., 2024). Thus, it can be deduced that most of them were aware of the opportunities of AI and its contributions to FLE, but when they exemplified the benefits, they only discussed them from teacher-learner perspectives. They did not exemplify anything about assessment, which implies there is a lack of knowledge about how AI can be used for assessment purposes in language education. This might stem from the fact that they neither used AI for assessment functions nor experienced AI-assisted assessments. But they only utilized it for teaching and learning goals. However, as Moorhouse (2024) has argued, one of the purposes of AI is to use it for feedback and assessment. Therefore, this finding implies that there is a need to extend awareness from usage and integration to assessment in FLE.

On the other hand, some were concerned about its potential harm such as increasing laziness, reducing creativity and critical thinking due to overreliance, all of which were seen as threats to internalized learning. These concerns are in line with many studies that showed pre-service teachers were worried about the lack of creativity and cognitive skills due to overdependence on AI (e.g., Karina & Kastuhandani, 2024; Kushmar et al., 2022). Contrary to Pei et al.'s (2025) study, which indicated pre-service teachers were worried that AI would replace them, many participants in this study agreed that AI is just a tool, humans manage it, and it cannot be a substitution for teachers, as supported by Pokrivcakova (2023).

Also, they argued that AI integration will always require human intervention, which is in contradiction with the studies by Kohnke et al., (2025), Kushmar et al. (2022), and Suharno et al. (2025) that revealed teacher candidates were anxious about losing human element. This perspective might be associated with one of the AI literacy competencies presented by DEC (2025) and UNESCO (2024) that states humans are the agents of and at the center of AI collaboration. This can be considered as an encouraging finding in that pre-service teachers were aware of the coexistence of AI and humans.

Regarding AI training, almost all of them reported a training course for AI is a must in teacher education because there was not such a course, as was also found in previous studies (Kohnke et al., 2025; Pei et al., 2025; Shi, 2024). The main reasons stated are about being up-to-date and ready for the future generation to foster successful education. This is in agreement with the studies by Ozer-Altinkaya and Yetkin (2025), and Temiz et al. (2024) that presented pre-service teachers desired for the efficient incorporation of AI in future teaching. However, as the scale and responses revealed, they did not feel greatly prepared and competent in AI knowledge, ethics, and integration into discipline-specific practices.

These findings are corroborated by the studies which demonstrated such findings were the main barriers to AI integration and that the lack of AI training courses resulted in having limited understanding of AI (Hartono et al., 2023; Ozer-Altinkaya & Yetkin, 2025; Pokrivcakova, 2023). This can also be ascribed to the

fact that pre-service teachers in this study employed AI without critical evaluation. Besides, they expected AI training courses would cover more practical knowledge and skills to integrate AI tools effectively and purposefully into language education. This expectation corresponds to the findings by Castillo-Cuesta et al. (2025), Karina and Kastuhandani (2024), Karaduman (2025), and Kohnke et al. (2025) such that more hands-on experience is demanded in AI training. Therefore, as pointed out by Pei et al. (2025), this study identified a need to enhance AI literacy through the inclusion of training in a university curriculum for future teachers.

6. Recommendations, Limitations and Future Research

This study indicated a moderate level of AI literacy in general, limited knowledge, restricted critical evaluation and ethical understanding despite high awareness, positive perceptions and frequent use of AI. Then, some recommendations can be made.

For example, as pre-service teachers demanded, training on AI should be provided early in learning to broaden their perspectives, cultivate their knowledge and practical skills, and make them more competent and confident, thereby making them well-equipped for the future (Almatrafi et al., 2024; Hur, 2025; Shi, 2024). Therefore, teacher training programs should offer AI courses including diverse topics ranging from basic knowledge of AI systems, familiarity with several AI tools to their connection to subject matters and ethical considerations. Especially for integration, more practical content can be introduced because as the sample indicated such training courses should cover both learning AI tools and how they can be integrated into teaching rather than simply theories of AI, which calls for a non-technical approach to AI literacy education for non-experts (Luckin et al., 2022).

Moreover, both AI pedagogy (UNESCO, 2024) and domain expertise (DEC 2025) should be seen as parts of AI literacy training. Therefore, while introducing and experiencing AI tools to expand tool repertoire at disposal, it is important to supply discipline-specific cases (Tzirides et al., 2024). Additionally, AI topics should be presented not only for teaching/learning but also for assessment purposes to complement each other. Besides, more information can be provided about the strengths and weaknesses of each AI tool so that teacher candidates can evaluate better and pay attention while using and integrating AI technologies. This is because future teachers are required to adopt a critical eye and not to be 'AI idiots' (DEC 2025); that is, they should not be overdependent on AI without questioning the generated contents. Particularly, this is vital when AI tools and contents necessitate cultural and contextual relevance (Suharno et al., 2025).

Therefore, teachers should be sensible and critical of the capabilities of existing AI tools for language education and not fall for 'AI hype' (Crompton et al., 2024). Though AI literacy seems to reflect the cognitive domain mostly, its social, emotional, and behavioral aspects should also be considered while delivering training (Kong et al., 2024). Furthermore, regarding needs about AI ethics and general concerns about AI, training can be helpful to overcome their

apprehensions and learn how to cope with unethical AI; therefore, the more ethical side of AI in training should be covered. Consequently, it is obvious that comprehensive teacher training about AI has become unavoidable, as expected by teacher candidates in this study. Hence, it is imperative to update teacher training programs to include AI literacy in the curricula. Moreover, AI literacy education should be constantly kept up to date along with new AI concepts and applications (Kohnke et al., 2025). Since AI literacy frameworks have established required competences, they can be used as a guide to plan AI literacy education content. Therefore, considering the frameworks and analyzing the sample contents, courses should be planned and implemented thoroughly conforming to the requirements of each domain for enhanced AI literacy education in teacher training.

While this study is believed to offer some insights into AI literacy competences and perceptions of pre-service teachers, it has provided self-reported data gathered all at once within only one institution to describe the current situation rather than generalizability despite gathering multiple data sources. Therefore, future research can focus on a more practical side of AI literacy in different contexts. For example, more longitudinal studies (e.g., action research) might be designed to investigate how actual AI literacy is developed through direct training (e.g., a course, workshop) and experience (e.g., practicum, lesson planning, application) built on the requirements of subject areas in teacher education.

Moreover, what factors influence their AI literacy progress could be examined. As Almatrafi et al. (2024) have maintained AI literacy changes substantially depending on area of expertise, how to implement AI literacy education and what their contents will be according to subject disciplines are worth exploring to guide planning. Lastly, due to the paucity of AI literacy frameworks grounded on a specific domain like ELT, there is an urgent need to establish discipline-based frameworks so that new potential competences peculiar to each domain might be revealed to promote more proper AI literacy education.

7. Conclusion

With the purpose of exploring the levels of AI literacy competences and perceptions of AI, the current study revealed that pre-service teachers perceived themselves moderately AI literate as a whole. Despite their high awareness of AI technologies, their AI tool repertoire was restricted by using ChatGPT dominantly as the main tool. Moreover, they were moderately capable of AI usage and critical evaluation. This indicates superficial engagement in AI even though they used AI tools frequently. Most notably, their understanding of ethical issues, responsible and effective use, and abilities/skills for integration were very limited. Although nearly all of them held positive perceptions of AI and its benefits to education, they underscored the need for training in teacher education, namely, developing their AI literacy regarding certain competences related to their subject field is requisite.

It can be concluded that there is still room for improvement for pre-service teachers to be entirely AI literate. However, as a result of this study, a greater insight has emerged into the AI literacy competences of pre-service teachers, especially by revealing where they were competent and incompetent, and their conceptions, experiences, and needs about AI literacy and integration into FLE. Since teacher candidates cannot help future learners without AI literacy, this study is assumed to shed light on what they need in terms of AI literacy education. It is also considered to contribute to ongoing research because AI literacy of foreign language teacher candidates has not been extensively studied.

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