AI literacy, preparedness, and use motives of elementary education pre-service teachers of a state university in the Philippines

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Abstract: Digital competence in the 21st century is a crucial aspect for future educators. However, some pre-service teachers still lack this competence, particularly in the use of artificial intelligence (AI). This study aimed to assess the perceptions of 46 pre-service elementary teachers regarding their literacy levels, preparedness, and motivations for using AI. The research employed an explanatory sequential mixed-method design, collecting quantitative data through three adapted survey questionnaires from students enrolled at a state university in the Philippines for the academic year 2024-2025. Subsequently, qualitative interviews were conducted with eight participants to provide context and deeper insights. Quantitative data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (regression analysis), while qualitative data were thematically analyzed. The results indicated that the participants' AI literacy was above average. They also demonstrated a moderate level of preparedness and showed openness to integrating AI into classroom practices. However, some participants expressed uncertainty about AI usage. Regression analysis revealed that preparedness, more than literacy, significantly predicts motivation to use AI. Thematic analysis of interview data identified key themes, including foundational awareness with conceptual gaps, enthusiasm coupled with uncertainty, ethical concerns, inadequate institutional guidelines, and a strong desire for AI integration. These findings highlight the necessity for Teacher Education Institutions (TEIs) to implement structured, ethically grounded AI training programs for pre-service elementary education teachers. Such initiatives are essential to foster confident, responsible, and innovative educators capable of thriving in an AI-driven future.

Keywords: Generative AI, Higher education, Mixed-methods, Negros Occidental, Tertiary education.

1. Introduction

In the 21st century, digital competence is becoming an important outcome in developing future teachers [1]. Part of these technological developments is the popularity of using artificial intelligence (AI) in education, which has substantially changed the conventional teaching-learning experiences and overall classroom instruction [2]. Thus, the growing number of AI users have already invaded and are affecting higher education institution programs [3]. Despite their differences in policy frameworks, technology infrastructure, and how their institutions prepare to adopt these changes, the way it is being applied in education by teachers and students is already unstoppable [4]. More so, as AI reshapes education, top-performing tertiary schools are reimagining the teaching profession to meet these challenges and make the most of new opportunities [4]. "The game is changing for our learners. To remain competitive, we need to ensure their technology literacy, much like athletes mastering new skills" [5].

Recent trends in AI have led to many studies that show its importance in teacher education. For example, researchers [6] explored how using AI can improve the teaching and learning experiences of classroom teachers. This reliance on technology makes it crucial for teachers to have the skills needed to teach in a digital environment. Incorporating AI into the curriculum was also suggested as it was

viewed to provide valuable experiences for pre-service teachers for its growing role in education [7]. Thus, this gap underscores the importance of improving their AI literacy through conduct of training and even in curriculum updates [8]. Moreover, it cannot be neglected nor disregarded that today's generation of learners grasp and acquire information differently. Therefore, it is essential for students enrolled in education programs to be taught and be equipped with skills on how to innovate their instructional pedagogy that adapts to these evolving needs. The claim was further supported by a survey conducted by Chung [9] regarding the pre-service teachers' perceptions of AI in Education showing that 88.9% of pre-service teachers use generative AI tools for personal learning or teaching preparation. But their opinions towards the adoption of AI in classrooms were divided with 49% in favor, 41.2% uncertain, and 9.8% opposed due to concerns about overreliance on technology and ethical issues. There were also findings from past studies suggesting pre-service teachers to learn and acquire different set of competencies related to AI integration and emphasizing more on values. These set of skills were presumed to profoundly their preparedness to teach the 21st-century learners [10]. The perceived need for future teachers to adopt innovative and adaptable pedagogical approaches to foster readiness on AI integration were also recommended [11] for them to effectively incorporate AI into their teaching practices.

Thus, conducting further research to examine how AI technologies implicate in-service teacher preparation is needed [12]. The findings could serve as a guide to educators, HEIs, TEIs, and policymakers to hone the skills of pre-service teachers of higher education landscape [13] to responsibly use AI in their future classrooms. Bautista, et al. [14] further suggested researchers in the future could consider using mixed-method to assess the pre-service teachers' readiness towards the integration of AI-based tools in education.

In this paper, the researcher attempted to show the literacy level, pedagogical preparedness, and their willingness to integrate it to their pedagogical approaches. The findings of this study can create a pre-service teacher training program that could help prepare and develop their skills in effective AI integration in education. This investigation further aims to ensure that the next generation of teachers are already familiar and equipped with skills on how to use AI tools to promote an inclusive learning experience to the new generation of learners.

This study sought to determine the intentions of pre-service teachers to integrate AI into their future classrooms. By examining their AI literacy levels and preparedness the research aims to contribute to the ongoing discourse on optimizing AI's role in higher education and in pre-service teacher training while ensuring responsible and effective use of technology in teaching and learning environments. To achieve this, the following questions were asked to the respondents:

1. What is the AI literacy level of pre-service teachers in terms of:
   a. Use & Application,
   b. Knowledge & Understanding,
   c. Detection, and
   d. Ethics?
2. What is the extent of pre-service teachers' preparedness in terms of:
   a. Abilities to use,
   b. social influence and support,
   c. Intention of use,
   d. Usefulness and efficiency,
   e. Limitation awareness,
   f. Pedagogical potential, and
   g. Assistance awareness?
3. What is the extent of motives to use AI of pre-service teachers in terms of:
   a. Ability to use,
   b. Expectancy,
   c. Attainment,

    d.   utility value,

    e.   intrinsic/interest value; and

    f.   cost?

4.   Is there a significant relationship on pre-service teachers' AI literacy, preparedness, and motives to use AI?

5.   What are the lived experiences, perceptions, and concerns of pre-service teachers regarding AI literacy, preparedness, and integration in education?

2. Review of Literature

The emergence of artificial intelligence (AI) in the rapid advancement of technology has substantially altered conventional teaching patterns which had significantly impacted various aspects of teaching and learning experiences [2]. These advancements enable educators to tailor instructional methods to individual learning styles, improving student outcomes and fostering a more inclusive educational experience.

Essien, et al. [13] found that Artificial Intelligence (AI) can help automate routine tasks of teachers including grading, scheduling, and providing real-time feedback to their students. Furthermore, they highlighted that the automation feature of AI allows teachers to focus most of their time in instructional quality and student mentorship. AI was also found helpful to teachers in evaluating their assignments and offering essential materials for students who are having difficulty which helped them handle larger classes while keeping a strong connection with their students. Moreover, the ability of professors to use AI can offer tailored course selection and steps to assist students who are encountering challenges to learn [15]. Thus, the adoption of AI in teaching offered strategies that improved educational practices of teachers and outcomes of students [13].

On the other hand, as artificial intelligence (AI) has become increasingly integrated into daily life, traditional digital literacy frameworks must be revised to address the modern challenges. These components are integrated with traditional digital literacy standards through a meta-learning layer that emphasizes adaptability and continuous learning. Integrating technical and humanistic aspects creates a comprehensive foundation for preparing students for an AI-driven world, while identifying areas for future empirical validation [16]. The introduction of AI into education marks a significant departure from conventional teaching methods, offering personalized learning and support for diverse educational requirement. However, this integration presents challenges especially on how to adapt this to the curriculum. Successful adaption could enable students, such as pre-service teachers, to enrich their educational experience and pedagogical practices [17]. Also, the effectiveness of AI in education largely depends on teachers' AI literacy and their ability to integrate these tools into pedagogy. It covers their ability to understand how AI functions, its applications in teaching, and the ethical considerations involved. Studies suggest that many pre-service teachers lack adequate AI literacy, which poses challenges for effective technology integration [18].

Likewise, research on the skills of future teachers on how equipped they are to use these tools effectively and ethically is also growing. In a study of Li, et al. [19] it showed that that college students demonstrated moderate familiarity with AI tools, particularly ChatGPT and willingness to use them in coursework. However, over-reliance on AI may lead to superficial understanding, as students might bypass necessary cognitive work, treating AI as a shortcut rather than a learning tool [20]. Yet, despite of ChatGPT's exceptional performance, it still fell behind university students' capability in the areas of evaluation and inductive reasoning [21].

Meanwhile, artificial intelligence also complemented with critical thinking of students when teachers integrate it with their innovative teaching methodologies [22]. In a separate study, Benlidayi [23] the use of AI in teaching enhancing critical thinking skills of students when used as an aid for analysis, problem-solving, and decision-making. Moreover, AI chatbots also help students easily understand the language when using AI-assisted language apps, tools, models, theories and methods [24]. Whereas, opportunities for personalized learning and improved outcomes while addressing ethical

challenges and the need to balance AI proficiency with independent thinking development is also viewed as important insights of the research of Hao, et al. [25]. These were few of the performed activities when students are engaging with AI-generated information, questioning its validity, and analyzing its impact in both personal and professional contexts [26].

Hence, findings of various researchers do not align to each other regarding the benefits and potential disadvantages of integrating AI in the classroom. For instance, Çela, et al. [27] found that while AI exposure doesn't significantly affect critical thinking skills, too much reliance on it is a disadvantage to the students, such as pre-service teachers, in terms of their problem-solving skills which could later affect their independent cognitive development. This concern aligns with the ethical considerations raised by Cooper [28] who highlights the risk of overreliance as a significant ethical challenge alongside data privacy and algorithmic bias. Borba and Balbino Junior [4] further emphasizes the issue of algorithmic bias, stating that AI trained on biased data can perpetuate inequalities. This underscores the need for educators to critically evaluate AI outputs, a point echoed by Hien [29] who advocate for students to develop critical thinking skills (information verification, source comparison, etc.) to navigate AI-generated information. Addressing these challenges requires a strong focus on teacher education, as noted by Cooper [28]. Educators must not only possess the technological competencies to implement AI effectively but also the ethical awareness to mitigate potential risks. This includes understanding how to critically evaluate AI's impact on student learning and classroom dynamics.

Certainly, the emerging trends highlight the increasing role of AI in competency-based education, where adaptive learning systems help students develop essential 21st-century skills such as critical thinking, problem-solving, and digital literacy. Future research should explore how AI can be more effectively integrated into teacher training programs, specifically to teacher education students, to bridge the gap between technological advancements and pedagogical practices. Research findings indicate that while educators recognize the potential benefits of AI, concerns about usability, training opportunities, and institutional support hinder adoption. Addressing these barriers requires targeted interventions, such as pre-service development programs and improved access to AI tools for teaching and learning process.

3. Methodology

The data for this study were collected using the explanatory sequential mixed-methods design. The design involves collecting and analyzing the quantitative data first, followed by qualitative data to explain and expand the quantitative results. This way, the researcher enabled to gather and provide a better understanding of research problems and complex phenomena because it is viewed that quantitative or

qualitative research tools alone are no longer enough to address the phenomenon [30]. On the first phase, the quantitative part, the researcher measured the AI literacy, preparedness,

motives of the pre-service teachers by using an adopted instruments from the studies of Carolus, et al. [31] used to measure the AI literacy, Viberg, et al. [32] AI preparedness, and Yurt and Kasarci [33] instrument to measure motives to use AI.

The AI literacy tool developed by Carolus, et al. [31] had a Cronbach's alpha of 0.90, which shows it is very reliable. In a similar way, the digital preparedness scale by Viberg, et al. [32] had strong internal consistency. Its reliability coefficients for subscales ranged from 0.64 to 0.87. The specific Cronbach's alpha values were abilities to use digital learning technology ($\alpha = 0.87$), social influence and support ($\alpha = 0.69$), intention of use ($\alpha = 0.84$), usefulness and efficiency ($\alpha = 0.86$), limitation awareness ($\alpha = 0.73$), pedagogical potential ($\alpha = 0.64$), and assistance awareness ($\alpha = 0.75$). The overall reliability for the full scale was also high ($\alpha = 0.90$). Meanwhile, the AI use motives scale by Yurt and Kasarci [33] showed strong internal consistency, with subscale alphas ranging from 0.865 to 0.935. These

values confirm the reliability and appropriateness of the tools used to measure AI-related topics in pre-service teacher education.

Whereas, on the second phase, the qualitative part, the research explored the pre-service teachers' in-depth insights into the experiences, perceptions, and concerns in using AI through an interview and focus group discussions. This way, the researcher could interpret why certain quantitative findings emerged, adding depth to the analysis. This sequential approach enabled the research to ensure that that the numerical data from surveys is supplemented with rich qualitative narratives that could further provide deeper insights surrounding Artificial Intelligence integration readiness of pre-service teachers in education.

The sample of pre-service elementary education teachers who served as respondents and participants of this study were the 46 of 84 Bachelor of Elementary Education pre-service teachers officially enrolled in second semester of academic year 2024-2025 on a state university in the Philippines. Pre-service teachers refer to students enrolled in Bachelor Elementary and Secondary Education or other-related teacher education program [34]. Furthermore, the students who participated in the survey were selected through stratified random sampling. Stratified random sampling is a probability sampling method that often used in surveys when a researcher wanted to increase the efficiency of a sample design with respect to survey costs and estimator precision. This is through dividing the population in distinct groups or strata where within each stratum the elements are like each other with respect to select characteristics of importance to the survey [35]. Stratification was done by year level to capture potential variation of responses from varying year levels and to ensure that there is an equal representation of BEED students. Whereas the purposive sampling was used to select participants for qualitative interviews. Purposive sampling is a type of non-probability sampling whose objective is to intentionally select participants based on their characteristics, knowledge, experiences, or some other criteria [36]. Moreover, the semi-structured interviews were held by the researcher with selected participants to validate findings and discuss their AI intention motives. The qualification that the researcher set was based on their AI exposure and experiences.

Ethical collection of data was observed and considered by the researcher. Thus, participating in the research was voluntary in which they, the respondents, are free to choose to participate without any pressure or coercion and can withdraw from, or leave, the study at any point without feeling an obligation to continue. Adhere to this code of conduct when collecting data from them enables the research to protect the rights of the participants, enhance research validity, and maintain scientific and academic integrity of the study. Furthermore, the data were obtained through an informed consent from participants who volunteered. Moreover, the researcher ensured that their anonymity will be secured to safeguard the well-being, privacy, and rights.

After which, the researcher analyzed the quantitative data using descriptive statistics such as mean, and standard deviation, and inferential statistics or through Regression analysis using SPSS. For qualitative data, the thematic analysis using [37] framework to identify emerging themes related to validate findings and discuss AI integration strategies in teacher education.

4. Results and Discussion

This section presents what was found out by this study regarding the elementary pre-service teachers' literacy level, preparedness, and motives to use AI for teaching-learning process in the future. This section also presents what does these descriptive results mean and their implications for future research.

Table 1.
AI literacy level of pre-service elementary teachers.

	AI Literacy	**M**	**S.D.**
	Apply AI Ng, et al. [38]	6.48	2.33
1	I can operate AI applications.	6.25	2.28
2	I can use AI applications to make my life easier.	6.70	2.20
3	I can use artificial intelligence meaningfully to achieve my goals.	6.53	2.54
4	I can interact with AI in a way that makes my tasks easier.	6.63	2.34
5	I can work together gainfully with an artificial intelligence.	6.53	2.25
6	I can communicate gainfully with artificial intelligence.	6.23	2.35
	Understand AI Ng, et al. [38]	6.96	2.12
7	I know the most important concepts of the topic "artificial intelligence".	6.28	2.17
8	I know definitions of artificial intelligence.	7.38	1.98
9	I can assess what the limitations and opportunities of using an AI are.	7.70	2.07
10	I can assess what advantages and disadvantages the use of an artificial intelligence entails.	7.95	1.89
11	I can think of new uses for AI.	5.95	2.29
12	I can imagine possible future uses of AI.	6.48	2.33
	Detect AI Wang, et al. [39]	6.45	2.13
13	I can tell if I am dealing with an application based on artificial intelligence.	6.53	2.06
14	I can distinguish devices that use AI from devices that do not.	6.03	2.07
15	I can distinguish if I interact with an AI or a "real human".	6.78	2.26
	AI Ethics Ng, et al. [38]	6.45	2.27
16	I can weigh the consequences of using AI for society.	6.63	2.17
17	I can incorporate ethical considerations when deciding whether to use data provided by an AI.	6.20	2.40
18	I can analyze AI-based applications for their ethical implications.	6.53	2.23
	Grand Mean	6.63	2.22

The first table presents the mean and standard deviation of pre-service teachers' perceptions regarding their level of artificial intelligence literacy. The result of the study shows that they perceived themselves with moderately pronounced or above average AI literacy, with a grand mean of 6.63 (SD = 2.22). The empirical result is in accordance with what Ng, et al. [38] talks about: that people who are almost literate enough have the capacity to use it to their gain. Furthermore, literacy is not about technical skill alone but also about having the ability to apply, evaluate, and ethically consider, as part of a tool, to enhance productivity and learning. In addition, the highest mean scores relate to the skill of the students to assess the advantages and disadvantages of AI (M = 7.95), understanding limitations and opportunities (M = 7.70), and knowledge of key AI concepts (M = 7.38). These findings could imply that the elementary education pre-service teachers have a moderately pronounced or above average understanding and ethical awareness about the role of artificial intelligence in education. Students could also perceive that they already have the fundamental knowledge and ideas about the concept of AI in education. This finding was further supported and affirmed by Guan, et al. [40] who found that although pre-service teachers already have basic knowledge in AI concepts, there is still a need for them to be trained on how to effectively integrate it into teaching.

However, most of the respondents admit that they were not creative enough and their understanding of the future uses of AI (e.g., "I can think of new uses for AI," M = 5.95) is limited, as evidenced in their fair rating. This implies that students may be aware of artificial intelligence but are experiencing a potential gap in imagination leading to missed opportunities for advancing their learning and productivity. Previous studies may explain this phenomenon: while students may have an idea of AI, they sometimes find it difficult to creatively apply it in a pedagogical setting [41]. This could be attributed perhaps to the fact that AI is still thought of as a tool rather than one important aspect. Moreover, their moderately pronounced perceptions in detecting AI-generated content (M = 6.45) highlight the importance of nurturing their critical evaluation skills, which will enable them to question first the validity and origin of AI-generated information before believing and accepting it as legitimate information [29]. Ethically, pre-service teachers showed commendable awareness, especially in

weighing societal consequences and recognizing ethical implications (M = 6.45). This supports the claims of Yulianti, et al. [42] and Pierrès, et al. [43] that while students are open to AI, concerns over misuse, such as plagiarism or bias, necessitate integrating ethics as a core part of AI education.

Table 2.
Preparedness of Pre-service elementary education students.

Ai Preparedness	Mean	Sd
Abilities to use	3.86	0.78
1. My use of digital technology (AI) does not require much effort.	3.45	0.81
2. It is easy for me to learn how to use digital technology (AI).	3.98	0.73
3. It would be easy for me to become adept at using digital technology (AI).	3.58	0.81
4. I find digital technology (AI) easy to use for my purposes.	4.05	0.78
5. I have sufficient knowledge to be able to use digital technology (AI).	3.78	0.7
6. I can use these digital tools (AI) in my teaching.	4.08	0.83
7. I have sufficient skills to teach my pupils to use digital technology (AI) as a tool for knowledge search, communication, creativity and learning.	3.95	0.75
8. I feel comfortable using digital technology (AI) in education.	4.03	0.86
Social influence & support	3.86	0.77
9. Colleagues affecting my work think I should use digital technology (AI).	3.6	0.87
10. The conduit (e.g., school authorities) has, generally, supported the use of digital technology (AI).	3.95	0.75
11. The organization (school) has supported the use of digital technology (AI).	4.03	0.7
Intention of use	3.98	0.7
12. I intend to use digital technology (AI) in the coming year.	3.9	0.71
13. I expect that I will use digital technology (AI) in the coming year.	4.03	0.73
14. I plan to use digital technology (AI) in the coming year.	4	0.72
15. I believe that the available supply of digital technology (AI) supports my teaching.	4	0.64
Usefulness & efficiency	3.93	0.72
16. I have found digital technology (AI) that is useful in my work.	4.03	0.8
17. Digital technology (AI) means that I can do my work faster.	4	0.75
18. Digital technology (AI) increases my productivity.	4	0.72
19. I believe that digital technology (AI) may enable a new and more diversified production of knowledge content.	3.85	0.74
20. I believe that digital technology can increase flexibility to choose between these representations.	4	0.64
21. The digital tools (AI) in teaching help students achieve their learning goals.	3.88	0.65
22. The digital tools (AI) facilitate your way to assess the pupils' learning.	3.83	0.68
23. I think the digital tools (AI) that I have found, or been introduced to, support my pedagogical ideas.	3.83	0.75
Pedagogical potential	3.94	0.68
24. I understand the potential of digital technology (AI) and how this can be used differently depending on the purpose and course content.	3.9	0.67
25. I'm actively looking for digital technology (AI) that I can use to facilitate student learning.	3.88	0.69
26. I am aware of the possibilities and limitations of digital technology (AI) in my teaching and how it may affect the pedagogical design in my topic.	4.05	0.68
Assistance awareness	3.83	0.69
27. I have access to the necessary resources to be able to use digital technology (AI).	3.73	0.85
28. I know where I can get help if I encounter a problem with digital technology (AI).	3.8	0.72
29. If I run into problems with digital technology (AI), I get help within a reasonable time.	3.73	0.72
30. I can find useful digital tools (AI) that can be easily integrated into my teaching.	3.98	0.53
31. I can influence which digital tools I use in my teaching.	3.88	0.69
Limitation awareness	3.91	0.76
32. I believe that there are limitations to what the available digital technology can be used to teach in certain areas of my subjects.	4.05	0.78
33. I believe that some choices of knowledge content can limit the type of digital technology I can use.	3.95	0.64

34. I believe that digital technology can limit representations of knowledge content.	3.73	0.85
Grand Mean	3.90	0.74

Table 2 presents the mean and standard deviation results regarding the AI preparedness of pre-service elementary education students at a state university. The results show that they are moderately ready to use artificial intelligence in classroom teaching when asked about their Ability to use (M= 3.86, SD= 0.78), Social influence & support (M= 3.86, SD= 0.77), Intention of use (M= 3.98, SD= 0.7), Usefulness & efficiency (M= 3.93, SD= 0.72), Pedagogical potential (M= 3.94, SD= 0.68), Assistance awareness (M= 3.83, SD= 0.69), Limitation awareness (M= 3.91, SD= 0.76), and having a Grand Mean of 3.90 (SD= 0.74). The findings suggest that pre-service teachers are somewhat prepared and are open to use artificial intelligence in classroom practices.

Respondents confidently expressed moderate agreements to almost all statements asked of them regarding their ability to use AI, although some items indicated hesitation. For instance, perceptions of effort required to use AI received a lower mean score (M = 3.45), showing that there are many students who are unclear and uncertain about their preparation to use AI. It further suggests that there were many students who acknowledged the potential use of artificial intelligence in education. Yet, there are still gaps in their ability to apply these tools confidently and effectively in pedagogical contexts. These findings agree with research conducted before recommending Teacher Education Institutions (TEIs) to conduct training to strengthen the pre-service teachers' technical proficiency [40, 44]. Yet, scholars have different perspectives regarding the importance of having the competence of using artificial intelligence among pre-service teachers with the agility required in AI-integrated classrooms [45, 46]. This means that the preservice teachers are not so confident or are having average AI literacy. Considering its popularity these days, it is obvious that they have basic knowledge in it and are already recognizing its potential in teaching and learning. However, there is still a need for them to become competent, particularly on how to effectively integrate it into their teaching practices. Room for growth is then evident among them to become better prepared and responsible AI pre-service users and advocates.

In terms of social influence and support, the results show differences regarding the individual perceptions of the pre-service teachers about the support systems of the institution, their peers, and teachers regarding AI use. As reflected in their collective responses, they perceived that they are receiving moderate support from their peers, mentors, and institutions. Though there is a little affirmation from previous studies that social support strongly influences students' negative or positive perceptions about AI, there are several studies proving that these external factors mentioned above somewhat dictate them to use or not to use it for their academic studies. Pieces of evidence reveal further emphasis that the institutional encouragement and support from classmates and peers significantly shape their confidence in adopting emerging technologies [39, 47, 48]. The absence of strong direction or discouragement may leave students ambivalent, highlighting a critical need for institutional clarity and structured AI integration strategies. Overall, the perception of preservice teachers of moderate social influence indicates that although there is some encouragement from peers, mentors, or institutions to explore AI, this support is not yet robust or consistent. This means that the institution has no strong and consistent instruction and no encouragement, yet no discouragement either, to use it or not to use it and to explore it. Because of that, they don't have a clear sense of direction on whether AI use is supported or discouraged for them. Furthermore, the perceptions of the pre-service teachers reflect the institutional backing in adopting AI tools in higher education institutions.

Respondents also show a moderate level of intention among the respondents implies that there is a sense of both openness and hesitation among pre-service elementary teachers to use AI in their teaching practice. They are somewhat willing to use it, but the intention to use it in teaching or learning is not yet strong. These mixed perceptions, uncertainty about its value, lack of confidence, or concerns about ethical and pedagogical implications are perhaps due to their limited exposure, skills, confidence, clarity,

and support to move from intention to consistent and meaningful use. It can be implied that they are not resistant but also not fully embracing AI use. Addressing these barriers through reflective discussions, modeling effective use cases, and clarifying AI's role in teaching and learning will help solidify pre-service teachers' motivation and commitment.

Pre-service elementary education teachers also perceived AI as moderately useful and efficient to use in their teaching practice. This perception implies that they are already prepared to use AI due to their awareness of promoting personalized learning among learners and that it could be a tool to help them design their instruction. There were studies, such as that of Zhang and Zhang [49] who already made assertions about the importance of teachers ability to use artificial intelligence in class. They claimed that teachers who can use AI effectively become more efficient, tailor their lessons, and manage their classrooms better. Furthermore, these researchers believe that AI can help pre-service and in-service teachers craft their lesson plans and draft assessments. This demonstrates a growing understanding of its role in teaching. In other words, how pre-service teachers view AI, their confidence, and their training experiences partly influence how prepared they feel to use it effectively. Additionally, past studies on similar topics agree that when pre-service teachers see AI as useful for tasks like lesson planning, developing content, and managing classrooms, they are more likely to incorporate it into their teaching [50-52]. However, many still approach AI with caution. They often see it as a mechanical tool rather than a partner in teaching. This cautious perspective shows that there is still a need for targeted teacher training and ethical guidance [53].

In addition, participants reported a relatively strong consensus in their confidence to learn the AI skills (M = 3.73) which indicates the participants believe they could learn competencies related to AI. However, their comparative self-reported confidence—for example, self-reported better than peers (M = 3.25) and greater potential than others (M = 3.20)—was more cautious. Moderate agreement on the perceptions among respondents on the pedagogical potential of AI means that they are already seeing the benefits of using AI to education they still balance its use to mitigate its risks to students. This further means that they are aware that over-reliance on AI for tasks, including teaching tasks, could lead to a decline in the essential pedagogical skills they have learned from college.

Also, they, the preservice teachers, perceived themselves as not that aware of how artificial intelligence (AI) can improve teaching. They recognized gaps in their understanding of AI tools like intelligent tutoring systems, automated feedback systems, and data-driven lesson planning. This indicates a need for better exposure to practical uses of AI in teacher education programs.

Despite this, respondents demonstrated a balanced awareness of AI's limitations (M = 3.91), reflecting thoughtful consideration of its constraints, including applicability in certain content areas and representational formats. As shown in Table 3, students expressed moderate affirmation of their intention to use AI (M = 3.48, SD = 0.72), indicating curiosity, optimism, and a generally positive disposition toward AI integration. However, the data show that the differences in terms of confidence level, extent of engagement, and the perceived benefits in using AI vary. Perhaps, their views and attitudes toward using AI were shaped by their personal experiences and differences in digital literacy. The findings of this study connect to the idea that to develop more positive attitudes and greater self-efficacy in pre-service teachers, they must first understand the AI's capabilities, such as improving feedback, lesson planning, and student engagement; they tend to show more positive attitudes and greater self-efficacy [54]. Greater awareness also reduces anxiety and uncertainty. This encourages the use of AI tools in the classroom [45]. On the other hand, low awareness often leads to mixed feelings and a practical view of AI as just a technical addition, not a transformative teaching partner [40, 55]. These findings emphasize the need to include AI-specific instructional and ethical training in teacher education programs.

Moreover, the respondents felt positively about the pedagogical use of AI (M = 3.94), and they were moderately aware of AI for assistance (M = 3.83). They recognized AI can influence the design of the course, help with the instruction, and help students learn. The findings matched those of Harakchiyska and Vassilev [56] and Lee, et al. [57]. Both studies noted that AI helps pre-service teachers improve

their ability to ask valid questions and refine their teaching strategies. The moderate agreement on awareness of limitations reveals an important opportunity. Pre-service teachers are beginning to see that AI has limitations, such as bias, data privacy concerns, and excessive reliance. However, they might not be fully exploring the ethical and critical views necessary for responsible use. It's important to highlight digital ethics, AI bias, and responsible innovation in teacher education programs to encourage critical digital citizenship.

This group of pre-service elementary education students from a state university saw themselves as somewhat responsible AI users. They understand the potential risks of relying too much on AI, based on both their shared and individual responses. This aligns with Zhou [41] who noted that the minimal time and effort needed to start using AI tools, like AI art tools, can discourage interest. In addition, Guan, et al. [40] noted that many pre-service teachers still regard AI as a functional tool, rather than interactive or a transformative educational partner.

Moderate agreement among them implies that they are pre-service that they already have the basic operational skills and have some familiarity with AI applications, showing confidence and competence in using these tools in diverse or complex educational scenarios, but they remain limited. This further means a need for more hands-on exposure, guided practice, and real-world integration in teacher education programs. Strengthening technical proficiency is foundational to increasing their actual readiness to teach with AI tools.

Table 3.
Motives to use AI of pre-service teachers.

Use Motives	M	S.D.
Expectancy	**3.49**	**0.87**
1. I can learn the skills that enable effective use of artificial intelligence applications.	3.73	0.85
2. My general knowledge about artificial intelligence is more than sufficient compared to many.	3.73	0.72
3. I am better than most of my peers in effectively using artificial intelligence applications.	3.25	0.98
4. My potential to effectively use artificial intelligence applications surpasses many people in my surroundings.	3.2	0.88
Task value		
Attainment	3.48	0.82
5. The ability to effectively use artificial intelligence is important to me.	3.3	0.76
6. Learning and implementing innovations in artificial intelligence applications are a priority for me.	3.63	0.77
7. It is important for me to stay updated on developments related to artificial intelligence.	3.5	0.85
8. I attach great importance to strengthening my skills in using artificial intelligence applications.	3.5	0.88
Utility value	3.58	0.85
9. Artificial intelligence applications will assist me in becoming a proficient professional.	3.55	0.71
10. Artificial intelligence enhances my overall efficiency, making my life more effective.	3.65	0.8
11. In daily life, artificial intelligence helps me streamline my tasks.	3.63	0.87
12. Artificial Intelligence benefits me in various subjects and courses.	3.48	1.01
Intrinsic/interest value	3.54	0.85
13. I take pleasure in using artificial intelligence applications.	3.68	0.86
14. I enjoy experiences related to artificial intelligence.	3.5	0.91
15. Following developments in artificial intelligence is an interesting activity for me.	3.53	0.85
16. Developing my skills in using artificial intelligence is a delightful learning process for me.	3.45	0.78
Cost	3.51	0.76
17. Investing time and effort to learn artificial intelligence applications is worthwhile for me.	3.68	0.69
18. Learning artificial intelligence applications is an easy task for me.	3.53	0.82
19. I am inclined to sacrifice time from other activities to learn artificial intelligence applications.	3.5	0.75
20. I am not hesitant to invest a considerable amount of time and effort to enhance my skills related to artificial intelligence.	3.33	0.76
Grand Mean	3.48	0.72

Table 3 presents the motivation of pre-service elementary teacher education students to use artificial intelligence in their teaching practice. The mean and standard deviation result shows that the respondents have moderate affirmation towards their expectancy (M= 3.49, SD= 0.87) and task value as measured through its utility value (M= 3.58, SD= 0.85), intrinsic/interest value (M= 3.54, SD= 0.85), and cost (M= 3.51, SD= 0.76), while they felt uncertain about its attainment (M= 3.48, SD= 0.82). Overall, the pre-service teachers are uncertain (M = 3.48, SD = 0.72) about using artificial intelligence in their teaching practices.

The results indicate that the preservice teachers enjoy and see AI's value and are somewhat motivated to use and integrate it into their teaching practice. A moderate expectancy among respondents means that they are slightly doubting their capability to use AI effectively. This doubt among them also means that they have limited ability to acquire the necessary skills, limited knowledge, and fewer capabilities to use artificial intelligence (AI) applications. One of the possible reasons for these perceptions and apprehensions among the respondents is the lack of complete information and guidelines about it. Thus, these perceptions may affect their value orientation, personal commitment, personal views, competence, proactive attitude in keeping up with innovations, and their strong desire to enhance and build their skills in AI. Together, these responses coming from the respondents represent a mediocre self-perception towards their intention to use artificial intelligence in their teaching practice.

In addition, a moderate motivation to use AI, in terms of its utility value, reflects a solid belief among respondents that AI has practical benefits for them. They perceived that using AI contributes significantly to their educational growth and competence, suggesting its relevance to scholastic development. Also, they perceive that using AI, their efficiency and task management could also improve, showing its practical benefits in everyday life, and it even extends to their academic performance.

Regarding intrinsic/interest value, moderate intrinsic motivation indicates some enjoyment or curiosity of the pre-service elementary education students in using AI for teaching practice. This further implies that the respondents have a fair level of personal enjoyment and satisfaction while striving to become interested in staying updated with AI advancements.

Subsequently, acknowledging a moderate sense of cost means pre-service teachers are somewhat worried about effort or potential drawbacks in learning artificial intelligence (AI). Since artificial intelligence is new and is growing exponentially, it requires them to spend more time and effort on AI learning. Perhaps, these perceptions mean that they already acknowledge that acquiring these skills requires strong commitment and motivation and, most of all, trade-offs, including possible burdens and rerouting of priorities over other activities, even at a personal cost.

Table 4.
Relationship on pre-service teachers' AI literacy, preparedness, and motives to use AI.

Predictor	B	SE B	Β	T	P
(Constant)	0.723	0.506	—	1.43	0.162
Preparedness	0.516	0.186	0.466	2.78	0.009*
AI Literacy	0.115	0.060	0.322	1.92	0.063

*Note: *p < .05.

Table 4 presents the relationship between pre-service teachers' AI literacy, preparedness, and motives to use. Using mean and standard deviation as descriptive statistical tools, the data shows moderate to high averages for the three variables: use motives (M = 3.50, SD = 0.61), preparedness (M = 3.90, SD = 0.55), and AI literacy (M = 6.62, SD = 1.72). The results of the standard multiple regression analysis revealed that use motives were strongly and significantly associated with both preparedness (r = .708, p < .001) and AI literacy (r = .672, p < .001). In addition, preparedness and AI literacy were highly correlated (r = .752, p < .001), which offers critical insight into the inseparable importance of conceptual knowledge versus practical readiness in shaping AI adoption among future

educators. The regression model further reveals statistically significant ($F_{(2, 37)} = 22.29$, $p < .001$) results that explain approximately 54.6% of the variance in use motives ($R^2 = .546$). Among the predictors, preparedness emerged as a significant predictor ($\beta = .466$, $p = .009$), while AI literacy approached significance ($\beta = .322$, $p = .063$) but did not reach the conventional threshold. Thus, pre-service teachers' perceptions of how prepared they are could be a significant predictor of use motives ($\beta = .466$, $p = .009$), suggesting that pre-service teachers who feel more prepared are highly motivated to use AI in their teaching practice. On the other hand, AI literacy was approached but did not reach statistical significance ($\beta = .322$, $p = .063$), indicating a possible but weaker effect.

It means that AI preparedness and literacy of pre-service teachers are good predictors of why they intend to use AI in their field of practice. Among them, preparedness is a strong and significant predictor, while AI literacy shows some influence but is not quite strong enough to be considered statistically significant based on common standards. Moreover, preparedness is a strong predictor of pre-service teachers' motivation to use AI, over and above their literacy level. While AI literacy was positively correlated with use motives, its unique contribution was only a small portion when preparedness was also included in the model. This may indicate that when students feel confident and supported by the teacher education institution, their intentions to use AI are higher than merely having conceptual knowledge or familiarity with AI.

The researcher performed a thematic analysis to explore the experiences and concerns of eight pre-service teachers enrolled in a teacher education program at a state university. The focus was on their views related to artificial intelligence (AI) literacy, preparedness, and integration in educational contexts. Thematic coding yielded five key themes: (1) foundational awareness but conceptual gaps, (2) enthusiasm mixed with uncertainty, (3) ethical apprehensions and responsible use, (4) lack of institutional support and structured training, and (5) desire for integration into practicum and curriculum.

Theme 1: Foundational Awareness but Conceptual Gaps

Pre-service teachers generally demonstrated a basic understanding of AI concepts and applications. However, they reported limited familiarity with how AI can be effectively implemented in teaching and learning processes.

"I know how to use AI to summarize texts or generate images, but I do not know how to effectively use codes to fit my examples for demonstration class" (Participant 4).

"It has been part or inserted in some of our classes, but it's in a form of reminder or tips—not in ways we can apply as teachers" (Participant 7).

Theme 2: Enthusiasm Mixed with Uncertainty

While most participants expressed excitement about AI's potential to support instruction, they also conveyed feelings of uncertainty and inadequacy due to limited hands-on experience and exposure.

"It excites me that AI can help make teaching easier and more interactive. But at the same time, I'm not sure if I'm ready to use it properly" (Participant 2).

"I sometimes feel left behind because most of my classmates are already good at technology, so I rather chose to do my task traditionally without depending on AI" (Participant 8).

Theme 3: Ethical Apprehensions and Responsible Use

Ethical concerns were consistently shared by pre-service teachers, particularly in relation to academic integrity, data privacy, and teacher dependence on AI tools.

"AI can make students lazy if we don't guide them properly. I'm also worried about how it collects and stores data" (Participant 3).

"There's this fear that teachers will become less creative or too dependent on AI tools" (Participant 6).

Theme 4: Lack of Institutional Support and Structured Training

Participants also shared that there is still limited guidance or formal training for them to develop AI-related teaching competencies within their teacher education program.

"How I wish we are guided to use AI through a formal seminar or structured sessions—not just encouragement or reminder but actual use where we try AI tools in lesson planning" (Participant 1).

"There's no consistent policy from our instructors on whether or how we should use AI" (Participant 5).

Theme 5: Desire for Integration into Practicum and Curriculum

There was a strong desire among pre-service teachers to have AI integration formally embedded in their practicum experiences and academic coursework to bridge the gap between theory and practice.

"It would be great if our practicum required using AI in at least one lesson. That way we can try and reflect on it" (Participant 6).

"We should be taught how to use AI from first year—not just during our final year projects" (Participant 7).

5. Conclusion

The researcher concluded that the pre-service elementary teachers who answered the survey from a Philippine state university demonstrated a moderately high level of AI literacy, according to their awareness of AI's basic concepts, ethical implications, and practical benefits in education. This study has identified that most of the respondents feel that they are somewhat prepared to use AI in teaching, as they have already recognized its usefulness, pedagogical potential, and efficiency to streamline and digitalize their classroom-related tasks and activities. Even though there were students who expressed their moderate motivation to integrate AI into teaching practice, many of them are still in doubt regarding their ability to creatively apply AI and fully grasp its future potential in the classroom because their curiosity, perceived value, and enjoyment of using it are affected by the unclear policies and guidelines of the institution. The regression analysis confirms that preparedness significantly predicts their motivation to use AI, suggesting that confidence, support, and training have a stronger influence on their intention than conceptual knowledge alone. Notwithstanding these concerns, it can be concluded further that despite the moderate perception regarding social influence and institutional support for students' intention to use AI, these are not yet strong enough to ensure equitable preparedness. Their limited creativity, collaboration with peers, and how much time and resources they need to invest in learning the tool, such as hands-on training, curricular integration, and ethical grounding, must be considered as well. Ultimately, for AI to be meaningfully adopted in education, teacher education programs must move beyond awareness and equip future educators with the practical, ethical, and pedagogical competencies necessary for confident and effective AI integration.

6. Recommendations

1. Integrate Practical AI Training into Teacher Education Curricula
   Teacher education programs should embed hands-on training with AI tools—not just theoretical discussions. Simulated teaching activities, lesson planning with AI applications, and classroom-based case scenarios can help pre-service teachers move from awareness to confident use.

2. Strengthen AI Preparedness Through Institutional Support
   Schools and colleges of education must ensure access to up-to-date AI technologies, provide stable infrastructure, and assign mentors or coordinators to guide AI integration. Institutional encouragement can significantly improve teachers' confidence and motivation to use AI.

3. Design Scaffolded Learning Pathways for AI Competence
   Develop structured learning paths that start with basic AI literacy and gradually build toward applied use, ethical decision-making, and creative classroom integration. This approach accommodates diverse backgrounds and allows learners to progress at their own pace.

4. Include AI Integration in Teaching Practicum Requirements
   Require pre-service teachers to integrate AI in at least one practicum lesson or unit plan. This will promote experiential learning and provide authentic opportunities for them to test and reflect on AI-supported teaching strategies.

5. Foster a Culture of Innovation and Collaboration Around AI
   Encourage collaborative learning environments where pre-service teachers share AI-related practices, challenges, and innovations. Peer influence and shared discovery can help reduce hesitation and normalize AI use as part of modern teaching.
6. Offer Targeted Support for Underconfident or Underrepresented Groups
   Given the variation in confidence and self-perceived ability, provide tailored workshops or coaching—particularly for students who are less confident in their digital skills or feel left behind in AI conversations.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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