

Gender Differences in Artificial Intelligence Awareness, Attitude, and Usage among Pre-Service Teachers

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Abstract

AI is changing education and pre-service teachers need to gain sufficient awareness, positive attitudes, and skills of effective use. The current investigation was intended to test the gender disparity in the area of awareness, attitude, application, perceived challenges, and pre-service teachers' overall use of artificial intelligence. A self-developed, standardized questionnaire was utilized to collect data from a sample of 114 pre-service teachers using a descriptive survey research design. The data was analyzed using descriptive statistics and the independent samples t-test.

a substantial gender disparity in terms of awareness and perceived challenges with male pre-service teachers being more aware and reporting more challenges in using AI tools than female pre-service teachers by the results. Nonetheless, there were no noteworthy differences in attitude, application, and general AI use based on gender. It means that despite the fact that gender affects certain areas of artificial intelligence, there is no overall difference in the amount of engagement with AI in male and female pre-service teachers.

The paper points out the necessity of balanced and inclusive AI training within teacher education programs to achieve equitable acquisition of AI competencies. It highlights the need to work on domain-based gaps to encourage the successful incorporation of artificial intelligence in education.

Keywords: Artificial Intelligence(AI), Pre-Service Teachers, Gender Differences, AI Awareness, AI Usage

Introduction

AI can be described as the method of employing technologies, particularly computer systems, to mimic human intellect, and includes the ability to learn, think, solve problems, perceive, and understand language (Zhang et al., 2023). In education, AI is also known as AI in Education and involves using technology, such as intelligent tutoring systems, adaptive learning platforms, automated assessment tools, and predictive analytics, The role of AI in the pre-service teacher is beyond measure because they are the future employees who will be expected to train the students to fit in the AI-saturated environment. To successfully integrate AI into the classroom, PSTs need to become AI literate, such as through technical skills, ethical knowledge, and pedagogical integration that promote critical thinking and equitable access to AI, which in turn leads to improved teaching performance and student achievement (Dayagbil et al., 2025; Rui et al., 2025).

Regardless of these developments, gender disparities should be investigated, and research shows that there are mixed patterns of AI adoption and use in the field of education. The disparity between males and females may be explained by the confidence and technical inclination towards AI, and females may feel more anxious due to stereotypes that AI is a male field, scarce exposure to STEM, and fear of risk-taking, especially regarding PSTs (where female representation is high). (Sarıkaya, 2025; Zhang et al., 2023) There is an interesting gap in gender-related studies of AI awareness, attitudes, and usage among PSTs. Although general technology acceptance models such as TAM have been utilized, there is a paucity of empirical research on AI, much of which has concentrated on in-service teachers or more general populations without disaggregating gender effects (Jatileni et al., 2023; Yetişensoy, 2023; Zhang et al., 2023) South

The current study intends to investigate the gap in gender awareness, attitudes and usage of AI among pre-service teachers, fills the gap by empirically researching the identified gap and informs the integration of AI in teacher education programs in an inclusive way.

Literature Review

- 1. Artificial Intelligence in Education:** Algorithms like intelligent tutoring systems, adaptive platforms, and ChatGPT can simulate Machines with human intelligence are able to think, learn, and solve problems. (Zhang et al., 2023) AI tools can be used in education to optimize teaching-learning by means of personalized instruction and information-based insights (Dayagbil et al., 2025; Han, 2025).
- 2. Awareness and Attitude toward Artificial Intelligence:** There is moderate awareness of AI and ambivalence among pre-service teachers, with many being uncertain due to lack of exposure (Dayagbil et al., 2025; Gatlin, 2023) Attitudes toward integration are also mixed, with benefits such as efficiency and risks being the opposite sides of the coin (Rui et al., 2025). Factors include
- 3. Usage of Artificial Intelligence in Teaching and Learning:** The use of AI in academic tasks such as research and lesson planning is sporadic among PSTs, although males report more frequent use (Butakor, 2023; Nyaaba et al., 2023). Applications include self-study and assessment, but there is no clear move towards integrating AI into teacher education (Isave, 2024; Nyaaba et al., 2024)
- 4. Perceived Challenges in Using Artificial Intelligence:** These barriers include the lack of technical infrastructure, skills, and ethical concerns such as prejudice and privacy (Baimukhambetova et al., 2025; Rui et al., 2025). In fact, based on the latent mean analysis, there is a considerable average difference in AI anxiety, with female pre-service teachers more commonly scoring higher (Butakor, 2023). This underscores the need to discuss gender-related fears and create specific pedagogical interventions to be incorporated in teacher education courses to guarantee equal AI implementation (Gamlem et al., 2026; Hsu, 2023).
- 5. Gender Disparities in the use of Artificial Intelligence:** Males are more confident and use AI more, attributed to exposure to STEM, and female experience anxiety due to stereotypes and risk avoidance (Nyaaba et al., 2023; Yetişensoy, 2023). Some studies show that female participants are more open to AI as a factor to improve social good (Jatileni et al.,)

OBJECTIVES OF THE STUDY

1. To study the level of awareness of artificial intelligence among male and female pre-service teachers.

2. To compare the attitude toward artificial intelligence between male and female pre-service teachers.
3. To examine the difference in usage of AI tools among male and female pre-service teachers.
4. To analyze gender differences in perceived challenges in using AI.
5. To find out whether there is a significant difference in overall AI usage based on gender.

HYPOTHESES

H01: There is no significant difference in awareness of artificial intelligence between male and female pre-service teachers.

H02: There is no significant difference in attitude toward artificial intelligence between male and female pre-service teachers.

H03: There is no significant difference in usage of AI tools between male and female pre-service teachers.

H04: There is no significant difference in perceived challenges in using AI between male and female pre-service teachers.

H05: There is no significant difference in overall AI usage between male and female pre-service teachers.

METHODOLOGY

Research Design

The current research has used a descriptive survey research study design to examine the gender variations in awareness, attitude, application, and the perceived challenges and the general use of artificial intelligence among pre-service teachers. This design was the right choice because it will provide the opportunity to collect quantitative data on a comparatively large sample, which will allow examining the current conditions without influencing the variables. The survey technique offered a methodical way of making out the perceptions and experiences of the participants concerning artificial intelligence in education.

Population and Sample

The study population was made up of pre-service teachers attending institutions of teacher education. Convenience sampling method was used to identify 114 respondents. This sample comprised of 34 male and 80 female pre-service teachers who had varying academic backgrounds. The sample size chosen was deemed to be adequate to conduct significant statistical analysis and arrive at valid conclusions on the gender differences.

Data Collection Instrument

A self-constructed and standardized questionnaire, called Artificial Intelligence and Its Usages among Pre-Service Teachers, was used to collect the data. The tool was aimed at measuring various aspects of artificial intelligence in education. It was comprised of five questions (demographic: gender) awareness of AI, attitude about AI, use of AI, and perceived problems with using AI. Everything was designed on a five-points Likert scale through which Strongly Agree, Strongly Disagree, is presented; all responses are to be similar.

Validity, Reliability, and Scoring Procedure

This tool was tested on expert review to check its content relevance, clarity as well as appropriateness. The reliability was determined based on Cronbach alpha which showed good internal consistency in all domains. The answers were rated between 5 and 1 with more points signifying that an individual agreed.

The awareness, attitude, application, and challenges had mean scores per domain. The mean of the domain scores was calculated to obtain an overall AI usage score.

Data Collection and Statistical Analysis Procedure

The survey was given to the respondents with an informed consent having been obtained. Respondents were assured of confidentiality and anonymity and enough time was given to submit the survey. The analyzed data was filtered to exclude errors and incompleteness. Statistical analysis was done with the help of SPSS. Levels of AI awareness, attitude, application and challenges were determined using descriptive statistics such as mean and standard deviation. Independent Samples t-test was used to analyze the difference of genders in domains. The level of significance used to test all the hypotheses was 0.05.

Ethical Considerations

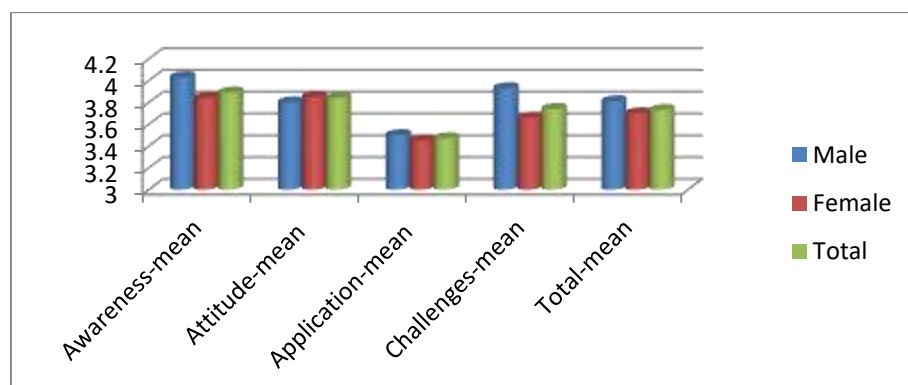
Strict adherence to ethical standards was maintained in the study. The process was voluntary and confidentiality of the respondents was ensured. Data that was gathered were contended purely to scholarly and research purposes.

Results and Analysis

Table 1

Gender-wise Descriptive Statistics of Artificial Intelligence Domains among Pre-Service Teachers

Gender	Statistic	Awareness	Attitude	Application	Challenge	Total AI Usage
Male (n = 34)	Mean	4.03	3.80	3.50	3.93	3.81
	SD			0.55	0.50	0.44
Female (n = 80)	Mean	3.84	3.85	3.45	3.66	3.70
	SD			0.53	0.55	0.30
Total (n = 114)	Mean	3.89	3.84	3.47	3.74	3.73
	SD	0.48	0.53	0.54	0.55	0.35



The descriptive statistics in Table 1 show that there are statistically significant differences between male and female pre-service teachers with AI in various domains. As to the awareness, male participants ($M = 4.03$, $SD = 0.56$) exhibited a higher level than female participants ($M = 3.84$, $SD = 0.43$), which implies that male participants are comparatively more familiar with the concepts of the field of artificial intelligence.

In terms of attitude toward artificial intelligence, female pre-service teachers ($M = 3.85$, $SD = 0.48$) had a slightly more positive attitude compared to their male counterparts ($M = 3.80$, $SD = 0.65$). Nevertheless, the difference seems to be slight, which suggests a more or less the same outlook towards AI across the two groups.

Male respondents ($M = 3.50$, $SD = 0.55$) indicated slightly more frequent use of AI tools than female respondents ($M = 3.45$, $SD = 0.53$) in the domain of application. This is a rather insignificant difference, indicating that both groups show similar percentages of AI use in education.

There was a post-factum clearer difference in the challenges domain where male pre-service teachers ($M = 3.93$, $SD = 0.50$) indicated more perceived challenges when compared with female pre-service teachers ($M = 3.66$, $SD = 0.55$). This suggests that the use of artificial intelligence in males can have more challenges or obstacles.

In general, the average AI usage score among male ($M = 3.81$, $SD = 0.44$) and female respondents ($M = 3.70$, $SD = 0.30$) was slightly lower. This indicates that male pre-service teachers demonstrate slight increase in the overall involvement with artificial intelligence though not that significant.

Table 2
Gender-wise Comparison of Artificial Intelligence Domains among Pre-Service Teachers using Independent Samples t-test

Domain	Levene's Test (Sig.)	t	df	p-value (2-tailed)	Mean Difference	95% Confidence Interval	Result
Awareness	0.253	1.996	112	0.048*	0.194	0.001 – 0.387	Significant
Attitude	0.016	-0.481	112	0.631	-0.053	-0.269 – 0.164	Not Significant
Application	0.556	0.431	112	0.667	0.048	-0.171 – 0.266	Not Significant
Challenges	0.450	2.488	112	0.014*	0.272	0.055 – 0.488	Significant
Total AI Usage	0.052	1.611	112	0.110	0.115	-0.027 – 0.257	Not Significant

*Significant at 0.05 level

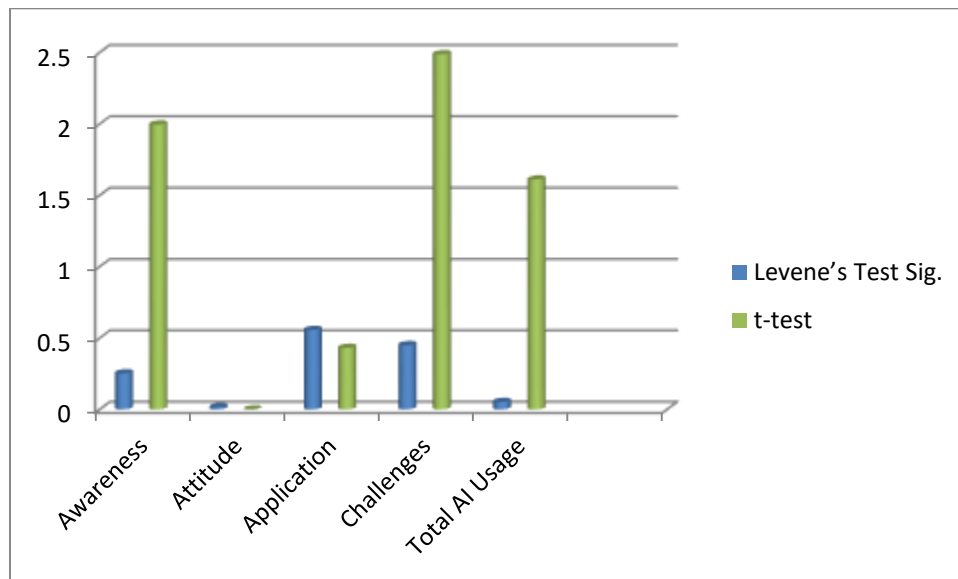
Independent Samples t-test findings in Table 2 show the level of gender disparity in different fields of artificial intelligence in pre-service teachers.

The statistically significant difference was found in the area of artificial intelligence awareness ($t(112) = 1.996$, $p < 0.05$). The positive difference in the mean (0.194) shows that, male pre-service teachers are more aware than female pre-service teachers. It is further supported by the confidence interval 0.001-0.387 that shows that the difference is reliable, indicating that gender is a significant factor in affecting the awareness of AI.

However, the attitude to artificial intelligence did not show a significant difference ($t(112) = -0.481$, $p > 0.05$). It means that the pre-service teachers, both male and female, have similar perceptions and attitudes to AI in the learning process. Likewise, the usage of artificial intelligence tools did not vary significantly in the two groups ($t(112) = 0.431$, $p > 0.05$), which means that there were similar levels of practical use.

One of the significant differences was the perceived difficulties of AI use ($t(112) = 2.488, p < 0.05$). The positive mean difference (0.272) indicates that pre-service teachers of men have more hardships than those of women. This result is consistent as confirmed by the confidence interval (0.055 0.488).

The artificial intelligence overall use was, however, not statistically significantly different by gender ($t(112) = 1.611, p > 0.05$). It means that, although the areas of awareness and difficulties differ in particular cases, the general attitude towards artificial intelligence is the same among genders.



Discussion

Interpretation of Findings

The findings reveal that there are statistically significant differences in AI awareness ($t = 1.996, p = 0.048$) and perceived challenges ($t = 2.488, p = 0.014$), where male pre-service teachers give higher means in both areas. Descriptively higher scores in application and total AI usage were also demonstrated by males, but not significant. Conversely, females exhibited a slightly higher mean attitude score, but differences in attitude ($t = -0.481, p = 0.631$), application ($t = 0.431, p = 0.667$), and total usage ($t = 1.611, p = 0.110$) were non-significant. These trends imply that even though males are more familiar and face more obstacles in AI usage, general usage and attitudes are equal between the genders, with subtle instead of blatant differences.

Comparison with Previous Studies

High male AI-awareness is also consistent with the evidence that indicates high levels of male confidence and preference towards technology among pre-service teachers due to high levels of STEM exposure and interest (Nyaaba et al., 2023; Ofosu-Ampong, 2023; Yetitingsoy, 2023; Zhang et al., 2023). On the same note, when male application is marginally higher, this is also equivalent to gender specific usage patterns in that males prefer resource-heavy AI tools (Nyaaba et al., 2024). The fact that there are no statistically significant differences in attitude, application, and total use supports other studies that indicate that there are no gender effects on AI literacy, attitudes, and acceptance in teacher education settings (Capinding and Dumayas, 2024; Han, 2025; Mukhamedkarimova and Umurkulova, 2025; Sarikaya, 2025). The female minor advantage in the attitudes is partly correlated with evidence of

the female higher intention with AI towards social good and teaching (Jatileni et al., 2023). Interestingly, superiority of male-perceived, as opposed to the anticipated female technology anxiety, dissociations (Yeti eat ad vi du, 2023) may be related to context-specific interactions.

Explanation of Gender Differences and Possible Reasons

The gender disparity in awareness can be due to males being more aware of AI through prior exposure via personal interests, digital media, and STEM pathways, which contributed to familiarity levels being higher (Nyaaba et al., 2023; Yetişensoy, 2023; Zhang et al., 2023). Male stereotypes, such as their technological superiority, may enhance self-confidence in males and result in self-doubt and reduced participation in females (Sultana et al., 2025; Yetişensoy, 2023; Zhang et al., 2023). The virtual absence of risk-taking in females also has the potential to restrain the use of exploratory AI by making people less aware but also less challenged, as the less exposed one is, the less perceived challenges arise (Yetişensoy, 2023). Higher male contests could be due to ambitious efforts at complicated applications, which could otherwise be cautious in females (Sarıkaya, 2025). Such gaps are further enhanced by more general determinants such as digital divides and inequality of access, whereas growing AI penetration in education can help to foster equity (Mukhamedkarimova and Umurkulova, 2025; Sarıkaya, 2025).

Findings of the Study

The results of the current research were based on analysis of gender difference in their awareness, attitude, application, perceived challenge and general use of artificial intelligence among pre-service teachers.

The findings showed that the differences in awareness of artificial intelligence between the genders, which were statistically significant. The awareness among male pre-service teachers was more than that among female pre-service teachers. This means that gender is a considerable factor of familiarity and knowledge of concepts of artificial intelligence.

Likewise, a crucial gender gap was promptly noticed within the framework of perceived difficulties in utilizing artificial intelligence. Male pre-service teachers also stated that they faced a higher number of challenges using AI tools, compared to female pre-service teachers. This indicates that despite the possibility of increased awareness of males they likewise face more problems when interacting with artificial intelligence applications.

The results however showed that there was no significant gender divergence in artificial intelligence attitude. The similarities between the perceptions and dispositions of both male and female pre-service teachers toward the application of AI to the educational setting mirror an overall balanced attitude between genders.

Also, there was no notable difference between the use of artificial intelligence tools between male and female pre-service teachers. This means that the two groups make use of AI tools at more or less the same rates in academics and at work.

Moreover, the research found that no significant gender difference in terms of overall use of artificial intelligence exists. Although the specific areas of difference include awareness and challenges, overall attitudes towards artificial intelligence are the same between pre-service male and female teachers.

In general, the results indicate that gender differences in artificial intelligence are not universal but domain-specific in nature, and considerable disparities are only seen in the areas of awareness and perceived difficulties, with all other aspects being more or less similar.

Conclusion

Engagement levels of artificial intelligence in awareness, attitude, application, perceived challenges, and general usage among pre-service teachers were analyzed and contrasted between females and males in the current study. The results allow concluding that gender is a relevant factor that affects particular aspects of artificial intelligence, especially perceptions and sense of difficulty. Male pre-service teachers were more aware and showed more challenges in the AI tools use than the female pre-service teachers. These distinctions underscore the area-related influence of gender when it comes to interacting with artificial intelligence.

Nonetheless, the research also demonstrated that the general usage of artificial intelligence is the same regardless of gender. There were no major variations in attitude towards AI, usage of AI tools or overall AI usage. This implies that, both male and female pre-service teachers are equally involved with artificial intelligence in teaching situations, although they do differ in some aspects.

The results highlight the necessity of balanced and inclusive preparation of AI in the teacher training processes. There should be an attempt to increase awareness among female pre-service teachers as well as alleviating the issues that exist among male pre-service teachers. Existing gaps can be addressed through the provision of equal opportunities, practical training, and enabling conducive learning settings to facilitate successful artificial intelligence integration in education.

To sum up, although it is true that there are gender dissimilarities regarding certain aspects of AI involvement, a properly designed and balanced perspective towards AI education can make sure that all pre-service educators are sufficiently equipped to use artificial intelligence in their teaching activities in the future.

Educational Implications

The results of the current research also have significant implications on teacher education curriculum, especially when it comes to incorporating the use of artificial intelligence on the teaching and learning process. Having noted that gender disparities were noted in certain areas like awareness and perceived challenges, then it is vital to establish specific interventions to make sure that AI competencies are fairly developed in pre-service teachers.

To begin with, pre-service training programs ought to aim at improving the awareness of artificial intelligence to female pre-service teachers. This would be done via formal orientation programs, workshops and practical trainings that would create confidence and acquaintance to the AI concepts and tools. The awareness gap may be bridged through encouraging active participation and an environment that is supportive of learning.

Secondly, the challenges of artificial intelligence by male pre-service teachers should be raised and minimized. The practical development of skills, strategy of troubleshooting, and practising sessions have to be the focus of the training program that may assist learners in surmounting challenges related to the usage of AI. These difficulties can be made easier through the provision of unending technical assistance and mentoring.

Lastly, learning institutions should provide equal targeted students with the resources and tools of artificial intelligence regardless of gender. This involves having proper infrastructure, digital facilities and exposures to experiential learning. Being inclusive and promoting equal inclusion will contribute to developing balanced AI skills in the future teachers.

Limitations of the Study

Although the current research does contribute to the overall understanding of gender disparities in artificial intelligence knowledge, perceptions, and application among pre-service teachers, it has some limitations.

To begin with, the sample size used in the research was very small (114 pre-service teachers) and this might prevent the findings to be extrapolated to the rest of the population. More representative and strong results can have been obtained with a bigger sample.

Second, convenience sampling technique was used in the study and this can lead to sampling bias. Because not all the participants were randomly chosen but chosen because of access, the results might not be able to represent the nature of the overall group of pre-service teachers.

Thirdly, the study was limited to pre-service teachers only hence ruling out in-service teachers and other education stakeholders. Consequently, the results might not be generalized to working teachers or other educational settings.

Suggestions for Further Research

The current research presents a number of recommendations on future studies, based on the limitations and results of the current study.

Future research could take into account the use of a bigger sample size to increase the validity and credibility of the findings to the population. Providing an increase in sample will enable more in-depth analysis of various groups.

It is also suggested that researchers should do researches within various geographical areas and this would aid in comprehending regional variances as well as contextual elements that affect adoption of artificial intelligence in education.

Moreover, longitudinal research can be conducted in order to study how the awareness, attitude, and use of artificial intelligence evolve over time. These researches can give a better understanding of the trends and the long-term effects of AI integration as it develops.

Lastly, intervention-based studies are needed, which are oriented to planning and assessing training programs that will enrich AI skills in pre-service teachers. Such studies can be used to come up with valid strategies to incorporate the aspect of artificial intelligence in teacher education.

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