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ORIGINAL

Pre-Service and In-Service Teachers' Perspectives on Artificial Intelligence in Education: Insights from Physical Education and Classroom Practice in the Southern Philippines

Perspectivas de los docentes en formación y en servicio sobre la inteligencia artificial en la educación: aportes desde la Educación Física y la práctica docente en el sur de Filipinas

Levie Guevara Tejada[1]

[1]Western Mindanao State University, Zamboanga City, 7000 Philippines.

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Corresponding author: Levie Guevara Tejada

ABSTRACT

Artificial intelligence (AI) is increasingly shaping educational practice, yet teachers' attitudes remain divided, combining optimism about its benefits with apprehension about risks. Limited research has compared preservice and in-service teachers' perspectives, particularly in the context of physical education (PE), where AI applications such as sports analytics, performance monitoring, and adaptive training are emerging. This study aimed to compare the attitudes of preservice and in-service teachers toward AI in education and to examine differences when they are grouped according to gender and socioeconomic status. A descriptive-comparative quantitative design was employed with 400 participants, comprising 200 preservice PE students preparing to become future teachers and 200 in-service teachers in public schools in the southern Philippines. Data were collected via a standardized survey measuring positive and negative attitudes toward AI, and the results were analyzed via weighted means, independent samples t tests, and one-way ANOVA. The overall mean of 3,11 indicated a neutral attitude toward AI. The respondents expressed positive views of AI's potential to create economic opportunities, support well-being, and offer beneficial applications but also concerns about errors, ethical misuse, surveillance, and control. No significant gender differences were found, although moderate to large effect sizes suggested subtle variations. Socioeconomic status did not influence preservice teachers' responses, but in-service teachers from higher-income groups reported stronger negative attitudes. A significant difference was observed between groups: preservice PE students demonstrated more positive attitudes, whereas in-service teachers expressed greater reservations. These findings highlight the need to embed AI literacy in PE curricula, strengthen professional development for in-service teachers, and promote equitable access to AI resources to ensure the balanced and responsible adoption of AI in education.

Keywords: Attitude; Artificial Intelligence (AI); Preservice and in-Service Teachers; AI in Education.

RESUMEN

La inteligencia artificial (IA) está moldeando cada vez más la práctica educativa, aunque las actitudes de los docentes siguen divididas, combinando el optimismo por sus beneficios con la preocupación por sus riesgos. Son escasas las investigaciones que comparan las perspectivas de los docentes en formación y en servicio, especialmente en el ámbito de la educación física (EF), donde están surgiendo aplicaciones de la IA como la analítica deportiva, el monitoreo del rendimiento y el entrenamiento adaptativo. Este estudio tuvo como

objetivo comparar las actitudes de los docentes en formación y en servicio hacia la IA en la educación y examinar las diferencias según el género y el nivel socioeconómico. Se empleó un diseño cuantitativo descriptivo-comparativo con 400 participantes: 200 estudiantes de EF en formación y 200 docentes en servicio de escuelas públicas del sur de Filipinas. Los datos se recopilaron mediante un cuestionario estandarizado que midió actitudes positivas y negativas hacia la IA, y se analizaron a través de medias ponderadas, pruebas *t* para muestras independientes y ANOVA de un factor. El promedio general de 3,11 indicó una actitud neutral hacia la IA. Los participantes expresaron opiniones positivas sobre el potencial de la IA para generar oportunidades económicas, promover el bienestar y ofrecer aplicaciones beneficiosas, aunque también manifestaron preocupaciones por los errores, el uso ético indebido, la vigilancia y el control. No se hallaron diferencias significativas por género, aunque los tamaños de efecto de moderados a grandes sugirieron variaciones sutiles. El nivel socioeconómico no influyó en las respuestas de los docentes en formación, pero los docentes en servicio de grupos con mayores ingresos mostraron actitudes más negativas. Se observó una diferencia significativa entre los grupos: los estudiantes de EF en formación presentaron actitudes más positivas, mientras que los docentes en servicio manifestaron mayores reservas. Estos hallazgos subrayan la necesidad de incorporar la alfabetización en IA en los planes de estudio de EF, fortalecer la formación profesional de los docentes en servicio y promover un acceso equitativo a los recursos de IA para garantizar una adopción equilibrada y responsable de la inteligencia artificial en la educación.

Palabras clave: Actitud; Inteligencia Artificial (IA); Docentes en Formación y en Servicio; IA en la Educación.

INTRODUCTION

The rapid diffusion of artificial intelligence (AI) and generative AI (GAI) technologies has increasingly transformed teaching and learning practices across the globe, including in the Philippines.[1,2,3,4,5,6] In recent years, the integration of AI-powered tools such as ChatGPT, adaptive learning platforms, and automated assessment systems has become more prevalent in educational settings,[7,8,9,10,11] reshaping instructional strategies and pedagogical approaches.[12,13,14] However, while global trends highlight the promise of AI in enhancing personalized learning, improving student engagement, and reducing teachers' workloads,[15,16,17,18] its adoption in the southern part of the Philippines has remained uneven, particularly between preservice and in-service teachers.[19,20,21] This disparity was influenced by variations in technology and digital competence,[22,23,24] access to resources,[25,26] and preparedness to integrate AI tools into the classroom.[27,28]

The emergence of AI poses significant challenges to teacher readiness, as studies have revealed that in-service teachers often demonstrate varying levels of confidence and acceptance compared with their preservice counterparts.[29,30] While some research has indicated that preservice teachers exhibit greater openness and adaptability toward adopting AI-based pedagogies due to their exposure to emerging technologies during training,[31,32,33] other studies have reported that despite more teaching experience, in-service teachers present higher levels of trust and perceived usefulness of AI tools when adequately supported through professional development.[34,35,36] These mixed findings underscore the importance of comparative studies that have examined the distinctions between preservice and in-service teachers' attitudes in AI integration within the Philippine educational landscape.

Gender differences in teachers' attitudes toward AI adoption also remain inconclusive. Several studies have suggested that female teachers expressed greater anxiety and ethical concerns over AI usage than male teachers did,[12,37] whereas other findings revealed no significant differences between genders in terms of AI acceptance and perceived competence.[38] Moreover, socioeconomic status (SES) further influences teachers' access to digital tools, AI resources, and training opportunities,[39] particularly in under resourced regions in the southern Philippines where infrastructural gaps persist.[40,41,42] Despite these findings, few studies have jointly examined the combined effects of teacher status, gender, and SES on attitudes toward AI adoption in the Philippine education system.

Another critical gap concerns the role of psychological and pedagogical factors such as self-efficacy, trust, ethics, and digital competence in shaping teachers' openness to AI in education. Previous studies have shown that teachers with higher levels of AI-related self-efficacy and digital competence are generally more receptive to AI integration, whereas those with stronger ethical reservations or lower levels of trust tend to exhibit resistance.[43,44,45,46,47,48] However, these factors are often examined independently and not directly connected to standardized measures of teachers' attitudes. In contrast, Schepman and Rodway's framework emphasizes both the positive and negative dimensions of attitudes toward AI, capturing optimism about its benefits, such as usefulness and excitement, alongside concerns related to errors, danger, and control. Few studies have contextualized such attitudinal perspectives within teacher training institutions and public schools in the southern Philippines.

Given these gaps, this study aimed to compare attitudes toward AI in education between preservice and in-service teachers in the southern Philippines and to examine differences when grouped according to gender and socioeconomic status. By examining both the positive and negative dimensions of attitudes toward AI, this research seeks to provide contextual insights that can inform curriculum design, professional development, and equitable AI adoption, particularly in physical education, where technologies such as sports analytics, performance monitoring, and adaptive training systems are becoming increasingly relevant.

Literature Review

Attitudes of Preservice Teachers Toward AI in Education

Preservice teachers, as future educators, play a pivotal role in shaping the integration of artificial intelligence (AI) in educational contexts.[49,50] Across recent studies, attitudes toward AI among this group have largely been positive, reflecting openness to innovation and technology-enhanced learning. For example, Alamri et al.[51] highlighted that preservice teachers demonstrated a strong willingness to experiment with AI tools, perceiving them as supportive aids for personalized learning and instructional efficiency. Similarly, Kelly et al.[52] Luckin et al.[53] and Zawachi-Richter et al.[54] reported that teachers expressed optimism toward AI's potential in reducing routine administrative tasks, thus enabling them to focus on more creative pedagogical strategies.

However, attitudes were not uniformly positive. Guan et al.[55] observed apprehensions among preservice teachers, particularly with respect to AI's ethical implications, data privacy, and perceived threat to professional autonomy. This skepticism was echoed by [56,57] who reported that while AI applications in lesson planning were appreciated, many preservice teachers doubted their readiness to use them effectively because of limited digital literacy training. These findings indicate that despite their enthusiasm, preservice teachers require more structured preparation for AI integration.

Research also reveals notable variations in attitudes on the basis of contextual and institutional factors. For example, Dumagay et al.[39] in a study conducted in teacher education programs in the southern Philippines, reported that access to AI-based platforms strongly influenced preservice teachers' perceptions of their usefulness. Those enrolled in technologically equipped universities showed significantly higher confidence levels than their counterparts in resource-constrained institutions did.[58] This highlights the critical role of institutional support in shaping attitudes toward AI in education.

Furthermore, Ayanwale et al.[59] suggested that preservice teachers' attitudes were positively correlated with their exposure to AI during coursework and practicum training. The participants who engaged in simulation-based instruction and adaptive learning technologies presented higher acceptance rates than did those with minimal exposure. These findings resonate with Daher's[60] conclusion that incorporating AI into teacher education curricula substantially enhances both competence and confidence. These perspectives underscore the need for localized approaches in designing AI integration frameworks for teacher preparation programs.

Attitudes of In-service Teachers Toward AI in Education

Compared with their preservice counterparts, in-service teachers, who are directly engaged in classroom practice, exhibit more complex and sometimes ambivalent attitudes toward AI. According to Hopcan et al.[61], many practicing teachers view AI as a valuable tool for lesson enhancement and classroom management, particularly in streamlining grading and providing personalized feedback to students. Similarly, Gayed[62] reported that in-service educators demonstrated strong acceptance of AI-driven language-learning platforms, which they perceived as beneficial for improving students' academic performance.

Nonetheless, several studies have identified significant challenges that contribute to resistance among in-service teachers. Zhai et al.[63] revealed concerns about AI replacing human educators and undermining pedagogical creativity. This resistance was particularly pronounced among teachers with limited technological training, who perceived AI as an additional burden rather than a supportive resource. Ng et al.[64] noted that teachers often lack institutional guidance on ethical and responsible AI integration, leading to uncertainty and cautious adoption.

Institutional support and policy interventions also strongly influence attitudes. For example, Tan et al.[34] reported that schools with AI-inclusive professional development programs presented higher confidence and acceptance rates among their teachers. Conversely, educators in under resourced contexts, especially in rural areas of the southern Philippines, faced structural barriers that negatively affected their perceptions and willingness to integrate AI tools.[21]

Moreover, studies highlight how cultural and pedagogical traditions intersect with teachers' openness to AI. Ben Zion et al.[65] demonstrated that educators rooted in student-centered pedagogies were more receptive to AI applications promoting active learning, whereas those adhering to traditional, lecture-based models showed minimal enthusiasm. These insights suggest that successful AI adoption requires not only technological readiness but also pedagogical alignment.

Differences in Attitudes Based on Gender and Socioeconomic Status

Research has consistently documented differences in attitudes toward AI in education when analyzed according to gender and socioeconomic status (SES). Studies have revealed that female preservice teachers reported slightly lower confidence levels in adopting AI tools than their male counterparts did, suggesting that this gap in the literature is attributable to a lower level of self-assessed technological competence. Similarly, male teachers—both preservice and in-service—expressed greater perceptions of AI usefulness, whereas female participants expressed greater concerns about ethical implications and classroom management challenges.[66,67,68,69]

However, not all studies have reported significant gender disparities. Several studies have concluded that when equal exposure to AI tools was ensured during teacher training, gender-based differences diminished substantially, suggesting that access and experience play a more decisive role than gender perse.[1,6]

Socioeconomic status has also emerged as a crucial determinant of AI-related attitudes. Research has revealed that preservice teachers from higher SES backgrounds demonstrated greater enthusiasm and confidence in AI integration, largely because of their earlier and more frequent exposure to digital technologies. In contrast, those from low-income households, particularly in rural provinces of the southern Philippines, expressed heightened anxiety and skepticism, stemming from limited access to infrastructure and training.[39]

METHOD

Research Design

This study adopted a quantitative cross-sectional research design, which is widely used in social science and educational research to capture data at a single point in time. The design was selected because it provides a snapshot of participants' attitudes and perceptions without requiring long-term tracking or experimental manipulation. By utilizing this approach, the study was able to compare preservice and in-service teachers simultaneously, identifying patterns, differences, and associations among variables related to artificial intelligence (AI) in education. The cross-sectional design also allowed the researcher to analyze relationships between demographic factors (e.g., gender, teacher status) and attitudinal dimensions (positive and negative perceptions) while ensuring efficiency in terms of time, resources, and logistics.

Respondents of the Study

A total of 400 participants were involved in the study, comprising 200 preservice teachers majoring in physical education programs and 200 in-service teachers actively teaching in public schools in the southern Philippines. Of these, 226 were women (56,5 %) and 174 were men (43,5 %), a distribution that reflects the gender composition typically observed in education programs where female participation is dominant.[70,71,72,73,74,75] The selection of participants employed a purposive sampling technique, which was deemed appropriate to ensure the inclusion of respondents with relevant exposure to educational technologies and classroom teaching contexts. This non-probability method complemented the study's descriptive-comparative and cross-sectional design, as it enabled the examination of group differences across teacher status, gender, and socioeconomic status without aiming for population-level generalizations. The sampling process intentionally involved preservice teachers enrolled in state universities and in-service teachers from public schools within the same geographic region to ensure contextual comparability between groups. Data collection was conducted online to guarantee accessibility, efficiency, and cost-effectiveness while maintaining participant anonymity and voluntary participation.

Research Tool

The primary data collection instrument used in this study was the General Attitudes Toward Artificial Intelligence Scale (GAAIS), which was initially developed and validated by Schepman and Rodway.[76] This instrument was selected for its robust psychometric properties and established reliability in measuring attitudes toward AI across various domains, including education. The GAAIS consists of items rated on a Likert scale, assessing dimensions such as perceived usefulness, trust, ethical considerations, and potential risks associated with AI integration in teaching and learning. To ensure contextual appropriateness, the instrument was pilot tested with 20 respondents composed of students majoring in physical education and in-service teachers who were not included in the final sample. This number falls within the acceptable range for pilot testing, which typically involves 15 to 30 participants[77] and confirmed that the instrument was clear, relevant, and suitable for the target population. The pilot test yielded a Cronbach's alpha reliability coefficient of 0,89, indicating high internal consistency.[78]

Data Analysis Procedure

The data were analyzed via both descriptive and inferential statistics to address the research questions comprehensively. Descriptive statistics, such as the means and standard deviations, were employed to summarize participants' overall attitudes toward AI. Independent samples t tests were conducted to examine

significant differences in attitudes between preservice and in-service teachers, whereas additional t tests and one-way ANOVA were used to test variations in attitudes based on gender and socioeconomic status (SES). Statistical significance was set at $p < 0,05$. The rigorous methodology ensured that the findings provided credible insights into the current state of AI-related attitudes among teachers, contributing to discussions on equitable AI integration, and professional development initiatives.

RESULTS AND DISCUSSION

Attitudes of preservice and in-service teachers toward AI in education

Table 1. Frequency distribution of the attitudes of preservice and in-service teachers toward AI in education

ATTITUDE	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	WM	SD	Des
For routine transactions, I would rather interact with an artificially intelligent system than with a human.	44	126	104	89	37	2,87	1,16	Neutral
Artificial Intelligence can provide new economic opportunities for this country.	14	43	119	164	60	3,53	0,99	Positive
Organizations use Artificial Intelligence unethically.	18	103	176	83	20	2,96	0,92	Neutral
Artificially intelligent systems can help people feel happier.	11	40	152	152	45	3,45	0,92	Positive
I am impressed by what Artificial Intelligence can do.	10	17	84	156	133	3,96	0,97	Positive
I think artificially intelligent systems make many errors.	30	97	190	75	8	2,84	0,89	Neutral
I am interested in using artificially intelligent systems in my daily life.	24	62	182	102	30	3,13	0,97	Neutral
I find Artificial Intelligence sinister.	69	81	178	56	16	2,67	1,04	Neutral
Artificial Intelligence might take control of people.	109	118	108	46	19	2,37	1,14	Negative
I think Artificial Intelligence is dangerous.	71	100	148	60	21	2,65	1,10	Neutral
Artificial Intelligence can have positive impacts on people's wellbeing.	6	28	156	159	51	3,55	0,86	Positive
Artificial Intelligence is exciting.	13	31	162	137	57	3,49	0,94	Positive
An artificially intelligent agent would be better than an employee in many routine jobs.	49	132	119	62	38	2,77	1,14	Neutral
There are many beneficial applications of Artificial Intelligence.	10	22	122	155	91	3,74	0,95	Positive
I shiver with discomfort when I think about future uses of Artificial Intelligence.	59	129	130	58	24	2,65	1,08	Neutral
Artificially intelligent systems can perform better than humans.	26	98	150	83	43	3,05	1,07	Neutral
Much of society will benefit from a future full of Artificial Intelligence.	12	38	166	116	68	3,48	0,98	Positive
I would like to use Artificial Intelligence in my own job.	16	68	157	106	53	3,28	1,02	Neutral
People like me will suffer if Artificial Intelligence is used more and more.	57	104	133	76	30	2,80	1,13	Neutral
Artificial Intelligence is used to spy on people.	38	72	156	105	29	3,04	1,06	Neutral
Overall						3,11		Neutral

The results indicate that the overall attitude of preservice and in-service teachers toward artificial intelligence (AI) in education is neutral (WM = 3,11), suggesting that while there is openness to AI integration, uncertainty and reservations persist. Items with neutral interpretations are clustered around routine transactions, potential

errors, ethical concerns, and the desire to use AI in daily life. For example, teachers were divided on whether they preferred to interact with AI systems over humans (WM = 2,87, SD = 1,16) and expressed ambivalence about trusting organizations that utilize AI ethically (WM = 2,96, SD = 0,92). These findings reflect a cautious stance, wherein respondents recognize AI's potential but remain uncertain about its wider implications.

Positive attitudes were recorded in several items highlighting AI's benefits and potential. Teachers agreed that AI could create new economic opportunities (WM = 3,53, SD = 0,99) and positively affect people's well-being (WM = 3,55, SD = 0,86). A high level of enthusiasm was evident in the statement "I am impressed by what AI can do" (WM = 3,96, SD = 0,97), which registered one of the highest means. Similarly, the respondents acknowledged the existence of many beneficial AI applications (WM = 3,74, SD = 0,95) and found that AI was generally exciting (WM = 3,49, SD = 0,94).

However, several items revealed persistent concerns and reservations. For example, the respondents exhibited apprehension about AI taking control of people (WM = 2,37, SD = 1,14) and expressed mixed feelings about AI being dangerous (WM = 2,65, SD = 1,10). Similar ambivalence was observed regarding the belief that AI systems make many errors (WM = 2,84, SD = 0,89) and could be used for surveillance (WM = 3,04, SD = 1,06). These findings suggest that while teachers acknowledge AI's potential, there are lingering fears about its misuse and unintended consequences.

Furthermore, the respondents were divided in terms of personal integration and the use of AI. While some teachers expressed interest in adopting AI in their daily lives (WM = 3,13, SD = 0,97) and in their professional practice (WM = 3,28, SD = 1,02), many remained neutral. Similarly, perceptions of AI's capacity to outperform humans were inconclusive (WM = 3,05, SD = 1,07), reflecting ongoing skepticism about AI's reliability and capabilities.

Generally, the findings suggest that preservice and in-service teachers hold balanced yet cautious attitudes toward AI in education. While there is enthusiasm for AI's potential benefits, concerns about ethics, control, and errors temper overall acceptance. The relatively high SD values for several items (e.g., WM = 2,87, SD = 1,16; WM = 3,04, SD = 1,06) indicate diverse opinions among respondents, highlighting a need for targeted AI literacy programs to build trust and foster informed usage.

Differences in attitudes toward preservice and in-service teachers' AI in education when grouped according to gender

Table 2. Independent samples t-test for significant differences in attitudes toward preservice and in-service teachers' AI in education when grouped according to gender

	Variables	Gender	N	Mean	SD	t	df	p value	d	Interpretation
Preservice	Positive Attitude	Male	90	3,45	0,56	-0,422	198	0,674	0,54	Not Significant
		Female	110	3,48	0,51	-0,418	182,255			Moderate effect
	Negative Attitude	Male	90	2,61	0,65	-0,441	198	0,660	0,60	Not Significant
		Female	110	2,64	0,55	-0,434	174,888			Moderate effect
In-service	Positive Attitude	Male	136	3,23	0,70	-0,60	198	0,551	0,69	Not Significant
		Female	64	3,29	0,68	-0,60	126,635			Moderate effect
	Negative Attitude	Male	136	2,84	0,73	-0,77	198	0,441	0,75	Not Significant
		Female	64	2,92	0,78	-0,76	117,055			Large effect

Table 2 presents the results of the independent samples t-test examining the significant differences in the attitudes of preservice and in-service teachers toward artificial intelligence (AI) in education when grouped according to gender.

For preservice teachers, the findings reveal no statistically significant difference between male and female respondents in either positive attitudes (t = -0,422, p = 0,674) or negative attitudes (t = -0,441, p = 0,660). Although these differences were not significant, the computed Cohen's d values indicate moderate effect sizes (0,54 and 0,60, respectively), suggesting a small practical difference in attitudes between genders. Similarly, for in-service teachers, no significant difference was observed between male and female respondents in positive attitudes (t = -0,60, p = 0,551) or negative attitudes (t = -0,77, p = 0,441). Despite the lack of statistical significance, the effect sizes were moderate for positive attitudes (d = 0,69) and large for negative attitudes (d = 0,75), implying that female in-service teachers exhibited slightly higher levels of both positive and negative attitudes toward AI in education than their male counterparts did.

These results are consistent with recent studies reporting that gender does not exert a significant influence on teachers' attitudes toward AI in educational settings. Devanadera[49] found that preservice teachers' attitudes and perceptions toward AI were not significantly associated with gender, although female respondents

reported higher anxiety levels related to AI use and job displacement. Similarly, Serdenia et al.[6] observed that while prospective teachers expressed favorable attitudes and moderate acceptance toward AI, no significant differences emerged between genders, though moderate effect sizes suggested subtle variations worthy of further examination. This pattern aligns with the findings of Alieto et al.[1], who likewise reported that both male and female teacher aspirants displayed neutral attitudes toward AI, with no statistically significant gender gap.

Further supporting these observations, Galindo-Domínguez et al.[17] revealed that teachers' attitudes toward AI were not significantly affected by gender, age, or years of experience. Instead, the study identified digital competence as the key determinant of positive AI attitudes, suggesting that access to training and exposure plays a more decisive role than gender in shaping perspectives. Similarly, Hopcan et al.[61] found no meaningful gender differences in AI-related anxiety among teacher candidates from various disciplines, although participants expressed concerns about AI's broader social and employment implications. These findings collectively affirm that, across both local and international contexts, gender does not substantially predict teachers' attitudinal orientation toward AI, despite minor emotional or ethical variations between male and female respondents.

Taken together, the present study's results corroborate the growing body of literature indicating that teachers' openness to AI is influenced less by gender and more by contextual and experiential factors such as digital literacy, professional exposure, and perceived utility. The moderate to large effect sizes observed in this study suggest that while the statistical differences are minimal, practical distinctions may exist, particularly regarding emotional engagement and ethical awareness. This underscores the importance of integrating AI literacy and reflective ethical discussions into teacher education and professional development programs to cultivate balanced, informed, and inclusive perspectives toward AI in education.

Differences in attitudes toward preservice and in-service teachers' AI in education when grouped according to socioeconomic status

Table 3. One-way ANOVA on the test of significant differences in attitudes toward preservice and in-service teachers' AI in education when grouped according to socioeconomic status

	Variables	Socioeconomic	N	Mean	SD	SS	df	MS	F	p value	η^2	Interpretation
Preservice	Positive Attitude	Poor	44	3,28	0,55	2,170	3	0,723	2,572	0,055	0,04	Not significant; small effect
		Low Income	56	3,50	0,51	55,138	196	0,281				
		Lower Middle	77	3,52	0,54	57,308	199					
		Middle Class	23	3,57	0,49							
		Total	200	3,47	0,54							
	Negative Attitude	Poor	44	2,59	0,60	0,381	3	0,127	0,355	0,785	0,01	Not significant; small effect
		Low Income	56	2,60	0,63	70,024	196	0,357				
		Lower Middle	77	2,64	0,59	70,405	199					
		Middle Class	23	2,73	0,53							
		Total	200	2,63	0,59							
In-service	Positive Attitude	Lower Middle	97	3,18	0,67	1,100	4	0,27	0,567	0,687	0,01	Not significant; small effect
		Middle Class	47	3,36	0,62	94,613	195	0,49				
		Upper Middle	26	3,30	0,77	95,712	199					
		High Income	18	3,25	0,90							
		Rich	12	3,19	0,68							
		Total	200	3,25	0,69							
	Negative Attitude	Lower Middle	97	2,74	0,72	6,937	4	1,73	3,262	0,013	0,06	Significant; moderate effect
		Middle Class	47	2,93	0,71	103,681	195	0,53				
		Upper Middle	26	3,05	0,67	110,618	199					
		High Income	18	3,29	0,92							
		Rich	12	2,58	0,67							
		Total	200	2,86	0,75							

Table 3 presents the results of the one-way ANOVA test conducted to examine differences in the attitudes of preservice and in-service teachers toward artificial intelligence (AI) in education when grouped according to socioeconomic status (SES).

For preservice teachers, the findings revealed no significant differences in positive attitudes toward AI across socioeconomic groups, $F(3, 196) = 2,572$, $p = 0,055$, $\eta^2 = 0,04$. While the effect size indicates a small effect, the differences in mean scores (poor = 3,28; low-income = 3,50; lower-middle = 3,52; middle-class =

3,57) were not statistically meaningful. Similarly, negative attitudes showed no significant variation, F(3, 196) = 0,355, p = 0,785, η^2 = 0,01, also indicating a small effect size. These results suggest that socioeconomic status has little influence on the AI-related attitudes of preservice teachers.

For in-service teachers, the results show that positive attitudes toward AI did not significantly differ across socioeconomic groups, F(4, 195) = 0,567, p = 0,687, η^2 = 0,01, reflecting a small effect size. However, a statistically significant difference emerged for negative attitudes, F(4, 195) = 3,262, p = 0,013, η^2 = 0,06, indicating a moderate effect size. Post-hoc inspection of the mean scores suggests that teachers from high-income groups (M = 3,29) and upper-middle groups (M = 3,05) tend to report higher negative attitudes toward AI, whereas those from the rich category (M = 2,58) and lower-middle groups (M = 2,74) display lower negative attitudes.

These findings align with Devanadera[49], who found that socioeconomic status did not significantly affect attitudes or perceptions toward AI among preservice teachers, although anxiety levels differed across income groups, with middle-class and poor respondents exhibiting higher AI-related anxiety. Serdenia et al.[6] similarly reported that demographic factors such as SES and gender did not produce significant variations in attitudes or perceived effectiveness of AI, suggesting that attitudinal differences may depend more on individual experience than on economic background. In contrast, Funa et al.[4] emphasized that teachers from more resourced socioeconomic contexts often demonstrate greater ethical awareness and critical reflection on AI's implications for equity and professional responsibility. This perspective helps explain the moderate differences in negative attitudes among higher-income in-service teachers observed in the present study, who may possess heightened awareness of AI's potential risks and ethical challenges.

In summary, the results indicate that socioeconomic status does not significantly influence positive attitudes toward AI among either preservice or in-service teachers. However, variations in negative attitudes among in-service teachers suggest that economic standing may shape how teachers interpret the ethical, social, and professional implications of AI integration in education.

Differences in the level of attitudes toward AI in education among preservice and in-service teachers

Table 4. Independent samples t test on the test of significant differences in attitudes toward preservice and in-service teachers' AI in education

Variables	Teacher	N	Mean	SD	t	df	p value	d	Interpretation
Positive Attitude	PreService	200	3,47	0,54	3,602	398	0,000	0,62	Significant
	In-Service	200	3,25	0,69	3,602	374,416			Moderate effect
Negative Attitude	PreService	200	2,63	0,59	-3,512	398	0,000	0,67	Significant
	In-Service	200	2,86	0,75	-3,512	379,283			Moderate effect

Table 4 presents the results of the independent samples t-test examining the differences in attitudes toward artificial intelligence (AI) in education between preservice and in-service teachers. The findings indicate significant differences in both positive and negative attitudes, with preservice teachers showing greater openness and optimism toward AI, and in-service teachers displaying more caution and skepticism. The moderate effect sizes (d = 0,62 and d = 0,67) suggest that these differences are meaningful and practically significant.

These findings align with Serdenia et al.[6], who reported that teacher education students generally demonstrated moderate acceptance and favorable attitudes toward AI, reflecting a positive orientation influenced by their ongoing training and exposure to digital tools. Their study also noted that preservice teachers' openness toward AI integration stems from their engagement with technology-rich learning environments and the influence of institutional encouragement to adopt innovative pedagogies. Similarly, Devanadera[49] found that preservice teachers exhibited positive attitudes and perceptions toward AI but also expressed mild reservations linked to ethical and practical concerns. This cautious optimism aligns with the current study's results, indicating that preservice teachers view AI as beneficial yet still approach it thoughtfully.

In contrast, the less favorable attitudes among in-service teachers in this study may be attributed to their direct experience with classroom management, institutional limitations, and perceived workload pressures, which shape a more guarded stance toward AI adoption. Collectively, these findings suggest that while preservice teachers' enthusiasm is shaped by academic exposure and evolving pedagogical frameworks, in-service teachers' skepticism reflects practical realities and contextual constraints within educational systems.

CONCLUSIONS

The study revealed that both preservice and in-service teachers held a neutral attitude toward artificial intelligence (AI) in education, with a grand mean of 3,11. While teachers expressed optimism regarding AI's potential to create economic opportunities, enhance well-being, and provide beneficial applications, they

also conveyed concerns about its risks, such as job displacement, errors, ethical misuse, and the possibility of control or surveillance. No significant differences were found when the effects were grouped by gender, although moderate to large effect sizes suggested subtle variations in perceptions between male and female teachers. Similarly, socioeconomic status did not significantly influence the attitudes of preservice teachers, but in-service teachers from higher-income groups displayed more negative views, indicating that the economic context may shape apprehension. Most notably, a significant difference was found between preservice and in-service teachers, with the former exhibiting more positive attitudes and the latter expressing more reservations.

In light of these findings, several recommendations are advanced. Higher education institutions should integrate AI literacy into their curricula, particularly for physical education students who are preparing to become future teachers, by embedding practical applications of AI, such as sports analytics, fitness and performance monitoring, injury prevention technologies, and adaptive training systems. These innovations can demonstrate the discipline-specific value of AI and prepare preservice PE teachers to use emerging tools in both classroom and athletic settings. For in-service teachers, targeted professional development programs should be designed to reduce skepticism and build competence in leveraging AI not only for general pedagogy but also for enhancing physical education instruction and management. Equitable access to AI resources and training must also be prioritized to address disparities across socioeconomic groups and ensure that AI integration does not widen the digital divide.

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Conceptualization: Levie Guevara Tejada.
Formal analysis: Levie Guevara Tejada.
Research: Levie Guevara Tejada.
Methodology: Levie Guevara Tejada.
Project management: Levie Guevara Tejada.
Resources: Levie Guevara Tejada.
Software: Levie Guevara Tejada.
Supervision: Levie Guevara Tejada.
Validation: Levie Guevara Tejada.
Display: Levie Guevara Tejada.
Drafting - original draft: Levie Guevara Tejada.