LatIA. 2025; 3:245
doi: 10.62486/latia2025245
ISSN: 3046-403X

ORIGINAL

Artificial Intelligence Anxiety and Attitudes among Pre-Service and In-Service Physical Education Teachers: Addressing an Underserved Field in AI Education

Ansiedad y actitudes hacia la inteligencia artificialentre profesores de educación física en formación y en activo: abordar unámbito desatendido en la educación sobre IA

Keith Alvin Solamillo[1]

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

Cite as: Solamillo KA. Artificial Intelligence Anxiety and Attitudes among Pre-Service and In-Service Physical Education Teachers: Addressing an Underserved Field in AI Education. LatIA. 2025; 3:245. https://doi.org/10.62486/latia2025245

Submitted: 12-07-2025 **Revised:** 18-09-2025 **Accepted:** 27-11-2025 **Published:** 28-11-2025

Editor: Misael Ron

Corresponding author: Keith Alvin Solamillo

ABSTRACT

Teachers' attitudes and anxiety toward Artificial Intelligence (AI) play a crucial role in shaping how AI is adopted in Physical Education (PE) settings. This study aimed to compare the attitudes and anxiety levels of pre-service and in-service PE teachers and to examine the relationships among these variables. Using a descriptive-correlational design, data were gathered from 200 participants (100 pre-service and 100 in-service) through two standardized instruments: the General Attitudes toward Artificial Intelligence Scale (GAAIS) and the Artificial Intelligence Anxiety Scale (AIAS). Results showed that teachers held moderately positive attitudes toward AI (M = 3,28, SD = 0,67) and experienced a moderate level of anxiety (M = 4,31, SD = 1,21). Among the four anxiety domains, Sociotechnical Blindness and Job Replacement recorded the highest means, reflecting concerns about AI misuse, malfunction, and potential job displacement. In-service teachers demonstrated slightly higher anxiety than pre-service teachers (r = 0,181, p = 0,010). Correlational analysis showed a weak positive relationship between teacher status and AI anxiety (r = 0,181, p = 0,010), a strong negative correlation between AI anxiety and negative attitude (r = -0,512, p < 0,001), and a moderate positive correlation between AI anxiety and positive attitude (r = 0,235, p < 0,001).These findings suggest that PE teachers are cautiously optimistic about AI's instructional potential while remaining aware of its ethical and occupational risks. Strengthening AI literacy, ethical training, and professional development is recommended to promote confident and responsible AI integration in physical education.

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

RESUMEN

Las actitudes y la ansiedad de los docentes hacia la Inteligencia Artificial (IA) desempeñan un papel crucial en la manera en que la IA es adoptada en los entornos de Educación Física (EF). Este estudio tuvo como objetivo comparar las actitudes y los niveles de ansiedad de los docentes en formación y los docentes en servicio, así como examinar las relaciones entre estas variables. Mediante un diseño descriptivo-correlacional, se recopilaron datos de 200 participantes (100 docentes en formación y 100 docentes en servicio) utilizando dos instrumentos estandarizados: la Escala de Actitudes Generales hacia la Inteligencia Artificial (GAAIS) y la Escala de Ansiedad hacia la Inteligencia Artificial (AIAS). Los resultados mostraron que los docentes presentaron actitudes moderadamente positivas hacia la IA (M = 3,28; DE = 0,67) y experimentaron un nivel moderado de ansiedad (M = 4,31; DE = 1,21). Entre los cuatro dominios de ansiedad, la Ceguera Sociotécnica y la Sustitución Laboral registraron las medias más altas, lo que refleja preocupaciones sobre el mal uso, el

funcionamiento incorrecto y el posible desplazamiento laboral causado por la IA. Los docentes en servicio demostraron niveles de ansiedad ligeramente más altos que los docentes en formación (r = 0,181; p = 0,010). El análisis correlacional mostró una relación positiva débil entre la condición docente y la ansiedad hacia la IA (r = 0,181; p = 0,010), una correlación negativa fuerte entre la ansiedad hacia la IA y la actitud negativa (r = -0,512; p < 0,001), y una correlación positiva moderada entre la ansiedad hacia la IA y la actitud positiva (r = 0,235; p < 0,001). Estos hallazgos sugieren que los docentes de EF mantienen un optimismo cauteloso sobre el potencial pedagógico de la IA, aunque continúan conscientes de sus riesgos éticos y laborales. Se recomienda fortalecer la alfabetización en IA, la formación ética y el desarrollo profesional para promover una integración segura, confiada y responsable de la IA en la educación física.

Palabras clave: Actitud; Ansiedad; Inteligencia Artificial (IA); Docentes de EF en Formación Y en Servicio.

INTRODUCTION

Understanding educators' attitudes and anxiety toward AI is crucial for multiple reasons. First, teachers are the primary mediators between technological tools and students; their perceptions directly shape how AI is implemented, how effectively it enhances learning, and how it influences students' engagement and skill development.[1,2,3,4] In Physical Education, where teaching relies heavily on hands-on instruction, interactive guidance, and personalized feedback, educators' confidence and willingness to integrate AI determine whether these tools would genuinely enhance performance or simply serve as supplementary technology with limited impact.[5,6,7,8,9]

Relatedly, previous interdisciplinary research demonstrates how media and technological narratives shape public understanding and emotional reactions toward emerging phenomena. For instance, Toukoumidis et al.[10] explored how media influence perceptions of endophobia, employing mixed methods to analyze survey and media data. Their study found limited awareness of the term and revealed that the way media frame issues can intensify stereotypes and emotional responses. These insights highlight the broader power of mediated narratives—an idea equally relevant to AI in education, where teachers' perceptions and anxieties can be influenced by exposure, discourse, and the framing of AI as either a threat or a tool for progress.

Examining both attitude and anxiety provides a nuanced understanding of the psychological and emotional factors that may facilitate or hinder AI adoption. While positive attitudes toward AI can promote openness, experimentation, and professional growth, heightened anxiety may lead to avoidance, misuse, or superficial implementation of AI tools.[11,12,13,14,15] By investigating the relationship between these variables, the study can identify whether anxiety constrains favorable attitudes, or if knowledge, familiarity, and support mechanisms can mitigate anxiety even when initial apprehension exists.[16,17,18,19,20]

Most studies in the literature have focused on either in-service teachers or pre-service teachers in isolation.[21,22,23,24] This separation limits understanding of how professional experience, exposure to real classrooms, and pre-service training interact to influence AI attitudes and anxiety. By investigating both in-service and pre-service Physical Education teachers, this study provides a more comprehensive view of the teaching workforce and identifies group-specific differences that can inform targeted interventions and professional development.[25,26,27,28] This dual-group approach allows for meaningful comparisons between experienced educators and those still in training, highlighting how experience, exposure, and contextual factors shape perceptions of AI.

In the Philippine educational context, where AI adoption is still emergent and uneven, research on teachers' attitudes and anxiety is particularly valuable. It provides evidence-based guidance for policy makers, school administrators, and teacher educators on how to support ethical, effective, and human-centered integration of AI in classrooms. Insights from this study can help ensure that AI in Physical Education is used not just as a technological novelty but as a pedagogical tool that empowers teachers, engages students, and preserves the interactive and embodied nature of the discipline.[29, 30, 31]

This study is important because it addresses a critical intersection of psychology, pedagogy, and technology. By exploring AI attitudes and anxiety among both pre-service and in-service Physical Education teachers, it illuminates the conditions under which AI can be successfully integrated into teaching practices, highlights potential barriers to adoption, and informs strategies to cultivate confident, competent, and adaptive educators in an increasingly AI-driven educational landscape.

Literature Review

Artificial Intelligence

Artificial Intelligence (AI) is a multidisciplinary field dedicated to developing computer systems capable of performing tasks that traditionally require human intelligence, such as learning, reasoning, decision-making, and problem-solving.[32,33,34] These systems are designed to simulate human cognitive functions, exhibiting

characteristics such as perception, adaptability, and goal-seeking behavior.[33,35,36] Beyond replicating human intelligence, AI can perform large-scale computations and analyze vast datasets at speeds far exceeding human capabilities.[37]

The concept of AI has deep historical roots, with early philosophical and fictional ideas predating formal computational models.[38,39] A significant milestone in the theoretical foundations of AI occurred in 1847, when George Boole developed a formal language for logical reasoning, establishing a framework that would influence future AI developments.[40] Later, Alan Turing's 1936 description of the Turing machine provided a mathematical model of computation that became foundational for computer science and AI Benkő & Lányi. The emergence of artificial neural models in 1943, proposed by Warren McCulloch and Walter Pitts, further advanced the understanding of computational representations of cognition.[40,41]

The formal naming of the field occurred in 1956 during the Dartmouth College conference, where the term "artificial intelligence" was coined, marking the official establishment of AI as a distinct area of scientific study.[40,41] Early AI research focused heavily on rule-based systems and symbolic reasoning, attempting to replicate human decision-making processes through explicit logical frameworks.[39,41] The 1980s witnessed a paradigm shift toward machine learning and neural networks, which enabled systems to learn from data rather than relying solely on pre-programmed rules. Concurrently, expert systems were developed to emulate human decision-making within specialized domains.[41]

A major breakthrough in AI was the advent of deep learning, which leverages multilayered neural networks to process and analyze complex datasets with high accuracy.[42,43] Recent developments in deep learning and reinforcement learning have produced highly sophisticated AI systems capable of adapting to novel environments and optimizing performance over time.[41,43] AI has since found applications across diverse sectors, including finance. [34] healthcare[32,33], aerospace[44], library and information science[37] and smart energy systems.[43] Its evolution reflects a continual trend toward systems that are more autonomous, data-driven, and capable of complex reasoning, ultimately transforming the way human activities and industries are managed and optimized.

Artificial Intelligence in Physical Education

Artificial Intelligence (AI) is transforming the landscape of physical education (PE) by introducing innovative teaching methods, personalized training, and immersive learning environments. AI technologies enable the creation of personalized training programs tailored to individual students' needs, enhancing both learning outcomes and athletic performance.[45,46,47,48] By analyzing data from various sensors, AI systems provide real-time feedback and dynamically adjust training plans to optimize student performance.[6,9] Beyond performance enhancement, AI plays a significant role in health monitoring by tracking students' physical activities and providing insights into metrics such as endurance, lung capacity, and overall fitness. This data-driven approach allows educators to develop scientifically informed exercise plans that promote both physical and mental well-being.[49]

The integration of Virtual Reality (VR) technology with AI further enhances PE by creating immersive, interactive training environments. These simulated scenarios allow students to practice complex sports skills in realistic yet controlled settings, such as football matches or track and field events, improving engagement and skill acquisition.[6,50] AI tools, including computer vision and machine learning, can also assess athletic performance by capturing and evaluating movement patterns. This detailed analysis helps coaches design more effective training strategies while ensuring exercises are performed correctly and efficiently.[51,52]

In addition, the combination of AI and gamification strategies has shown promise in motivating students and fostering engagement. Wearable devices track real-time performance, and gamification elements such as rewards and challenges create a competitive and enjoyable learning environment.[53] However, the reliability and accuracy of AI systems are critical for their successful implementation. Technical failures or inaccurate assessments can negatively affect training outcomes and overall learning experiences.[54,55]

The ethical use of AI in PE also raises important concerns. Ensuring the privacy and security of student data is essential, and educators must be mindful of how personal information is collected, stored, and utilized.[55,56] Moreover, professional development is necessary for teachers to effectively integrate AI technologies into their teaching practice, as many educators may lack the technical knowledge or skills to fully utilize these tools.[56,57]

Looking forward, AI is expected to continue reshaping PE through innovative teaching models, enhanced evaluation systems, and more engaging learning environments.[58] The integration of AI with VR and other advanced technologies promises to make physical education more interactive, immersive, and enjoyable, ultimately enhancing both teaching efficiency and student outcomes.[6,50]

Attitude toward Artificial Intelligence

Attitude is broadly defined as a predisposition to evaluate an object, person, group, issue, or concept in a favorable or unfavorable manner, encompassing feelings, beliefs, and behavioral reactions toward the entity. Importantly, attitudes are considered learned behaviors rather than innate traits.[4,59,60] While relatively stable,

attitudes can be modified and are commonly conceptualized as consisting of three interrelated components: cognitive, affective, and behavioral.[3,59]

Research on attitudes toward Artificial Intelligence (AI) in educational contexts indicates a complex and varied landscape across learner and teacher populations. Prospective teachers often hold neutral attitudes toward AI, reflecting ambivalence about preferring AI over human interaction in routine educational tasks.[61] In contrast, law students and secondary students generally demonstrate positive attitudes toward AI, signaling a favorable disposition toward its integration in learning environments.[3,62]

Among undergraduate students, particularly those in Public Relations programs, attitudes toward AI and AI-based tools such as ChatGPT are largely positive, though concerns persist regarding potential impacts on traditional educational models.[63] Similarly, pre-service teachers exhibit moderate positive and negative attitudes toward AI[21] with many expressing positivity about AI's potential while remaining uncertain about their own anxiety levels related to AI adoption.[24] In special education contexts, pre-service teachers tend to maintain neutral attitudes toward employing AI technologies.[64]

Specific disciplinary contexts further shape attitudes toward AI. Art pre-service teachers, for example, display interest in AI-driven art generators, perceiving these tools as valuable for course material preparation and student engagement, though they report challenges with time-consuming keyword revisions.[48] In broader geographical and cultural contexts, teachers in several Asian countries exhibit positive attitudes toward AI, recognizing its educational potential despite limited knowledge of AI applications. Notably, teachers in Morocco and Turkey generally maintain positive outlooks toward AI in their teaching practices.[22,65] Likewise, pre-service teachers in Indonesia demonstrate favorable attitudes toward AI, particularly in the context of scientific research.[66]

Variations also exist across teacher specialties. STEM teachers generally exhibit more positive attitudes toward AI and report lower anxiety compared to non-STEM teachers.[24,67] In China, art education instructors' attitudes are influenced by their digital expertise, with digital art teachers demonstrating more positive attitudes and higher confidence in applying AI technologies in their pedagogy.[68] Meanwhile, in the Philippines, no significant difference in AI interest was observed among teachers based on urban versus rural school locations, suggesting that socio-geographical factors may not strongly influence attitudes in this context[31]

The literature highlights a general trend of positivity toward AI among learners and teachers, tempered by disciplinary differences, contextual factors, and varying levels of knowledge or anxiety. These insights underscore the importance of targeted professional development, contextualized AI integration strategies, and ongoing research to support effective and confident adoption of AI in educational settings.

Factors affecting attitude toward Artificial Intelligence

Multiple studies have identified demographic, cognitive, experiential, and socio-cultural factors as significant determinants of attitudes toward artificial intelligence (AI) in educational contexts. Gender has consistently been highlighted as an influential factor, with male respondents generally exhibiting more positive attitudes toward AI than females.[5,21,27,61,69] Nonetheless, some research indicates minimal gender differences, suggesting that gender effects may be context dependent.[69,70]

Age has also been examined, with older individuals often showing more favorable dispositions toward AI compared to younger counterparts. [61,69] although other studies report no significant impact of age on AI attitudes.[71] Socio-geographical factors similarly influence perceptions, with teachers from rural and urban areas demonstrating differing attitudes; social influences and local norms can contribute to more cautious or negative perceptions.[31]

Digital competence emerges as a strong predictor of positive attitudes toward AI.[72,73,74,75,76] Competence in digital technologies, pedagogical skills, and content creation enhances teachers' confidence and readiness to adopt AI in their instructional practices. Experience and familiarity with AI tools further reinforce these positive attitudes.[22,27,77] with specific exposure to platforms such as ChatGPT influencing perceptions favorably. Moreover, mindfulness and attentional awareness have been shown to mediate the relationship between digital competence and AI attitudes, highlighting the role of psychological readiness in technology adoption.[74]

Individual traits also play a role. Extraversion and a preference for science fiction media correlate positively with favorable attitudes toward AI.[70] Similarly, constructivist pedagogical beliefs and engagement with innovative teaching modalities promote adoption and positive perceptions.[78] Teachers who critically assess AI's pedagogical and ethical implications tend to maintain a more balanced view, avoiding uncritical enthusiasm or unwarranted skepticism.[73] Professional development and training programs enhance teachers' understanding and comfort with AI, which is associated with more positive attitudes.[22,28,73]

Social and cultural factors further shape attitudes toward AI. Societal norms, peer influence, and local expectations significantly affect teachers' perceptions.[79,80] Cultural dimensions, including religiosity and adherence to traditional values, can influence attitudes, although their effect may be more limited compared to professional and experiential factors.[81,82]

Finally, perceptions of AI's utility and usability critically inform attitudes. The perceived ease of use, usefulness, and practical benefits of AI tools are positively associated with favorable dispositions, whereas concerns regarding job security, teacher autonomy, and potential overreliance on AI contribute to negative attitudes.[21,27,79]

This body of literature underscores that attitudes toward AI in education are multidimensional, shaped by a complex interplay of demographic, cognitive, experiential, pedagogical, social, and cultural factors. Understanding these determinants is critical for designing interventions, training programs, and policies that foster informed and constructive engagement with AI technologies in educational settings.

Anxiety toward Artificial Intelligence

Anxiety, a fundamental human emotion, embodies feelings of tension, apprehensive thought, and physiological arousal such as increased blood pressure. Unlike fear, which emerges in response to a clearly identifiable threat, anxiety often arises from ambiguous or indeterminate dangers—those shadows of uncertainty that the mind projects into possibility.[83,84,85] At moderate levels, anxiety is adaptive; it alerts, prepares, and protects. Yet when it exceeds the threshold of control, it can evolve into debilitating forms—panic disorder, generalized anxiety disorder, or obsessive-compulsive disorder—conditions that constrain human functioning and often coexist with depression.[83,84]

In the contemporary era, a new manifestation of this emotional terrain has surfaced: anxiety toward Artificial Intelligence (AI). This form of anxiety reflects the unease surrounding the rapid development and integration of AI technologies into daily life and professional practice. Concerns about job displacement, the relentless demand for technological adaptation, and the perceived erosion of human agency generate deep psychological unease among workers.[86] Such anxiety may deplete work enthusiasm, leading to emotional exhaustion and diminished engagement. Yet, paradoxically, exposure and familiarity with AI can serve as a form of cognitive inoculation—reducing apprehension and fostering adaptation.[16,86]

For certain professional groups, such as academic librarians, this anxiety assumes a distinct contour—rooted not merely in the fear of technological redundancy but in the uncertainty of understanding, managing, and mastering AI systems.[86] Beyond the boundaries of individual professions, however, lies a broader societal anxiety: a collective unease fueled by sensationalist narratives and misconceptions about AI's potential to act autonomously or even malevolently.[87]

Thus, anxiety—once a deeply personal emotional experience—has become a social and technological phenomenon. Understanding its contours within the context of AI offers not only insight into human adaptation but also a mirror reflecting how societies negotiate the balance between innovation and apprehension.

AI Anxiety among Educators in the Philippines and abroad

Artificial Intelligence (AI) anxiety among educators has emerged as a significant global concern, reflecting growing apprehension about the ethical, professional, and pedagogical implications of integrating AI into educational systems. Such anxiety is often rooted in fears of job displacement, diminished cognitive engagement among learners, and the erosion of traditional teaching practices. Moreover, ethical concerns related to data privacy, fairness, and the authenticity of learning further intensify these apprehensions.

In the Philippine context, educators exhibit diverse attitudes toward AI, balancing curiosity with caution. Studies indicate that Filipino teachers express anxiety about AI's integration into educational processes, particularly its potential to dominate future teaching practices and alter pedagogical roles.[30,31] For instance, a study involving secondary school teachers in Zamboanga revealed that while teachers could interact with AI without immediate fear, they harbored significant anxiety concerning AI's influence on human agency and its possible dominance in future education.[31] Similarly, Ramos et al.[31] reported that while teachers acknowledge the pedagogical benefits of AI tools such as ChatGPT, their use is tempered by limited institutional training and lingering ethical concerns, both of which contribute to heightened AI-related anxiety.

In more rural areas of the Philippines, apprehensions take on a deeper ethical dimension. Teachers in these regions have expressed unease about issues such as data privacy, algorithmic bias, and the risk that AI could exacerbate existing educational inequalities.[88] Calles[29] further highlighted that Filipino educators fear a potential reduction in students' cognitive engagement and critical thinking due to overreliance on AI, alongside concerns about academic integrity and the misuse of AI-generated outputs. These anxieties reflect broader systemic tensions between technological innovation and the preservation of authentic learning processes.

Similar patterns of anxiety appear in international contexts, underscoring that the phenomenon is not unique to the Philippines. In Palestine, educators have expressed profound concern over AI's role in reducing traditional teaching responsibilities and undermining educational quality, coupled with persistent ethical issues related to privacy and research integrity.[89] Iranian EFL teachers likewise reported moderate levels of AI anxiety, primarily driven by fears of job displacement and ethical unease surrounding generative AI tools like ChatGPT.[90] In the United Arab Emirates, while educators recognized the transformative potential of AI for

improving learning outcomes, they simultaneously voiced apprehensions about data privacy and the deepening of educational inequality through unequal access to AI technologies.[91]

A European perspective further enriches this global picture. A recent study in Estonia revealed that teachers' AI anxiety is influenced not only by ethical or employment-related concerns but also by contextual factors such as limited professional training and uncertainty about the relevance of AI within

These studies illuminate a shared pattern of ambivalence—where educators worldwide recognize the potential of AI as a transformative educational tool yet remain anxious about its ethical, professional, and cognitive implications. This convergence of local and global concerns suggests that AI anxiety among educators is not merely a technological issue but a deeply human response to a rapidly shifting educational landscape, demanding thoughtful policy, robust training, and sustained ethical dialogue.

Factors influencing Artificial Intelligence Anxiety

AI anxiety is a multifaceted phenomenon shaped by interwoven psychological, contextual, and demographic factors. As artificial intelligence becomes increasingly integrated into daily and professional life, it evokes complex emotional responses that extend beyond mere technological apprehension. Such anxiety often reflects deeper fears of disruption, obsolescence, and the blurring boundaries between human and machine. Frenkenberg and Hochman[14] describe these tensions as anticipatory and annihilation anxieties—the former stemming from fears of impending change and the latter from existential concerns about the erosion of human autonomy and identity. These anxieties intensify when individuals perceive AI as an uncontrollable or unpredictable force capable of exceeding human comprehension and moral governance.[87,92,93,94]

Difficulties in understanding and applying AI technology are among the most common sources of this unease. Individuals who struggle with the technical and conceptual aspects of AI tend to exhibit higher anxiety levels.[12,93] A lack of awareness regarding the broader social and ethical implications of AI similarly exacerbates uncertainty and mistrust.[12] These gaps in understanding can leave users feeling alienated from the technology and powerless in the face of its rapid evolution.

Another major contributor to AI anxiety is the fear of job displacement, particularly in professions where human empathy and expertise have traditionally been indispensable. Educators and healthcare practitioners, for instance, often report heightened concerns that AI could supplant key aspects of their roles.[12] Beyond employment insecurity, worries about data privacy and surveillance have emerged as pervasive triggers of anxiety. As AI systems increasingly collect and analyze personal information, individuals express apprehension about misuse and loss of control over their data.[68,94] Closely tied to this is the fear of overdependence—the unsettling notion that humans may become excessively reliant on AI, thereby compromising their autonomy and cognitive independence.[68,94]

Perceptions of AI risk, including the possibility that intelligent systems could operate beyond human regulation, amplify these anxieties.[87,94] Such fears are not distributed evenly across populations. Gender differences have been observed, with female individuals generally reporting higher levels of AI anxiety than males.[95] Similarly, differences across degree-year levels suggest that experience and exposure may shape how student-teachers perceive job-related AI threats, with anxiety levels fluctuating across stages of academic progression.[96]

While these concerns are pervasive, several mitigating factors can reduce AI anxiety. Perceived usefulness and ease of use significantly influence individuals' emotional responses to AI; positive perceptions foster acceptance and reduce apprehension.[19, 97] Familiarity and AI literacy also play crucial roles—those with greater understanding and hands-on experience tend to feel more confident and less threatened.[16,19] Moreover, social influence and support from peers, mentors, and institutional leaders can buffer against anxiety by creating environments that encourage collaboration and shared learning.[97,98]

Ultimately, AI anxiety reflects the human struggle to adapt to technological transformation. It thrives in the spaces between uncertainty and understanding, dependence and control. Yet, as the literature suggests, it can be mitigated through knowledge, empowerment, and collective support—reminding us that even amid the march of intelligent machines, the most enduring intelligence remains human.

METHOD

Research Design

This study employed a descriptive-correlational quantitative design to examine the levels of anxiety and attitudes toward Artificial Intelligence (AI) among preservice and in-service teachers, and to determine the relationships among these variables. The descriptive component identified the degree of teachers' anxiety and attitudes across multiple dimensions, while the correlational analysis explored the associations between teaching status, AI anxiety, and attitude dimensions (positive and negative). This design was chosen to provide a statistical understanding of how educators' affective responses toward AI vary according to their professional status and to uncover interrelations among the variables measured.

Respondents of the Study

A total of 200 teachers participated in the study, composed of 100 preservice teachers enrolled in the physical education program and 100 in-service teachers currently employed in basic or higher education institutions. The respondents were selected through purposive sampling, ensuring representation of both groups actively engaged in teaching preparation and practice. Preservice teachers were selected from the college offering the physical education program, while in-service teachers were drawn from various schools and higher education institutions within the region. All participants voluntarily took part in the study and provided responses through structured survey questionnaires administered online. Prior to data collection, the participants were informed of the study's purpose, procedures, and ethical considerations, including confidentiality, anonymity, and voluntary participation. Informed consent was obtained from all respondents before answering the survey.

Research Tool

Two standardized questionnaires were used to gather data on teachers' attitudes and anxiety toward Artificial Intelligence (AI) in education. The first tool measured attitudes toward AI using the General Attitudes toward Artificial Intelligence Scale (GAAIS) by Schepman and Rodway[99]. This instrument consists of 20 statements that reflect how individuals generally think and feel about AI. The items are grouped into two components: positive attitude and negative attitude. The positive attitude items express openness and optimism about AI's potential (e.g., "Artificial Intelligence can provide new economic opportunities for this country," "AI can have positive impacts on people's well-being"), while the negative attitude items express caution and apprehension (e.g., "I think Artificial Intelligence is dangerous," "Artificial Intelligence is used to spy on people"). Eight items specifically numbers 3, 6, 8, 9, 10, 15, 19, and 20 represent negative statements. Responses were recorded using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores on positive items indicate a stronger favorable disposition toward AI, whereas higher scores on negative items reflect greater concern or skepticism.

The second tool examined participants' anxiety toward AI using the Artificial Intelligence Anxiety Scale (AIAS) developed by Wang and Wang[100]. This scale includes 21 items rated on a seven-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), where higher scores signify stronger anxiety. The items are organized into four areas that represent different sources of AI-related concern: Learning Anxiety (8 items), which relates to discomfort in learning or using AI technologies; Job Replacement Anxiety (6 items), which pertains to fears about dependence on AI or potential job loss; Sociotechnical Blindness Anxiety (4 items), which captures worries about AI malfunction or misuse; and AI Configuration Anxiety (3 items), which reflects unease about humanoid or human-like AI systems. Together, these dimensions provide a comprehensive picture of how teachers emotionally respond to the growing use of AI in education.

Both instruments were selected for their clarity, reliability, and prior use in educational research, ensuring that the measures appropriately captured the emotional and attitudinal dimensions relevant to the study.

Data Analysis Procedure

The data collected from the survey questionnaires were encoded, organized, and analyzed using the Statistical Package for the Social Sciences (SPSS). Both descriptive and inferential statistics were applied to address the objectives of the study. Descriptive statistics such as frequency, percentage, mean, and standard deviation were computed to determine the respondents' levels of attitude and anxiety toward Artificial Intelligence (AI). These descriptive measures summarized the responses across the dimensions of the two instruments: positive and negative attitude for the General Attitudes toward Artificial Intelligence Scale (GAAIS), and learning, job replacement, sociotechnical blindness, and AI configuration for the Artificial Intelligence Anxiety Scale (AIAS).

For inferential analysis, statistical tests were used to examine the relationship between teacher status (preservice and in-service) and the main variables of AI attitude and AI anxiety. The Pearson Product-Moment Correlation Coefficient (r) was utilized to determine the strength and direction of relationships among variables, particularly between AI anxiety and both positive and negative attitudes. All tests were carried out at a 0,05 level of significance, and interpretations were based on standard criteria for the strength and direction of correlation values.

Before analysis, the dataset was carefully checked for missing values and inconsistencies to ensure accuracy and validity. The analyzed data were then presented in tables and interpreted according to the study's objectives, providing insights into how teachers' attitudes and anxieties relate to the use of Artificial Intelligence in education.

RESULTS AND DISCUSSION

Attitudes toward AI in education among pre-service teachers and in-service teachers

Table 1 revealed that both preservice and in-service teachers exhibited moderately positive attitudes toward

Artificial Intelligence (AI). As presented in the table, the overall mean score for positive attitude was 3,28 (SD = 0,67), while the mean for negative attitude was 2,74 (SD = 0,58). These findings indicate that respondents generally held more favorable than unfavorable views of AI. When grouped by teaching status, preservice teachers recorded a slightly higher mean for positive attitude (M = 3,32, SD = 0,72) than in-service teachers (M = 3,24, SD = 0,63), suggesting that preservice teachers, who are still immersed in teacher training programs and more exposed to emerging technologies, tend to express greater enthusiasm about AI. Conversely, preservice teachers also reported a slightly higher negative attitude (M = 2,79, SD = 0,51) than in-service teachers (M = 2,68, SD = 0,64), implying that while they are optimistic, they also harbor a bit more apprehension or uncertainty about AI's broader implications.

Table 1. Pre-service and In-service Teachers' Levels of Attitudes toward AI in education

Variables		Mean	SD
Preservice	PositiveAtt	3,32	0,72
	NegativeAtt	2,79	0,51
Inservice	PositiveAtt	3,24	0,63
	NegativeAtt	2,68	0,64
Overall Attitude	PositiveAtt	3,28	0,67
	NegativeAtt	2,74	0,58

The frequency distributions further support these results. For the positive attitude items, a large portion of respondents indicated neutral or agree responses, reflecting openness and optimism toward AI's usefulness and potential. For example, 38 % were neutral and 16 % agreed that they would rather interact with an AI system than a human for routine transactions. Similarly, 42,5 % agreed and 9 % strongly agreed that AI can create new economic opportunities for the country, while 50,5 % agreed that AI can have positive effects on people's well-being. Responses were likewise favorable for items such as "Artificial Intelligence can have positive impacts on people's well-being" (46,5 % agree; 13 % strongly agree), "There are many beneficial applications of Artificial Intelligence" (47 % agree; 19 % strongly agree), and "Much of society will benefit from a future full of Artificial Intelligence" (33 % agree; 8 % strongly agree). These trends illustrate that most teachers view AI as an innovative tool capable of improving productivity, efficiency, and societal development.

Despite the overall positive orientation, neutrality dominated several items, suggesting some reservation or limited familiarity with AI's applications. Nearly half (47,5 %) of respondents were neutral about being impressed by what AI can do, and 41,5 % were neutral about the idea that AI systems can help people feel happier. This indicates that many teachers recognize AI's possibilities but are cautious in fully endorsing its role, likely because they have not yet experienced direct integration of AI technologies in their own professional contexts.

Meanwhile, the negative attitude items received lower levels of agreement, highlighting that apprehension toward AI was minimal. A majority (38,5 %) disagreed that AI systems make many errors, and 52,5 % were neutral about the statement that AI might take control of people. Likewise, 46 % were neutral and only 3 % strongly agreed that AI is dangerous. Most respondents were either neutral or disagreed with fear-oriented statements such as "I shiver with discomfort when I think about future uses of Artificial Intelligence" and "People like me will suffer if Artificial Intelligence is used more and more." Only a small percentage, roughly between 8 % and 10 %, expressed strong apprehension about AI being used unethically, spying on people, or leading to loss of human control. These frequencies reinforce the interpretation that teachers generally do not perceive AI as a major threat but remain watchful of its ethical and technical implications.

Overall, both preservice and in-service teachers demonstrated a favorable yet balanced attitude toward Artificial Intelligence. They acknowledged its capacity to improve learning and social systems, enhance well-being, and perform routine tasks efficiently, while maintaining awareness of possible issues related to misuse and human dependency. The prevalence of neutral and agree responses in positive statements, coupled with the low agreement levels in negative items, suggests that teachers' perceptions are more hopeful than fearful. As a group, educators can thus be described as cautiously positive toward AI, reflecting openness to technological progress combined with a mindful awareness of its potential risks and responsibilities.

Anxiety toward AI in education among pre-service teachers and in-service teachers.

Table 2 revealed that both preservice and in-service teachers exhibited a moderate level of anxiety toward Artificial Intelligence (AI), as reflected in the overall mean of 4,31 (SD = 1,21). This suggests that while teachers show a general openness to AI integration, they also experience apprehension toward its use and potential consequences in educational and occupational contexts. When compared by teaching status, in-service teachers (M = 4,53, SD = 1,26) manifested slightly higher anxiety levels than preservice teachers (M = 4,09, SD = 1,12), implying that those already working in schools may feel more directly impacted by the technological shifts reshaping the teaching profession.

Table 2. Pre-service and In-service Teachers' Levels of Anxiety toward AI in education

Variables		Mean	SD
Preservice	Learning	3,56	1,45
	JobRep	4,41	1,51
	SocTechBlind	4,77	1,47
	AIConfig	3,93	1,62
	AIAnxiety	4,09	1,12
Inservice	Learning	3,88	1,60
	JobRep	4,98	1,60
	SocTechBlind	5,24	1,45
	AIConfig	4,29	1,76
	AIAnxiety	4,53	1,26
Overall AIAnxiety	Learning	3,72	1,53
	JobRep	4,70	1,58
	SocTechBlind	5,01	1,48
	AIConfig	4,11	1,70
	AIAnxiety	4,31	1,21

Across the four domains of AI anxiety, the results show varied levels of concern. For the Learning Anxiety dimension, the mean score of 3,72 (SD = 1,53) indicates moderate anxiety about learning to understand, use, and keep up with AI technologies. Preservice teachers had a mean of 3,56 (SD = 1,45), while in-service teachers registered 3,88 (SD = 1,60). Frequency distributions show that nearly one-third of respondents chose the neutral category, while around 20–30 % expressed mild disagreement, and a smaller proportion (about 10–13 %) agreed that learning AI makes them anxious. Statements such as "Learning to use AI techniques or products makes me anxious" and "Reading an AI manual makes me anxious" received mixed responses, showing that while most teachers recognize AI's complexity, their anxiety remains manageable and not characterized by avoidance.

A higher level of concern was observed in the Job Replacement Anxiety domain, which recorded an overall mean of 4,70 (SD = 1,58). Preservice teachers obtained a mean of 4,41 (SD = 1,51), while in-service teachers recorded 4,98 (SD = 1,60). The frequency patterns indicate that about 60–70 % of respondents agreed or strongly agreed that AI might lead to dependence, reduced human initiative, or even job displacement. Items such as "I am afraid that AI may replace humans" and "AI techniques may make us dependent" drew strong agreement from 17–19 % of participants, highlighting fears that automation could render some human roles obsolete. This trend was more pronounced among in-service teachers, suggesting that those who have established careers feel a greater sense of vulnerability as AI tools become more integrated into administrative and instructional processes.

The Sociotechnical Blindness Anxiety dimension produced the highest mean among all four domains, 5,01 (SD = 1,48), signifying a relatively strong concern about the possible misuse or malfunction of AI systems. Preservice teachers scored M = 4,77 (SD = 1,47), while in-service teachers reported M = 5,24 (SD = 1,45). Frequency data show that more than 60 % of respondents agreed or strongly agreed with statements such as "I am afraid that AI may be misused" and "I am afraid that AI may get out of control and malfunction." Only about 10 % disagreed, while nearly 20 % strongly agreed, reflecting an acute awareness of ethical and safety risks. This dimension reveals that teachers' highest anxiety stems not from using AI itself, but from fears about its autonomy, malfunction, and potential to operate beyond human control. Such findings underscore a cautious attitude toward the reliability and governance of AI technologies in education and society.

Meanwhile, the AI Configuration Anxiety dimension, which pertains to feelings of discomfort toward humanoid or human-like AI systems, obtained a mean of 4,11 (SD = 1,70). Preservice teachers reported M = 3,93 (SD = 1,62), while in-service teachers showed M = 4,29 (SD = 1,76). Frequency analysis revealed that roughly one-fourth of respondents were neutral, about 15–17 % somewhat agreed, and around 10 % strongly agreed that humanoid robots are intimidating or frightening. Many participants expressed mild to moderate unease toward AI products designed to imitate human form or behavior, consistent with responses to items such as "I find humanoid AI techniques or products scary" and "I find humanoid robots intimidating." This indicates that while educators are increasingly familiar with AI concepts, the physical resemblance and perceived autonomy of humanoid systems still provoke psychological discomfort.

Taken together, the findings suggest that both preservice and in-service teachers experience moderate levels of AI-related anxiety, though in-service teachers consistently reported higher levels across all four dimensions. The strongest anxieties were related to Sociotechnical Blindness and Job Replacement, emphasizing fears about ethical misuse, malfunction, and job displacement. Learning Anxiety and AI Configuration Anxiety, on the

other hand, showed moderate yet manageable concern levels, implying that teachers' apprehensions toward AI stem more from perceived risks than from personal incapacity to learn or use it. Overall, the results depict teachers as cautious but not resistant—they acknowledge AI's potential benefits while remaining wary of its uncertainties. Their anxiety reflects both professional awareness and a call for structured training, ethical guidelines, and institutional support to help educators confidently adapt to the growing presence of AI in education.

Test of Relationship among relationship among attitudes, and anxiety toward AI in education among pre-service and in-service teachers

Table 3. Correlations among Teacher Status, AI Anxiety, and Attitude toward Artificial Intelligence

Variables	Status	AI Anxiety	Negative Attitude	Positive Attitude
Status	1	0,181*	-0,100	-0,058
	Sig. (2-tailed)		0,010	0,158
AI Anxiety	0,181*	1	-0,512**	0,235**
	Sig. (2-tailed)	0,010		<0,001
Negative Attitude	-0,100	-0,512**	1	-0,393**
	Sig. (2-tailed)	0,158	<0,001	
Positive Attitude	-0,058	0,235**	-0,393**	1
	Sig. (2-tailed)	0,413	<0,001	<0,001
N	200	200	200	200

Note: *N* = 200. Pearson's correlation coefficients are reported. p < 0,01 (2-tailed).

Table 3 presents the correlation coefficients among teacher status, AI anxiety, and attitudes toward artificial intelligence. The analysis reveals a significant but weak positive correlation between teacher status and AI anxiety (r = 0,181, p = 0,010), indicating that in-service teachers tend to experience slightly higher levels of anxiety toward artificial intelligence than preservice teachers. However, teacher status shows no significant relationship with either negative attitude (r = -0,100, p = 0,158) or positive attitude (r = -0,058, p = 0,413), suggesting that both groups hold generally similar evaluative orientations toward AI regardless of professional experience.

A strong negative correlation was found between AI anxiety and negative attitude (r = -0,512, p < 0,001), implying that teachers who exhibit greater anxiety about AI tend to hold less favorable affective perceptions of its use. Conversely, AI anxiety demonstrated a moderate positive correlation with positive attitude (r = 0,235, p < 0,001), indicating that some degree of anxiety may coexist with cautious optimism toward the technology. Meanwhile, negative and positive attitudes were moderately and inversely correlated (r = -0,393, p < 0,001), signifying that as teachers' negative perceptions toward AI increase, their positive outlook tends to diminish.

Overall, these findings highlight a complex affective pattern wherein teachers may experience both apprehension and openness toward AI integration in education. While anxiety appears to dampen favorable perceptions, a moderate level of unease may also coexist with curiosity and acceptance, reflecting the ambivalence and adjustment typical in educational transitions toward emerging technologies.

CONCLUSIONS

This study revealed that both pre-service and in-service teachers held moderately positive attitudes toward Artificial Intelligence (AI) while experiencing a moderate level of anxiety about its use in education. Teachers generally viewed AI as a valuable tool that can enhance teaching and learning but remained cautious due to limited experience and uncertainties surrounding its ethical and professional implications. The strongest concerns emerged in Sociotechnical Blindness and Job Replacement Anxiety, reflecting apprehensions about AI misuse, malfunction, and potential displacement of human roles. Meanwhile, Learning and AI Configuration Anxiety were moderate, suggesting that educators' apprehensions are rooted more in perceived risks than in resistance to learning new technologies.

In-service teachers demonstrated slightly higher anxiety levels than pre-service teachers, indicating greater sensitivity to AI's impact on teaching practices. Correlation analysis showed a weak but significant positive relationship between teacher status and AI anxiety, a strong negative relationship between anxiety and negative attitude, and a moderate positive correlation between anxiety and positive attitude. These patterns reveal that anxiety and optimism coexist, reflecting a cautious but adaptive stance toward AI integration.

To address these findings, educational institutions across all levels should strengthen AI literacy programs, integrate practical and ethical discussions into teacher training, and provide continuous professional development for in-service teachers. Institutional policies should promote responsible AI use, protect data privacy, and

ensure that AI supports rather than replaces educators. Establishing collaborative learning communities and mentoring systems can further reduce anxiety and build collective confidence.

Overall, the study concludes that successful AI integration depends not only on technological access but also on educators' emotional readiness, ethical awareness, and institutional support, ensuring that AI enhances rather than diminishes the human dimension of education.

REFERENCES

1. Balasa KA. Interplay of AI literacy, readiness-confidence, and acceptance among pre-service teachers in Philippine higher education: A gender, discipline and connectivity perspective. EthAIca. 2025;4:429.

2. Dumagay AH, Kunting AF, Alieto EO, Kenoh KS, Tarroza RT, Rillo RM, Riparip EM, Jacinto LAC, Lauzon LDS, Estigoy EB, Francisco CI, San Juan DO. Artificial intelligence as the call of the times: Attitudes of higher education teachers across gender, generational cohorts, and length of service in the context of Education 5.0. LatIA. 2025;3:246. https://doi.org/10.62486/latia2025246

3. García LCE, Laitano CMF, Flores LGR. Attitude of undergraduate students of the Law Program in UNITEC Honduras towards artificial intelligence, an instrumental adjustment. In: Larrondo Petrie MM, Texier J, Matta RAR, editors. Proceedings of the LACCEI International Multi-Conference for Engineering, Education and Technology. Latin American and Caribbean Consortium of Engineering Institutions; 2024. Article 362. https://doi.org/10.18687/LEIRD2024.1.1.362

4. Logan CD, Hodges MI. Psychology of attitudes. New York: Nova Science Publishers, Inc.; 2012.

5. Alieto EO, Dumagay AH, Eijansantos AM, Estigoy EB, Vallejo RG, Serdenia JRC. Perceptions toward generative AI among Filipino pre- and in-service teachers: Implications for AI use in educational assessment. In: Lahby M, editor. Innovative educational assessment with generative AI: Opportunities, challenges, and practical case studies. Vol. 70. Springer; 2026. p. 225–43. https://doi.org/10.1007/978-3-032-05306-0_11

6. Cao Q, Yu Q. Application analysis of artificial intelligence virtual reality technology in fitness training teaching. International Journal of High Speed Electronics and Systems. 2025;34(2):2440084. https://doi.org/10.1142/S0129156424400846

7. Gao LX, López-Pérez ME, Melero-Polo I, Trifu A. Ask ChatGPT first! Transforming learning experiences in the age of artificial intelligence. Studies in Higher Education. 2024;49(12):2772-96. https://doi.org/10.1080/03075079.2024.2323571

8. Liu Z, Yue W. Research on the application of AI empowering new forms of university physical education curriculum teaching. In: 2024 5th International Conference on Information Science and Education (ICISE-IE 2024). IEEE; 2024. p. 474–8. https://doi.org/10.1109/ICISE-IE64355.2024.11025197

9. Yuan J. Application of artificial intelligence in physical education and future prospects. Revista de Psicologia del Deporte. 2022;31(4):271–8.

10. Toukoumidis AT, Mendoza CV, Alieto EO, Chiguano MP. The influence of the media on the perception of endophobia. Dirasat: Human and Social Sciences. 2025;53(4):9008. https://doi.org/10.35516/Hum.2025.9008

11. Alieto EO, Dumagay AH, Serdenia JRC, Labad EM, Galang SK, Vallejo RG. Attitude toward artificial intelligence among teacher aspirants in an emerging AI landscape: A gender-based analysis. In: González Vallejo R, Moukhliss G, Schaeffer E, Paliktzoglou V, editors. The Second International Symposium on Generative AI and Education (ISGAIE'2025). Lecture Notes on Data Engineering and Communications Technologies, Vol. 262. Springer; 2025. https://doi.org/10.1007/978-3-031-98476-1_39

12. Al-Smadi S, Al-Smadi F, Alzayyat A, Al-Shawabkeh JD. The role of AI anxiety and attitudes toward artificial intelligence in shaping healthcare perceptions among Jordanian children. Open Nursing Journal. 2025;19:e18744346417980. https://doi.org/10.2174/0118744346417980250718070018

13. Dumagay AH. Preservice teachers and AI in Education 5.0: Examining literacy, anxiety, and attitudes across gender, socioeconomic status, and training. EthAIca. 2025;4:432. https://doi.org/10.56294/ai2025432

14. Frenkenberg A, Hochman G. It's scary to use it, it's scary to refuse it: The psychological dimensions of AI adoption—Anxiety, motives, and dependency. Systems. 2025;13(2):82. https://doi.org/10.3390/systems13020082

15. Serdenia JR, Dumagay AH, Balasa K, Capacio E, Lauzon LD. Attitude, acceptability, and perceived effectiveness of artificial intelligence in education: A quantitative cross-sectional study among future teachers. LatIA. 2025;3:313. https://doi.org/10.62486/latia2025313

16. Cengiz S, Peker A. Generative artificial intelligence acceptance and artificial intelligence anxiety among university students: The sequential mediating role of attitudes toward artificial intelligence and literacy. Current Psychology. 2025;44(9):7991–8000. https://doi.org/10.1007/s12144-025-07433-7

17. Li H, Thien LM. Artificial intelligence (AI) anxiety and usage intention in English teaching: Insights from Chinese EFL pre-service teachers. Asian Education and Development Studies. 2025;1–14.

18. Maghanoy J, Tahil M, Sulasula J, Vallejo RG, Dumagay AH, Alieto EO. Gender and educational attainment dynamics on artificial intelligence anxiety among educators with emerging understanding. In: González Vallejo R, Moukhliss G, Schaeffer E, Paliktzoglou V, editors. The Second International Symposium on Generative AI and Education (ISGAIE'2025). Lecture Notes on Data Engineering and Communications Technologies, Vol. 262. Springer; 2025. https://doi.org/10.1007/978-3-031-98476-1_40

19. Schiavo G, Businaro S, Zancanaro M. Comprehension, apprehension, and acceptance: Understanding the influence of literacy and anxiety on acceptance of artificial intelligence. Technology in Society. 2024;77:102537. https://doi.org/10.1016/j.techsoc.2024.102537

20. Torreciba ND, Alieto EO. Attitude, anxiety, and literacy among teacher aspirants' embrace of artificial intelligence: Implications for practical and ethical challenges in integrating AI in education. EthAIca. 2025;4:416. https://doi.org/10.56294/ai2025416

21. Ata R, Alpaslan MM. Examining attitudes of Turkish pre-service teachers towards artificial intelligence. In: Uden L, Liberona D, editors. Communications in Computer and Information Science. Vol. 2551 CCIS. Springer; 2025. p. 47–54. https://doi.org/10.1007/978-3-031-98003-9_4

22. Fakhar H, Ajana L, Echantoufi N, El Khattabi K, Lamrabet M. Artificial intelligence from teachers' perspectives and understanding: Moroccan study. International Journal of Information and Education Technology. 2024;14(6):856–64. https://doi.org/10.18178/ijiet.2024.14.6.2111

23. Gapol PAM, Alieto EO, Capacio EA, Dumagay AH, Francisco CI, Vallejo RG. Preservice teachers' extent of knowledge and willingness to adopt generative AI in higher education. In: González Vallejo R, Moukhliss G, Schaeffer E, Paliktzoglou V, editors. The Second International Symposium on Generative AI and Education (ISGAIE'2025). Lecture Notes on Data Engineering and Communications Technologies, Vol. 262. Springer; 2025. https://doi.org/10.1007/978-3-031-98476-1_6

24. Uyanik Aktulun O, Kasapoglu K, Aydogdu B. Comparing Turkish pre-service STEM and non-STEM teachers' attitudes and anxiety toward artificial intelligence. Journal of Baltic Science Education. 2024;23(5):950–63. https://doi.org/10.33225/jbse/24.23.950

25. Dumagay AH, Balasa KA, Kunting AF, Cabangcala RB. AI acceptance among prospective social studies and culture and arts education students. In: Arai K, editor. Intelligent Computing. CompCom 2025. Lecture Notes in Networks and Systems, Vol. 1426. Springer; 2025. https://doi.org/10.1007/978-3-031-92611-2_11

26. Devanadera AC. AI integration in education: A correlational study on attitudes, perceptions and anxiety among pre-service teachers. LatIA. 2025;3:249. https://doi.org/10.62486/latia2025249

27. Kim SW, Lee Y. Investigation into the influence of socio-cultural factors on attitudes toward artificial intelligence. Education and Information Technologies. 2024;29(8):9907–35. https://doi.org/10.1007/s10639-023-12172-y

28. Yue M, Jong MSY, Ng DTK. Understanding K–12 teachers' technological pedagogical content knowledge

readiness and attitudes toward artificial intelligence education. Education and Information Technologies. 2024;29(15):19505–36. https://doi.org/10.1007/s10639-024-12621-2

29. Calles AB. Harnessing AI for content and strategies in instructional purposes: Limitations and red flags. Environment and Social Psychology. 2025;10(5):3235. https://doi.org/10.59429/esp.v10i5.3235

30. Ramos RF, De Angel RM, Ruetas AP, Enrile JC, Calimbo AL, Vargas PC. Impact assessment of ChatGPT and AI technologies integration in student learning: An analysis for academic policy formulation. In: Proceedings of the 2024 6th International Workshop on Artificial Intelligence and Education (WAIE 2024). Institute of Electrical and Electronics Engineers Inc.; 2024. p. 87–92. https://doi.org/10.1109/WAIE63876.2024.00023

31. Santos ZMB, Cadano KJ, Gyawali YP, Alieto EO, Clorion FD. Navigating between conditions and convictions: Investigating the influence of socio-geographical factors on interest and attitudes toward artificial intelligence among secondary school teachers. In: Motahhir S, Bossoufi B, editors. Lecture Notes in Networks and Systems. Vol. 1101 LNNS. Springer; 2024. p. 168–77. https://doi.org/10.1007/978-3-031-68675-7_17

32. Bastawrous A, Cleland C. Artificial intelligence in eye care: A cautious welcome. Community Eye Health Journal. 2022;35(114):13.

33. Cappello G, Defeudis A, Giannini V, Mazzetti S, Regge D. Artificial intelligence in oncologic imaging. In: Multimodality imaging and intervention in oncology. Springer; 2023. p. 585–97. https://doi.org/10.1007/978-3-031-28524-0_24

34. Darda P, Pendse MK. The impact of artificial intelligence (AI) transformation on the financial sector: From trading to security operations. In: Shaping cutting-edge technologies and applications for digital banking and financial services. Taylor & Francis; 2025. p. 322–39. https://doi.org/10.4324/9781003501947-20

35. Lexcellent C. Artificial intelligence. In: SpringerBriefs in Applied Sciences and Technology. Springer; 2019. p. 5–21. https://doi.org/10.1007/978-3-030-21445-6_2

36. Valadez SCO, Mendoza JCH, Villanueva-Hernandez V, Tijerina G, Avila-Guzman D. Languages with artificial intelligence applications. In: Exploring intersectionality and women in STEM. IGI Global; 2024. p. 192–201. https://doi.org/10.4018/979-8-3693-1119-6.ch010

37. Wheatley A, Hervieux S. Artificial intelligence and libraries. In: Encyclopedia of Libraries, Librarianship, and Information Science. Vol. 2. Elsevier; 2024. p. 286–90. https://doi.org/10.1016/B978-0-323-95689-5.00275-3

38. Buchanan BG. A (very) brief history of artificial intelligence. AI Magazine. 2005;26(4):53–60.

39. Holmes JH. Artificial intelligence. In: Clinical Applications of Artificial Intelligence in Real-World Data. Springer International Publishing; 2023. p. 221–30. https://doi.org/10.1007/978-3-031-36678-9_14

40. Benkő A, Lányi CS. History of artificial intelligence. In: Encyclopedia of Information Science and Technology. 2nd ed. IGI Global; 2008. p. 1759–62. https://doi.org/10.4018/978-1-60566-026-4.ch276

41. Rojas RVB. Artificial intelligence: Genesis, development, and future. In: Revolutionizing communication: The role of artificial intelligence. CRC Press; 2024. p. 1–15. https://doi.org/10.1201/9781003473633-1

42. Alomari SA, Sumari P, Zitar RA, Gul F, Jia H, Smerat A, Snasel V, Ezugwu AE, Abualigah L. Introduction to artificial intelligence and deep learning. In: A to Z of Deep Learning and AI. CRC Press; 2025. p. 1–8. https://doi.org/10.1201/9781003516385-1

43. Li J, Zhao Y, Sun C, Bao X, Zhao Q, Zhou H. A survey of development and application of artificial intelligence in smart grid. In: 2018 International Conference of Green Buildings and Environmental Management (GBEM 2018), IOP Conference Series: Earth and Environmental Science. Vol. 186(4). Institute of Physics Publishing; 2018. p. 012066. https://doi.org/10.1088/1755-1315/186/4/012066

44. Sarwar MG, Ashraf SK, Ahmad MN, Tabssum S. Application of artificial intelligence system in aerospace area. In: Advances in Aerospace Technologies. River Publishers; 2024. p. 211–35.

45. Cabato JU. From awareness to practice: Exploring the knowledge, attitudes, and practices of secondary ESL teachers in the Philippines toward ChatGPT in education. LatIA. 2025;3:360. https://doi.org/10.62486/latia2025360

46. Domingo AR, Clorion FDD, Mangila B, Hasan NN, Tarroza R, Flores B, Rillo R, Pantaleon C, Francisco CI, Delos Santos M, Alieto EO. Quill & Bytes: A qualitative analysis on the perceived impacts of AI-based paraphrasing tools in academic writing and performance toward higher education students. Procedia Computer Science. 2025;263:664–71. https://doi.org/10.1016/j.procs.2025.07.079

47. Francisco CI. Teachers' perceptions of learning from, about, and with artificial intelligence in education (AIED): Implications for ethical practice and the challenges of AI use in basic education. EthAIca. 2025;4:433. https://doi.org/10.56294/ai2025433

48. Zhou T, Wu X, Wang Y, Wang Y, Zhang S. Application of artificial intelligence in physical education: A systematic review. Education and Information Technologies. 2024;29(7):8203–20. https://doi.org/10.1007/s10639-023-12128-2

49. Huo D. Research on the practice path of artificial intelligence-enabled college students' physical health promotion. In: 2024 4th International Conference on Information Technology and Contemporary Sports (TCS 2024). IEEE; 2024. p. 18–22. https://doi.org/10.1109/TCS64526.2024.11025284

50. Wang J, Yang Y, Liu H, Jiang L. Enhancing the college and university physical education teaching and learning experience using virtual reality and particle swarm optimization. Soft Computing. 2024;28(2):1277–94. https://doi.org/10.1007/s00500-023-09528-4

51. Deng H, Xiao H, Xiang S, Liu J. Intelligent golf swing assessment: An AI-driven approach to personalized sports education. In: 2025 7th International Conference on Computer Science and Technologies in Education (CSTE 2025). IEEE; 2025. p. 1071–5. https://doi.org/10.1109/CSTE64638.2025.11091979

52. Zhang Y. An AI-based design of student performance prediction and evaluation system in college physical education. Journal of Intelligent and Fuzzy Systems. 2021;40(2):3271–9. https://doi.org/10.3233/JIFS-189367

53. Hussein L, Yusupova G, Dilshodbek M, Kirit DD. Gamification and artificial intelligence in physical education using a wearable device for athletes. In: 2025 International Conference on Computational Innovations and Engineering Sustainability (ICCIES 2025). IEEE; 2025. https://doi.org/10.1109/ICCIES63851.2025.11032626

54. Tian Y. Empowering college physical education: AI-driven training, teaching, and intelligent information processing. MCB Molecular and Cellular Biomechanics. 2024;21(1):327. https://doi.org/10.62617/mcb.v21i1.327

55. Zhou Y. The impact of the artificial intelligence (AI) art generator in pre-service art teacher training. In: Proceedings of the 2024 IEEE Conference on Artificial Intelligence (CAI 2024). IEEE; 2024. p. 1406–7. https://doi.org/10.1109/CAI59869.2024.00250

56. Tohănean DI, Vulpe AM, Mijaica R, Alexe DI. Embedding digital technologies (AI and ICT) into physical education: A systematic review of innovations, pedagogical impact, and challenges. Applied Sciences. 2025;15(17):9826. https://doi.org/10.3390/app15179826

57. Baena-Morales S, Sánchez-Jarque M, Ferriz-Valero A, Bofill-Herrero A. The paradox of experience: Generational analysis of AI integration in physical education using the iTPACK framework. Physical Education and Sport Pedagogy. 2025. https://doi.org/10.1080/17408989.2025.2536145

58. Yin N. The reform and development of physical education in colleges and universities in the era of artificial intelligence. In: Proceedings of the 2021 2nd International Conference on Information Science and Education (ICISE-IE 2021). IEEE; 2021. p. 1441–4. https://doi.org/10.1109/ICISE-IE53922.2021.00321

59. Olufemi TD. Theories of attitudes. In: Logan CD, Hodges MI, editors. Psychology of attitudes. Nova Science Publishers, Inc.; 2012. p. 61–78.

60. Schwarz N. Attitude measurement. In: Wright JD, editor. International Encyclopedia of the Social & Behavioral Sciences. 2nd ed. Elsevier Inc.; 2015. p. 178–82. https://doi.org/10.1016/B978-0-08-097086-8.24006-3

61. Balasa KA, Dumagay AH, Alieto EO, González Vallejo R. Gender and age dynamics in future educators' attitudes toward AI integration in education: A sample from state-managed universities in Zamboanga Peninsula, Philippines. Seminars in Medical Writing and Education. 2025;4:668. https://doi.org/10.56294/mw2025668

62. Pande K, Sonawane S, Jadhav V, Mali M. Artificial intelligence: Exploring the attitude of secondary students. Journal of E-Learning and Knowledge Society. 2023;19(3):43–8. https://doi.org/10.20368/1971-8829/1135865

63. Sánchez-Reina JR, Theophilou E, Hernández-Leo D, Ognibene D. Exploring undergraduates' attitudes towards ChatGPT: Is AI resistance constraining the acceptance of chatbot technology? In: Casalino G, Di Fuccio R, Fulantelli G, Taibi D, Raviolo P, Rivoltella PC, Toto GA, editors. Communications in Computer and Information Science. Vol. 2076 CCIS. Springer; 2024. p. 383–97. https://doi.org/10.1007/978-3-031-67351-1_26

64. Mukh YA, Abd-Rabo A, Tarter S. Preservice teachers' attitudes towards employing AI applications in the special education environment. In: Fostering inclusive education with AI and emerging technologies. IGI Global; 2024. p. 183–206. https://doi.org/10.4018/979-8-3693-7255-5.ch008

65. Mazı A. Investigation of primary school teacher's attitudes towards artificial intelligence. In: Integrating artificial intelligence in education: Enhancing teaching practices for future learning. IGI Global; 2024. p. 27–57. https://doi.org/10.4018/979-8-3693-3944-2.ch002

66. Mayasari ED, Rofiah K, Irvan M. Bridging scientific research and AI: How Indonesian teacher candidates perceive emerging technologies in education. In: Tomczyk L, editor. Communications in Computer and Information Science. Vol. 2537 CCIS. Springer; 2025. p. 304–27. https://doi.org/10.1007/978-3-031-95627-0_21

67. Ayanwale MA, Sanusi IT. Perceptions of STEM vs. non-STEM teachers toward teaching artificial intelligence. In: 16th IEEE AFRICON (AFRICON 2023). IEEE; 2023. p. 1–6. https://doi.org/10.1109/AFRICON55910.2023.10293455

68. Yang H. Multidimensional analysis of art education teachers' attitudes and self-efficacy toward artificial intelligence: Exploring relationships and strategies for enhancement. Interactive Learning Environments. 2025;33(4):2824–47. https://doi.org/10.1080/10494820.2024.2423175

69. Chavarria A, Palau R, Santiago R. Navigating stakeholders' perspectives on artificial intelligence in higher education. Algorithms. 2025;18(6):336. https://doi.org/10.3390/a18060336

70. Nidhi, Sandra. Attitude towards AI: Exploring role of psychological factors. In: Studies in Systems, Decision and Control. Vol. 236. Springer; 2025. p. 545–52. https://doi.org/10.1007/978-3-031-86712-5_48

71. Nja CO, Idiege KJ, Uwe UE, Meremikwu AN, Ekon EE, Erim CM, Ukah JU, Eyo EO, Anari MI, Cornelius-Ukpepi BU. Adoption of artificial intelligence in science teaching: From the vantage point of the African science teachers. Smart Learning Environments. 2023;10(1):42. https://doi.org/10.1186/s40561-023-00261-x

72. Galindo-Domínguez H, Delgado N, Campo L, Losada D. Relationship between teachers' digital competence and attitudes towards artificial intelligence in education. International Journal of Educational Research. 2024;126:102381. https://doi.org/10.1016/j.ijer.2024.102381

73. Morales-Cevallos MB, Alonso-García S, Martínez-Menéndez A, Victoria-Maldonado JJ. Artificial intelligence adoption amongst digitally proficient trainee teachers: A structural equation modelling approach. Social Sciences. 2025;14(6):355. https://doi.org/10.3390/socsci14060355

74. Musood T, Kaur B. Digital competence and attitudes toward AI: Mindful attention awareness as a mediator. IAFOR Journal of Education. 2025;13(2):113–33. https://doi.org/10.22492/ije.13.2.05

75. Tomczyk Ł, Majkut A. Integrating AI in education: An analysis of factors influencing the acceptance, concerns, attitudes, competencies and use of generative artificial intelligence among Polish teachers. Human Behavior and Emerging Technologies. 2025;2025(1):5599169. https://doi.org/10.1155/hbe2/5599169

76. Yang Y, Xia X. Examining the association between teacher education students' AI literacy and digital competence in educational internship. In: 2025 11th International Conference on Education and Training Technologies (ICETT 2025). IEEE; 2025. p. 282–7. https://doi.org/10.1109/ICETT66247.2025.11137290

77. Heine S, König J. Applying artificial intelligence in teacher education: Preservice teachers' attitudes and reflections in using ChatGPT for teaching and learning. European Journal of Teacher Education. 2025. https://doi.org/10.1080/02619768.2025.2540791

78. Acosta-Enriquez BG, Ballesteros MAA, Guzman Valle MA de los A, Angaspilco JEM, Blanco-García LE, Ventura GC, Requejo JDC, Torre MC. Determinants of AI use in university teachers: The role of leadership, teaching concerns, and constructivist pedagogical beliefs. Human Behavior and Emerging Technologies. 2025;2025(1):4834893. https://doi.org/10.1155/hbe2/4834893

79. Ballenas EB, Lasco MT. Exploring mathematics teachers' behavioral intentions to use artificial intelligence through structural equation modeling. In: 2024 International Conference on TVET Excellence and Development (ICTeD 2024). IEEE; 2024. p. 195–200. https://doi.org/10.1109/ICTeD62334.2024.10844599

80. Lu W, Lin C. Meta-analysis of influencing factors on the use of artificial intelligence in education. Asia-Pacific Education Researcher. 2025;34(2):617–27. https://doi.org/10.1007/s40299-024-00883-w

81. Jia M. Does artificial intelligence erode undergraduates' traditional cultural values and interactions with teachers in the classroom? Journal of Applied Research in Higher Education. 2025;1–13. https://doi.org/10.1108/JARHE-04-2025-0270

82. Turós M, Tari IP, Szőke-Milinte E, Rubovszky R, Soltész-Várhelyi K, Zsódi V, Szűts Z. Beyond utility: The impact of religiosity and calling on AI adoption in education. Religions. 2025;16(8):1069. https://doi.org/10.3390/rel16081069

83. Ashipala DO, Shilunga A. Acceleration of the biopsychosocial model in public health. In: Acceleration of the biopsychosocial model in public health. IGI Global; 2023. p. 194–210. https://doi.org/10.4018/978-1-6684-6496-0.ch009

84. Boughner EN. Anxiety. In: Zeigler-Hill V, Shackelford TK, editors. The Wiley Encyclopedia of Personality and Individual Differences: Personality Processes and Individual Differences. Wiley; 2020. p. 37–41. https://doi.org/10.1002/9781119547174.ch183

85. Öhman A. Anxiety. In: Fink G, editor. Encyclopedia of Stress. 2nd ed. Elsevier; 2007. p. 236–9. https://doi.org/10.1016/B978-012373947-6.00039-8

86. Gültekin V, Kavak A. An assessment of artificial intelligence anxieties of academic librarians in Türkiye. Journal of Academic Librarianship. 2025;51(3):103058. https://doi.org/10.1016/j.acalib.2025.103058

87. Johnson DG, Verdicchio M. AI anxiety. Journal of the Association for Information Science and Technology. 2017;68(9):2267–70. https://doi.org/10.1002/asi.23867

88. Resti THV. Integración de la Inteligencia Artificial (IA) en la educación superior rural filipina: Perspectivas, desafíos y consideraciones éticas. IJERI: International Journal of Educational Research and Innovation. 2024;(23):1–25.

89. Jabali O, Saeedi M, Alawneh Y. Navigating anxiety in academia: The role of generative artificial intelligence. Education and Information Technologies. 2025;30(11):15529–44.

90. Parviz M, Arthur F. AI anxiety in English language education: A study of Iranian EFL teachers' perceptions and demographic influences. International Journal of Computer-Assisted Language Learning and Teaching. 2025;15(1). https://doi.org/10.4018/IJCALLT.386135

91. Mohebi L. A qualitative study on the integration of AI in education: Perceptions, challenges, and opportunities among selective in-service and pre-service teachers in the UAE. In: Lecture Notes in Educational Technology. Part F312. Springer Science and Business Media Deutschland GmbH; 2025. p. 113–26. https://doi.org/10.1007/978-981-96-4952-5_8

92. Granström M, Oppi P. Assessing teachers' readiness and perceived usefulness of AI in education: An Estonian perspective. Frontiers in Education. 2025;10:1622240. https://doi.org/10.3389/feduc.2025.1622240

93. Clorion FDD, Fuentes J, Suicano DJ, Estigoy E, Eijansantos A, Rillo R, Pantaleon C, Francisco CI, Delos Santos M, Alieto EO. AI-powered professionals and digital natives: A correlational analysis of the use and benefits of artificial intelligence for the employability skills of postgraduate education students. Procedia Computer Science. 2025;263:107–14. https://doi.org/10.1016/j.procs.2025.07.014

94. Feng C, Chen J, Chen X, Wu X. Navigating AI anxiety: Understanding librarians' continuous adoption of artificial intelligence in libraries. In: Wu J, Hu X, Nurmikko-Fuller T, Chu S, Yang R, Downie JS, editors. Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL 2024). IEEE; 2025. Article 102. https://doi.org/10.1145/3677389.3702551

95. Christian M, Pardede R, Yulita H, Dewi YK, Wibowo S, Sunarno S. Anxiety-related AI configuration and AI usage behavior among lecturers: Gender's moderating role. In: Proceedings of the 2024 International Conference on Control and Automation, Electronics, Robotics, Internet of Things, and Artificial Intelligence (CERIA 2024). IEEE; 2024. https://doi.org/10.1109/CERIA64726.2024.10914840

96. Ilhan B. Motivation to teach and AI anxiety among TESOL student-teachers with degree-year and gender differences. LLT Journal: Journal on Language and Language Teaching. 2025 Apr;28(1):153–73. https://doi.org/10.24071/llt.v28i1.9166

97. Zhang J, Baharudin AM. The impact of artificial intelligence and virtual teachers on students' learning stress and anxiety: A social psychological analysis. Environment and Social Psychology. 2025;10(4):3515. https://doi.org/10.59429/esp.v10i4.3515

98. Nazeer S, Ahmad A. AI anxiety or job crafting? How employees' AI perceptions reshape innovative work behaviour in Pakistan's corporate landscape. International Journal of Sociology and Social Policy. 2025;1–18. https://doi.org/10.1108/IJSSP-04-2025-0227

99. Schepman A, Rodway P. Initial validation of the general attitudes toward artificial intelligence scale. Computers in Human Behavior Reports. 2020;1:100014. https://doi.org/10.1016/j.chbr.2020.100014

100. Wang YY, Wang YS. Development and validation of an artificial intelligence anxiety scale: An initial application in predicting motivated learning behavior. Interactive Learning Environments. 2022;30(4):619–34. https://doi.org/10.1080/10494820.2019.1674887

FINANCING

The author did not receive financing for the development of this research.

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Keith Alvin Solamillo.
Formal analysis: Keith Alvin Solamillo.
Research: Keith Alvin Solamillo.
Methodology: Keith Alvin Solamillo.
Project management: Keith Alvin Solamillo.
Resources: Keith Alvin Solamillo.
Software: Keith Alvin Solamillo.
Supervision: Keith Alvin Solamillo.
Validation: Keith Alvin Solamillo.
Display: Keith Alvin Solamillo.
Drafting - original draft: Keith Alvin Solamillo.
Writing - proofreading and editing: Keith Alvin Solamillo.