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ORIGINAL

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

Percepciones de los Docentes sobre el Aprendizaje de, sobre y con la Inteligencia Artificial en la Educación (IAED): Implicaciones para la Práctica Ética y los Desafíos del Uso de la IA en la Educación Básica

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ABSTRACT

Teachers' perceptions play a key role in shaping how emerging technologies are accepted and applied in education. With artificial intelligence (AI) becoming more prominent in schools, it is important to explore how teachers view its role as a source of knowledge, a subject to be taught, and a tool for instruction. The purpose of this study was to examine teachers' perceptions across three domains—learning from AI, learning about AI, and learning with AI—and to analyze how these areas are interrelated. A descriptive-quantitative-correlational design was employed, involving 204 public elementary teachers selected through proportionate random sampling from 22 schools in Manicahan District, Division of Zamboanga City. Results revealed that teachers expressed high perceptions of learning from AI (M = 4,36, SD = 0,58) and learning about AI (M = 4,22, SD = 0,62), while learning with AI received a very high rating (M = 4,48, SD = 0,55). The overall mean score of 4,35 (SD = 0,58) indicated generally favorable views toward AI in education. Correlation analysis further showed significant positive relationships among the three domains, with the strongest link between learning about AI and learning with AI ($r = 0,546$, $p < 0,001$). These findings suggest that as teachers deepen their knowledge of AI, they are more inclined to apply it in classroom practice, highlighting the importance of professional development that integrates both conceptual understanding and practical application of AI in teaching.

Keywords: Artificial Intelligence in Education; Learning from AI; Learning about AI; Learning with AI.

RESUMEN

Las percepciones de los docentes desempeñan un papel fundamental en la forma en que las nuevas tecnologías son aceptadas y aplicadas en la educación. Con la creciente presencia de la inteligencia artificial (IA) en las escuelas, resulta importante explorar cómo los maestros perciben su papel como fuente de conocimiento, como asignatura a enseñar y como herramienta de apoyo a la instrucción. El propósito de este estudio fue examinar las percepciones de los docentes en tres ámbitos—aprender de la IA, aprender sobre la IA y aprender con la IA—y analizar cómo se relacionan entre sí. Se utilizó un diseño descriptivo-cuantitativo-correlacional, con la participación de 204 maestros de educación primaria seleccionados mediante muestreo aleatorio proporcional en 22 escuelas del Distrito de Manicahan, División de Zamboanga City. Los resultados mostraron que los docentes expresaron altas percepciones en cuanto a aprender de la IA (M = 4,36, DE = 0,58) y aprender sobre la IA (M = 4,22, DE = 0,62), mientras que aprender con la IA obtuvo una valoración muy alta (M = 4,48, DE = 0,55). La media general de 4,35 (DE = 0,58) reflejó visiones generalmente favorables hacia

la IA en la educación. El análisis de correlación reveló además relaciones positivas significativas entre los tres ámbitos, destacándose el vínculo más fuerte entre aprender sobre la IA y aprender con la IA ($r = 0,546$, $p < 0,001$). Estos hallazgos sugieren que, a medida que los docentes profundizan su conocimiento de la IA, muestran mayor disposición para aplicarla en la práctica de aula, lo que resalta la importancia de programas de desarrollo profesional que integren tanto la comprensión conceptual como la aplicación práctica de la IA en la enseñanza.

Palabras clave: Inteligencia Artificial en la Educación; Aprender de la IA; Aprender sobre la IA; Aprender con la IA.

INTRODUCTION

Artificial intelligence (AI) is increasingly shaping how societies learn, communicate, and work, making it a defining feature of the Fourth Industrial Revolution.[1] The rapid growth of generative AI tools, such as ChatGPT, has further underscored the urgency of connecting education to AI so that both teachers and learners are equipped to navigate a technology-driven future.[2] Globally, governments have initiated policy frameworks that recognize AI as a driver of economic and social development, with education positioned as a key area of application. In the United States, the National AI Initiative Act of 2020 established funding mechanisms to strengthen students' AI-related skills.[3] In the United Kingdom, the Office for Artificial Intelligence launched the National AI Strategy to map future pathways for AI adoption in schools.[4] Similarly, China's New Generation Artificial Intelligence Development Plan and the Ministry of Education's Education Informatization 2.0 Action Plan emphasize embedding AI in school curricula.[5,6]

Despite these initiatives, the readiness of schools to integrate AI into basic education often falls short of expectations. UNESCO[7,8] highlights barriers, including the absence of clear curriculum guidelines, limited leadership support, and teachers' lack of confidence in applying AI tools in instruction. Moreover, the conceptualization of AI in education (AIED) remains fragmented, leaving schools to interpret how AI can be meaningfully embedded in practice. To address this gap, Wang and Cheng[9] proposed a tripartite framework of AIED, which includes learning about AI, learning with AI, and learning from AI. This framework captures both the pedagogical opportunities and the challenges of AI integration in classroom contexts.

Teachers' perceptions of these dimensions are particularly critical, as their acceptance or resistance often determines the success of integration. Previous studies report that while teachers recognize the potential of AI for personalizing learning and improving efficiency, they remain cautious due to concerns over ethics, equity, and workload.[10,11] Issues such as data privacy, algorithmic bias, and the socioemotional limitations of AI exacerbate these concerns.[12,13] Viberg et al.[14] further contend that teachers' trust in AI depends not only on its technical reliability but also on their literacy, training, and confidence.

Recent empirical studies reinforce these insights but are largely situated in higher education or preservice teacher training. For example, Bantoto et al.[15] reported that students perceived AI as an effective tool in classroom instruction, particularly in academic writing, whereas Clorion et al.[16] documented how students in an emerging economy understood AI's influence and use in higher education. Similarly, Francisco et al.[17] reported that senior high school students generally hold positive attitudes toward using ChatGPT as a learning tool. Gregorio et al.[18] emphasized the importance of preparing preservice teachers to integrate AI into their professional practice in an ethical manner. Other related studies also provide context for teacher perceptions in education. For example, Alieto, Devanadera, and Buslon[19] examined how women teachers navigated cognition in K–12 language policy implementation, underscoring that teacher cognition shapes responses to systemic changes. Bacang, Rillo, and Alieto[20] explored how gender influences rhetorical choices in ESL writing, reflecting how demographic factors may also shape perceptions and practices in broader educational contexts. Similarly, Casiano, Encarnacion, Jaafar, and Alieto[21] investigated digital game-based learning and teacher aspirants' attitudes, offering evidence that teachers' openness to digital tools parallels the challenges and opportunities of adopting AI in the classroom. While these studies expand knowledge of AIED in postsecondary contexts, less is known about how in-service teachers in basic education perceive AI across its three dimensions. This represents a significant gap, as these teachers are the frontliners of curriculum delivery in early learning environments.

Thus, this study aims to explore teachers' perceptions of learning from, about, and with AI in education, focusing on their implications for ethical practice and the challenges of AI use in basic education. The central objective is to examine the correlations among the three subscales of AIED and to understand how teachers' views relate to classroom practice and the responsible integration of AIED. Addressing this issue is expected to provide insights that will inform professional development, strengthen digital literacy, and guide policy strategies for ensuring that AI integration in schools is both practical and ethically grounded.

Learning from Artificial Intelligence

In the context of education, learning from AI emphasizes the role of artificial intelligence as a direct source of knowledge and a facilitator of student learning. AI-powered platforms provide instructional support that extends beyond traditional methods, creating opportunities for more personalized, adaptive, and engaging learning experiences.[22]

Several AI applications have been developed to enhance students' learning outcomes. Instructional platforms that employ machine learning techniques—such as chatbots and expert systems—allow teachers to optimize class time and provide real-time support for students' queries.[23] These systems function as on-demand resources, enabling students to access explanations and feedback outside of scheduled lessons, thereby extending learning opportunities beyond the classroom.

Similarly, intelligent tutoring systems (ITSs) have been widely studied for their potential to reinforce student knowledge and scaffold learning processes. Kabudi et al.[24] argued that ITSs not only improve teaching quality but also enhance the personalization of instruction by adapting to individual student progress. In addition, recommender systems have proven effective in curating multimedia learning resources that support active and self-regulated learning. By tailoring suggestions on the basis of student profiles, recommender systems encourage learners to take greater responsibility for their own progress.[25]

AI has also been integrated into classroom assistants, which can dynamically respond to student progress and stimulate motivation by providing timely interventions.[26] In addition, learning companions and AI-aided systems have demonstrated the capacity to deliver customized content and learning pathways that consider learners' interests, aptitudes, and behavioral patterns.[27] These systems highlight the role of AI not only as a tool but also as a learning partner that adjusts educational experiences to meet the diverse needs of learners.

Emerging research adds depth to this perspective by demonstrating how students and teachers interact with AI in academic settings. Domingo et al.[28] reported that higher education students perceived AI-based paraphrasing tools as valuable in supporting academic writing, suggesting that learners actively draw knowledge from AI systems to improve performance. Bantoto et al.[15] and Clorion et al.[16] also reported that students in emerging economies view AI as a reliable aid in classroom learning and academic tasks. Moreover, studies focusing on preservice teachers highlight the importance of readiness to learn from AI. Gregorio et al. [18] revealed that preservice teachers require stronger competencies to ethically integrate AI tools into instruction, whereas Gapol et al.[29] reported that their willingness to adopt generative AI is closely tied to their extent of knowledge. Complementary findings by Fernandez et al.[30] and Lozada et al.[31] further emphasize how attitudes toward technology, access, and economic factors influence the extent to which learners can effectively benefit from AI. Relatedly, Pahulaya et al.[32] demonstrated that teachers' attitudes and cognition toward language policies were shaped by gender differences, underscoring that sociodemographic and contextual factors likewise play a role in shaping how educators perceive and engage with innovations such as AI.

Thus, learning from AI enables a shift toward more personalized and student-centered approaches. AI applications have demonstrated effectiveness in supporting individualized instruction and enhancing overall learning quality. However, while the potential of AI to serve as a source of learning is clear, challenges remain in ensuring equitable access, safeguarding student data, and preparing both teachers and learners to critically and ethically engage with AI technologies in practice.

Learning about artificial intelligence

Learning about AI involves equipping learners with AI-related knowledge, skills, and values, enabling them to thrive in an increasingly AI-saturated future by developing AI literacy. Previously, providing scaffolding for children to understand AI knowledge through syntax-based programming was highly challenging, particularly due to its technical complexity. [33,34] However, the emergence of more age-appropriate hardware and software, including programmable kits and drag-and-drop, block-based platforms, in recent years has made it easier for teachers to teach AI skills to younger learners.

There are various pedagogies for learning about AI, including project-based learning (PBL), which allows students to apply what they have learned to real-world problems, and computational thinking (CT), which uses the principles of computer science to decipher issues. Both PBL and CT can be used to teach students about AI concepts and how to use AI to solve problems.[35,36] Inquiry-based learning has also been highlighted as a practical approach, enabling learners to develop critical thinking while exploring AI through data analysis and algorithmic reasoning.[37] Similarly, product and solution design activities have been shown to nurture creativity and innovation, as students prototype AI applications that integrate technical skills with imagination.[38]

The growing exposure to AI-powered technologies in daily life also provides more opportunities for learners to comprehend AI concepts and increase their ICT awareness, thus contributing to their adaptation to life in a "smart city".[39] Cheng and Wang[40] further emphasized that equipping students with AI literacy is essential for career readiness, highlighting the need to integrate AI education into formal curricula. The models of learning about AI in basic education are being actively explored by researchers.[41], actual practices in schools have yet

to become mainstream, suggesting a gap between theory and classroom implementation.

Recent studies provide further evidence of the importance of AI literacy and technological readiness. Jacinto and Alieto[42] reported that ESL teachers' virtual teaching attitudes were strongly tied to their technological competence, underscoring the role of teacher readiness in integrating digital innovations into instruction. Similarly, Mumbing et al.[43] reported that language teachers in developing contexts viewed digital education positively, although competence levels varied, highlighting challenges in mainstreaming AI literacy. Abequibel et al.[44] further showed that digital habits, such as reading practices, significantly influence how prospective teachers adapt to technology-mediated learning. In parallel, Devanadera and Alieto[45] noted that even in early education, cognitive and linguistic factors such as lexical bias affect how learners process new knowledge, indicating that AI literacy must account for foundational cognitive development. Lee and Alieto[46] also demonstrated that teaching self-efficacy in virtual environments is influenced by gender, which suggests that demographic and personal factors similarly play a role in shaping readiness for AI literacy.

Within the AI domain, Santos et al.[47] reported that socio-geographical conditions influence teachers' interest in AI, demonstrating how context affects AI adoption. Fuentes et al.[48] also reported that teacher education students displayed openness toward ChatGPT as a learning tool, reflecting the growing relevance of AI literacy in teacher training programs. Together, these studies reinforce the argument that developing AI literacy requires not only technical skills but also favorable attitudes, access, and contextual support.

Thus, learning about AI extends beyond teaching programming or algorithms; it includes fostering awareness, competence, and readiness among both students and teachers. While technological scaffolds are increasingly available, the effective integration of AI literacy depends on addressing disparities in competence, access, and teacher preparedness, ensuring that future generations are equipped to thrive in AI-driven societies.

Learning with artificial intelligence

Learning with AI refers to using AI tools to support and enhance educational practices. In smart learning environments, AI can automatically record student behaviors and better direct teacher attention in the classroom through recognition and tracking technologies.[49] Teachers can also rely on AI-powered tools to reduce the number of routine administrative tasks, allowing them to focus more on higher-order functions such as designing meaningful learning experiences and mentoring students—areas that machines cannot easily replace.[49]

One of the most widely recognized applications of learning with AI is learning analytics (LA). LA empowers teachers to make data-informed decisions as they review and improve teaching and learning practices, and it can even help predict students' performance in public examinations. Algorithms analyze data about learners and their environments, enabling teachers to deliver instructional content and feedback that is sharply tailored to individual progress and areas of difficulty. LA also provides insights into learning behaviors, patterns, and characteristics, allowing teachers to design and implement more personalized activities.

Recent studies have piloted LA dashboards that display learning behavior patterns, enabling teachers to offer just-in-time support to students.[50] Such dashboards generate data visualizations that help educators capture student learning performance more clearly. Another application of LA focuses on improving learner retention and success by enabling the early detection of students at risk of failure or dropout.[51] LA has also been explored as a tool for strengthening academic integrity, for example, by examining language-use patterns in student assignments.[52]

These implementations demonstrate how LA allows teachers to make informed pedagogical choices, provide differentiated instruction, and provide timely feedback. Teachers can continuously refine their strategies and create more responsive classrooms. However, the integration of AI into teaching practice depends not only on the availability of tools but also on teacher readiness and attitudes. Alieto et al. [53] reported that while teachers across subject disciplines recognized the benefits of digital classrooms, disparities in technological competence and access shaped their ability to maximize AI potential. Similarly, Cabangcala et al.[54] reported that during the transition to online learning, teachers' technological competence became a critical factor in adapting to AI-mediated instruction.

Demographic and psychosocial factors also shape teacher perceptions. Balasa et al.[55] reported that gender and age dynamics influence future educators' attitudes toward AI integration, whereas Maghanoy et al.[56] highlighted that educational attainment plays a role in shaping AI-related anxiety among educators. At the same time, Clorion et al.[57] demonstrated that AI use contributes not only to improved learning outcomes but also to employability skills, positioning teachers and students alike to benefit from digitally enhanced educational practices.

These studies suggest that learning with AI is not only about adopting technology but also about preparing teachers to engage with it confidently, equitably, and ethically. However, issues of trustworthiness and data use remain pressing.[58,59], AI-supported applications, such as LA, demonstrate a shift away from the traditional one-size-fits-all model toward personalized or precision education.

METHOD

Research Design

This study aimed to examine teachers' perceptions of learning from, about, and with artificial intelligence (AI) in education, as well as the relationships among these three areas of learning. To achieve this goal, the study employed a quantitative, cross-sectional, correlational survey design. As Kothari[60] explains, this type of design involves collecting numerical data and analyzing it statistically to gain a better understanding of the variables being studied. The correlational part looks at the degree and direction of relationships between the three subscales, whereas the descriptive part provides an overall picture of teachers' perceptions.[61,62]

This design was chosen because it aligns with the study's purpose, which is not only to describe the levels of teachers' perceptions but also to examine their connections. Since the data were collected from a group of teachers at one point in time, the study is also cross-sectional in nature.[63] This approach enables an understanding of how teachers currently perceive AI in basic education and how their views on learning from, about, and with AI are interrelated.

Respondents of the Study

The respondents of this study were public elementary school teachers from twenty-two (22) schools in Manicahan District, Division of Zamboanga City. On the basis of district records, the total teacher population was four hundred and seventeen (417). To identify the appropriate number of respondents, the study applied Slovin's formula with a five percent (5 %) margin of error, which resulted in a sample size of approximately two hundred four (204) teachers.

To ensure that all schools were fairly represented, the study employed a proportionate stratified random sampling method. Each school was treated as a stratum, and the number of teachers chosen from each school was calculated on the basis of its share of the total population. Larger schools, such as School 08 with one hundred eleven (111) teachers, contributed more respondents, whereas smaller schools with fewer than ten (10) teachers contributed proportionately fewer. Random selection was then applied within each school to minimize bias and ensure that every teacher had an equal opportunity to participate in the study.

This approach was selected because it provides a balanced and fair representation of the whole district. It also helps capture the perspectives of teachers from both large and small schools, as well as those working in central and remote areas.

Research Tool

To measure teachers' perceptions of artificial intelligence (AI) in education, this study used a survey questionnaire developed by Cheng and Wang[40] and published in Computers and Education: Artificial Intelligence. The instrument is based on the framework of learning from AI, learning about AI, and learning with AI, which has been recognized as a useful model for examining how AI can be integrated into teaching and learning. Using this framework ensured that the study was guided by a tool that is both conceptually grounded and empirically tested.

The questionnaire consisted of eighteen (18) items grouped into three parts. The Learning about AI section contains six (6) items that focus on how AI can help students build the knowledge, skills, and values necessary in an AI-driven world. The items in this part included programming activities, project-based learning, inquiry-based learning, and product or solution design, all of which encourage computational thinking, creativity, problem-solving, and ICT awareness. The Learning with AI section also contains six (6) items, which look at how AI supports teachers in instruction. These items measure the ability of AI systems to generate data and visualizations, predict student performance, provide insights into learning processes, and support the creation of more personalized learning activities. The Learning from AI section included another six (6) items describing AI-powered systems as direct sources of learning. The items in this part addressed how AI can extend opportunities beyond classroom time, consolidate outcomes, respond to student needs, and offer multimedia resources tailored to learners.

Responses were rated on a six-point (6-point) Likert scale ranging from strongly disagree (1) to strongly agree (6). This type of scale encouraged participants to take a position rather than remain neutral. Cheng and Wang[40] reported high levels of reliability for the instrument, with Cronbach's alpha coefficients of 0,926 for Learning about AI, 0,966 for Learning with AI, and 0,940 for Learning from AI. For the present study, the instrument was pilot tested among 30 public elementary school teachers from Zamboanga City Division who were not included in the final sample. The pilot testing yielded Cronbach's alpha values of 0,918 for Learning about AI, 0,955 for Learning with AI, and 0,934 for Learning from AI. These results provided further evidence of reliability and validity in the specific context of this research, underscoring the methodological rigor of the study. These values exceed the commonly accepted benchmark of 0,70, indicating excellent internal consistency. In addition, the validity of the instrument was confirmed through factor analysis, which supported the three-part structure and

showed that the items measured their intended dimensions.

Data collection procedure

The data-gathering process was carried out using an online platform (Google Forms), where the adopted research instrument was digitalized. At the beginning of the form, a cover letter from the researcher was included, requesting the voluntary participation of the teachers. Once participants confirmed their consent, they were asked to provide basic demographic information, with their name requested only as an optional entry.

Teachers were assured that their personal information would remain confidential and that all responses would be treated with the highest level of privacy. Before proceeding to the questionnaire, respondents were presented with clear instructions outlining the study's objectives and guidance on completing the form. The instrument consisted of eighteen (18) items designed to measure teachers' perceptions of learning from, about, and with AI in education.

The survey was open for a three-week period, during which the researcher actively facilitated participation through multiple channels, including official school communication lines, district group chats on Facebook Messenger, and in-person follow-ups. Reminders were sent regularly to encourage timely responses. Out of the targeted 204 teachers, all provided complete responses, yielding a 100 % response rate within the scheduled data-gathering timeframe.

Data Analysis Procedure and Statistical Treatment

The data gathered were analyzed via the IBM SPSS 29,0 program. First, whether the collected data were normally distributed was determined by examining the skewness coefficients. The normality of the sample was then tested via the Kolmogorov–Smirnov test, which revealed that the data were normally distributed ($p = 0,082 > 0,05$). This finding indicated that the assumptions for applying parametric tests were met.

To determine the levels of teachers' perceptions of learning from AI, learning about AI, and learning with AI, descriptive statistics such as the mean and standard deviation were employed. These measures provided an overview of the respondents' overall ratings across the three subscales.

To examine the interrelationship among the three subscales, the Pearson product–moment correlation coefficient (Pearson r) was used. A positive correlation value ($0 < r \leq 1$) indicated a direct relationship where both variables increased together, whereas a negative correlation value ($-1 \leq r < 0$) indicated an inverse relationship where one variable increased as the other decreased. The strength of the correlation was determined by the closeness of the coefficient to 1 or -1. The p value was used to determine the significance of the correlation, with values less than 0,05 suggesting that the correlation was statistically significant and not due to chance.

After the results were identified, interpretation was performed to properly determine the levels among the variables. The descriptive statistics for the perception items were interpreted via a five-level scale, where weighted mean values ranging from 5,00-4,21 were described as very high, 4,20-3,41 as high, 3,40-2,61 as moderate, 2,60-1,81 as low, and 1,80-1,00 as very low. This interpretation scale was applied across the three subscales of learning from AI, learning about AI, and learning with AI.

The interrelationship among the three subscales was further interpreted on the basis of the correlation values. A positive value ($0 < r \leq 1$) indicates a direct relationship, whereas a negative value ($-1 \leq r < 0$) indicates an inverse relationship. The closer the coefficient was to either 1 or -1, the stronger the relationship was. The p value was also used to test statistical significance, with values less than 0,05 confirming that the observed correlation was meaningful and unlikely to have occurred by chance.

To provide deeper insights aligned with the study's focus on implications for ethical practice, additional exploratory analyses were integrated. These included examining subgroup patterns by teaching level and years of experience, which helped identify whether certain groups of teachers demonstrated stronger or weaker perceptions. Moreover, effect size calculations complemented significance testing to assess the practical relevance of the relationships found. Beyond technical correlations, the interpretation also considered how teachers' varying levels of familiarity and engagement with AI could influence ethical dimensions in classroom practice, such as equity of access, responsible AI use, and the balance between human and machine roles in education. This extended layer of analysis strengthened the connection between statistical outcomes and their ethical implications in real-world teaching contexts.

Ethical Considerations

This study adhered strictly to ethical principles to ensure the protection, dignity, and rights of all participants involved. Prior to data collection, formal approval was secured from the Schools Division Superintendent of Zamboanga City and the district supervisor of Manicahan District. Similarly, the principals of the participating schools granted permission to conduct the study. All teacher-respondents were informed of the purpose of the research, assured of confidentiality, and asked to provide their voluntary consent before participation.

Informed Consent

Informed consent was obtained from all teacher-participants before their involvement in the study. Written consent forms explained the purpose, procedures, potential risks, and benefits of participation. Participants were assured that their responses would be treated with the highest ethical standards and used solely for academic purposes.

Confidentiality and Anonymity

All personal information was treated with strict confidentiality. Respondents' identities were anonymized using coding systems, ensuring that individual responses could not be traced back to them in any report or publication. Data were securely stored in password-protected files accessible only to the researcher.

Minimizing Risks

The research posed minimal risk to participants. No sensitive or intrusive questions were asked, and the instruments used focused strictly on professional perceptions of AI in education. Respondents were given the freedom to clarify or skip items if they felt uncomfortable.

Voluntary Participation and Right to Withdraw

Participation in the study was entirely voluntary. Teachers were informed that they could withdraw at any stage or decline to answer specific questions without facing any penalties or consequences related to their professional standing.

Use of Data and Dissemination

Collected data were used solely for academic and research purposes and reported in aggregate form. Findings were shared with school and division stakeholders to inform future localized policies and teacher professional development initiatives, while maintaining the confidentiality of all participants.

RESULTS

Teachers' Perceptions of Learning from, about, and with Artificial Intelligence in Education

Table 1. Descriptive statistics on teachers' perceptions of learning from, about, and with AI

AI In Education	Mean	SD	Interpretation
Learning from AI	4,36	0,58	High
Learning about AI	4,22	0,62	High
Learning with AI	4,48	0,55	Very High
Overall	4,35	0,58	High

The results indicate that teachers generally exhibit positive perceptions of artificial intelligence in education. Learning from AI obtained a mean score of 4,36 (SD = 0,58), whereas learning about AI yielded a slightly lower mean score of 4,22 (SD = 0,62); both fall under the high category. In contrast, learning with AI received the highest rating, with a mean of 4,48 (SD = 0,55), indicating a very high level. Considering all three domains together, the overall mean score of 4,35 (SD = 0,58) reflects a generally high perception of AI among teachers.

Interrelations among Teachers' Perceptions of Learning from, about, and with Artificial Intelligence

Table 2. Pearson Correlations Among Subscales of Teachers' Perceptions of AI in Education

Variables		p value	r-value	Interpretation
Learning from AI	Learning about AI	0,002	0,318	Weak Positive Correlation
Learning about AI	Learning with AI	0,000	0,546	Moderate Positive Correlation
Learning with AI	Learning from AI	0,000	0,261	Weak Positive Correlation

Pearson correlation analysis showed significant positive relationships among the three domains of teachers' perceptions of AI in education. A weak positive correlation was found between learning from AI and learning about AI ($r = 0,318$, $p = 0,002$), while a moderate positive correlation emerged between learning about AI and learning with AI ($r = 0,546$, $p < 0,001$). Learning with AI and learning from AI were also positively correlated,

though at a weaker level (r = 0,261, p < 0,000).

DISCUSSION

The findings of this study provide meaningful insights into two interrelated aspects of AI integration in basic education: teachers' perceptions across different dimensions of AI use and the interconnections among these domains.

Teachers' Positive Orientation Toward AI as a Pedagogical Resource

The results confirm that teachers generally hold favorable perceptions of artificial intelligence in education, with the strongest support evident when AI is used directly as an instructional tool. This finding is consistent with Cheng and Wang[40], who reported that teachers in Hong Kong expressed positive attitudes toward AI integration when it was framed as a supportive aid for classroom teaching rather than as a subject requiring advanced technical knowledge. Similarly, Hwang and Chang[22] found that educators are more inclined to adopt AI systems when these technologies are tied to clear improvements in student learning and classroom management.

These parallels suggest that teachers' enthusiasm for AI is driven less by abstract understanding of its principles and more by its immediate relevance to pedagogical practice. While teachers recognize the importance of learning from and about AI, their stronger preference for learning with AI underscores a practical orientation that values efficiency, personalization, and classroom applicability. At the same time, this enthusiasm carries practical and ethical challenges. Teachers' confidence and competence with AI vary, implementation across schools is inconsistent, and resource gaps, particularly in rural or underfunded contexts, may limit effectiveness. Concerns about equity, privacy, and responsible use must also be considered to ensure meaningful integration. This indicates a need to design training programs that combine conceptual knowledge with hands-on strategies, ensuring teachers are not only confident users but also informed guides for students.

The implications are clear: professional development initiatives should provide teachers with structured opportunities to explore AI both as content knowledge and as a pedagogical tool. Such training must go beyond technical mastery to include modules on the ethical responsibilities of AI use—addressing issues such as student data protection, algorithmic bias, and the irreplaceable role of human judgment in teaching. These insights highlight that successful AI integration in education will depend not only on access to tools but also on sustained support that addresses both the technical and ethical dimensions of AI practice.

Interconnectedness of Conceptual Understanding and Practical Application

The analysis revealed significant positive relationships among the three domains of teachers' perceptions of AI in education, though with varying strengths. The strongest relationship was observed between learning about AI and learning with AI, suggesting that teachers who deepen their knowledge of AI concepts are also more inclined to apply AI tools in their teaching practice. This echoes the findings of Mumbing et al.[43], who showed that teachers with positive orientations toward digital education were more willing to integrate such tools into their instructional routines. The pattern underscores the value of linking conceptual understanding with application, demonstrating that awareness can foster confidence and readiness to adopt new technologies.

By contrast, the weaker correlations between learning from AI and the other two domains highlight a more cautious stance among teachers. While they may be open to AI as a supportive tool, they appear less comfortable positioning it as a direct source of knowledge for learners. This aligns with Fernandez et al.[30], who argued that teachers' engagement with educational technologies is shaped less by the availability of tools and more by contextual factors such as access, training, and institutional support. This caution also reflects ethical awareness, suggesting that teachers recognize the need to preserve human interaction, critical thinking, and socio-emotional learning, rather than relying entirely on AI.

This implies that professional development must not only introduce teachers to AI concepts but also create opportunities for them to practice, adapt, and evaluate these tools in authentic classroom settings. Crucially, such initiatives should emphasize reflective practice, encouraging teachers to assess both the benefits and risks of AI use, and to develop strategies for maintaining human-centered education in increasingly digital environments. Such an approach ensures that conceptual knowledge translates into meaningful, ethical, and sustainable classroom practices.

CONCLUSIONS

The rise of artificial intelligence has influenced how teachers perceive and approach their professional practice. In education, teachers' perceptions of AI vary across dimensions such as learning from, learning about, and learning with, reflecting differences in how they view its effectiveness and integration. This suggests that AI not only represents a technological innovation but also reshapes the way teachers interpret their role in preparing students for a technology-driven future.

The study shows that teachers generally have high views of learning from and learning about artificial

intelligence, and very high views of learning with it. This means that teachers value AI as something to learn from and something to teach, but they trust it most when it helps them in the classroom. Teachers see AI not just as technology, but as a tool that supports their work and helps them guide students for a future where technology is important.

Looking closer at how the different views connect, teachers who understand AI better are also more likely to use it in their teaching. The weaker connections in other areas show that knowing about AI does not always lead to using it without support or guidance. This shows the need to help teachers move from understanding to practical use in real classroom situations.

These results suggest that training programs should not just explain AI but also give teachers chances to practice using it with students. Helping teachers turn knowledge into action will make their confidence in AI more effective and useful.

Overall, the study shows that teachers' positive views are a good starting point, but they need guidance and support to make these views work in teaching. The connections among learning from, learning about, and learning with AI give a clearer picture of how teachers can use these ideas together, and this can help schools plan programs and support that lead to real improvements in teaching and learning.

RECOMMENDATIONS

In light of these findings, teacher professional development programs should focus on workshops where teachers actively apply AI tools in real classroom scenarios, emphasizing hands-on activities that align with curriculum goals. These sessions should integrate both learning about AI and learning with AI, reflecting the observed moderate correlation between these domains. Teachers should practice lesson planning, classroom management, and assessment strategies using AI, ensuring they are confident in applying knowledge to support student learning.

Since teachers expressed the highest confidence in using AI as a supportive classroom tool, professional learning should prioritize demonstrations of practical AI applications, such as adaptive learning platforms, interactive simulations, or automated feedback systems, which can enhance teaching efficiency and personalize learning. Guided exercises should show how AI can foster student autonomy while complementing teacher-led instruction, addressing the weaker correlation between learning from AI and learning with AI.

Ethical and practical considerations must be embedded in training. Programs should include modules on student data protection, algorithmic bias, equitable access, and responsible AI use, using case studies and scenario-based discussions to make these issues concrete. Teachers should be encouraged to reflect on the balance between AI integration and maintaining human-centered teaching, promoting socio-emotional learning, critical thinking, and fairness. Mentoring, peer collaboration, and resource-sharing platforms can support teachers in implementing these practices consistently across schools, particularly where access and infrastructure are limited.

Finally, professional development should be ongoing and institutionalized. Education leaders should incorporate AI competencies into teacher standards, school improvement plans, and periodic evaluation processes. Providing continuous access to technical and pedagogical support ensures that teachers' high and very high perceptions of AI translate into sustainable, ethical classroom practices that enhance both teaching effectiveness and student learning outcomes.

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