

Ethical Use of Artificial Intelligence Tools by Future Teachers

Utilisation éthique des outils d'intelligence artificielle par les futures personnes enseignantes

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Abstract

This study analyses how pre-service teachers use artificial intelligence (AI) tools in academic contexts and their perceptions and practices regarding ethical use. A quantitative, cross-sectional design was applied to 136 teacher education students from a Spanish university using convenience sampling. A custom questionnaire comprised three sections: general AI usage frequency, usage in specific academic tasks, and a Likert scale assessing ethical perceptions. Findings indicate that AI tools are mostly used for content comprehension, academic writing, and exam preparation, while their application in time management, presentations, and research remains limited. Ethically, students mostly engage in responsible practices, though issues such as blind reliance or uncited use still emerge. The discussion highlights a partial and functionally restricted integration of AI, constrained by insufficient digital competence and limited ethical training. No significant differences were found by age, academic major, or year of study. The study concludes that targeted training programs are urgently needed to promote ethical AI literacy among future teachers, ensuring a critical, autonomous, and pedagogically sound integration of these tools in higher education.

Keywords: artificial intelligence, digital competence, educational ethics, higher education, teacher education, technology perception

Résumé

Cette étude analyse la manière dont les enseignants en formation initiale à l'enseignement utilisent les outils d'intelligence artificielle (IA) dans des contextes académiques, ainsi que leurs perceptions et leurs pratiques en matière d'utilisation éthique. Une méthodologie quantitative transversale a été appliquée à

136 personnes étudiantes en formation à l'enseignement d'une université espagnole, à l'aide d'un échantillonnage par convenance. Un questionnaire personnalisé comprenait trois sections : fréquence d'utilisation générale de l'IA, utilisation dans des tâches académiques spécifiques et échelle de Likert évaluant les perceptions éthiques. Les résultats indiquent que les outils d'IA sont principalement utilisés pour la compréhension de contenu, la rédaction académique et la préparation aux examens, tandis que leur application dans la gestion du temps, les présentations et la recherche reste limitée. Sur le plan éthique, les personnes étudiantes adoptent principalement des pratiques responsables, même si des problèmes tels que la confiance aveugle ou l'utilisation sans citation persistent. La discussion met en évidence une intégration partielle et fonctionnellement limitée de l'IA, freinée par des compétences numériques insuffisantes et une formation éthique limitée. Aucune différence significative n'a été constatée en fonction de l'âge, de la matière universitaire ou de l'année d'études. L'étude conclut qu'il est urgent de mettre en place des programmes de formation ciblés afin de promouvoir la culture éthique de l'IA chez les futures personnes enseignantes, garantissant ainsi une intégration critique, autonome et pédagogiquement solide de ces outils dans l'enseignement supérieur.

Mots-clés: intelligence artificielle, compétence numérique, éthique éducative, enseignement supérieur, formation des personnes enseignantes, perception de la technologie

Introduction

Background

Rapid advancements in artificial intelligence (AI)-based technologies have profoundly impacted educational environments in physical and virtual settings. Recent advancements in natural language processing have led to the emergence of tools such as ChatGPT, Copilot, DALL-E, and Gemini, which have significantly impacted educational practices. These tools have enabled the generation of content and the provision of automated feedback, thereby transforming the landscape of teaching and learning (García Peñalvo, 2023). As articulated by Burgueño-López (2024), this phenomenon redefines conventional roles within the educational process, thereby unveiling novel prospects for personalisation, accessibility, and pedagogical efficacy. However, it also gives rise to significant inquiries regarding the essence, constraints, and ramifications of its implementation in training settings, encompassing both distance and non-face-to-face modalities, as well as in face-to-face educational contexts, wherein technological mediation assumes a pivotal role in both scenarios.

In this context of accelerated change, the critical incorporation of AI and its ethical use in education has become a priority challenge. Beyond the evident technological enthusiasm, risks associated with the uncritical or inappropriate use of these tools are beginning to emerge. These risks include, but are not limited to, cognitive dependence, academic plagiarism, invisibilisation of biases, misinformation, or weakening of critical thinking (Cotton et al., 2023). These issues extend beyond mere technical concerns, encompassing ethical and pedagogical dimensions that must be addressed during the initial training of teachers. Brandão et al. (2024) posited that teacher professional development should incorporate AI literacy and practical activities with generative AI tools. In this vein, Celik (2023)

underscored the necessity of critical reflection on the values that inform its integration into educational practices. Lee (2023) drew attention to the ethical responsibility that should guide the relationship between teachers, students, and technologies. The main objective of education should be integral development, necessitating the incorporation of technologies from a humanistic and committed perspective.

Problem Statement

Recent literature on the use of technologies in the classroom has focused more on technology adoption, perceived usefulness, or general academic implications and less on the ethical implications of AI use in educational contexts. Existing instruments tend to focus on frameworks such as the technology acceptance theory (TAM; Scherer et al., 2019; Teo, 2011) or digital literacy (Gao et al., 2024; Ng, 2012; Su et al., 2023). However, these frameworks obviate innovative technologies' valuational, deontological, and pedagogical dimensions. This discrepancy is especially pronounced in the domain of initial teacher training, where rigorous instruments are imperative for diagnosing and cultivating technological professionalism. In this vein, the study conducted by Neff et al. (2024) at a Japanese university signified a substantial advancement by exploring the ethical perceptions of English as a foreign language students and teachers through hypothetical scenarios. While this line of research contributes to elucidating the intricacies of the phenomenon, its design does not extend to validating psychometric scales applicable in analogous contexts. Consequently, it is imperative to develop instruments tailored explicitly to cultural contexts and empirically validated to assess ethical attitudes towards AI from the outset of teacher training.

Objectives

In this context, the primary objective of this study was to examine the uses that future teachers make of AI tools in academic contexts, as well as their perceptions and practices associated with their ethical use. In doing so, the study sought to understand the frequency and nature of such uses and to explore how trainee teachers incorporate principles of accountability, transparency, and academic honesty when integrating these emerging technologies into their educational tasks. Consequently, a scale was developed and validated to assess perceptions and ethical attitudes concerning using AI in educational settings. The scale is intended to serve as a valuable diagnostic instrument for teacher training and implementing pedagogical interventions. The objectives of the study were as follows:

1. to design a theoretically grounded scale to measure the ethical use of AI in future teachers and to empirically validate the structure of the scale through robust psychometric analyses;
2. to analyse the frequency of use of AI tools in academic tasks by future teachers; and
3. to determine whether there are significant differences in ethical practices based on age, university studies, and academic year.

Through this initiative, we aim to contribute to developing institutional policies, training programs, and research agendas that integrate technological ethics as a central axis in teaching teachers.

Literature Review

Concerns About Ethical Use of AI in Education

Among the primary concerns university teachers express is academic honesty, specifically concerning using AI tools in exams or to elaborate assignments in whole or in part (Perezchica-Vega et al., 2024). This concern gives rise to the challenge of identifying the purposes of future teachers' use of AI in academic activities and ensuring that such use remains within acceptable ethical margins. In alignment with this concern, a report published by the *Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado* [INTEF] (2024) compiled ten specific points on concerns related to the ethical use of AI in academic activities. These aspects were selected as the foundation for constructing the evaluation scale on the ethical uses of AI that was used in this study.

In response to these concerns, numerous research studies have proposed strategies to promote the ethical and responsible integration of AI in educational environments. Among these, the most prominent actions include: the design and implementation of normative frameworks that regulate the use, the revision and adaptation of learning assessment methods, and the specific training of both students and teachers on the technical, ethical, and pedagogical foundations of AI (INTEF, 2024; Miao & Holmes, 2023; Perezchica-Vega et al., 2024). These actions assume particular significance in the expanding integration of AI tools within higher education (Triberti et al., 2024). This development required the creation of rigorous instruments to assess and encourage the ethical and pedagogically sound utilisation of these technologies.

The ethical challenges these AI tools pose are intricate and require assessment that captures not only technological attitudes but also the evaluative, professional, and contextual dimensions of AI use in teaching practice. This discrepancy is particularly salient in the context of teachers' roles in instilling ethical practices, safeguarding academic integrity, and cultivating critical digital citizenship.

Methodology

Study Design

The research design was a non-experimental cross-sectional study, using a quantitative methodological approach. Specifically, we employed a survey design based on a self-constructed questionnaire to achieve the stated objectives. The construction process of the scale was hypothesised and deductive. Initially, theoretical sources were consulted, followed by construct validation to ascertain the instrument's final structure.

Participants

The sample consisted of 136 teachers in training including primary ($n = 60$); early childhood education ($n = 33$); physical activity and sport sciences ($n = 32$); and postgraduate education ($n = 11$) from a university in Spain, of which 72.8% were women and 27.2% men, aged 18–40 years ($M = 21.88$; $SD = 4.1$). The sample was selected by non-probabilistic convenience sampling. The questionnaire was

disseminated through university teachers and tutors who requested anonymous participation from students to complete the survey, respecting their freedom to do so at all times.

Instrument

An ad hoc questionnaire was designed for data collection, consisting of three distinct sections, including a self-referenced scale on the ethical use of AI tools in academia. This study aimed to examine the patterns of AI application use in academic contexts, as well as the ethical perceptions associated with their application. The instrument's design aligned with the research's objectives and was informed by extant methodological literature.

The first section of the questionnaire inquired about the frequency of use of various AI tools, including text generators, image generators, and automatic translators. The subsequent section centred on the frequency with which participants use these tools for particular academic tasks (e.g., composing papers, searching for information, proofreading). The two survey sections consisted of independent, non-cumulative items, each with a response scale of six ordinal categories ranging from “never” to “always.” The items in question did not constitute a unidimensional scale; they were treated individually in the analysis. This methodological decision was made to capture the diversity in all possible use patterns.

The third section of the instrument consisted of a 6-point Likert-type scale aimed at assessing the ethical perception of the use of AI in different academic tasks. The scales employed in this study adopted a response format ranging from “never” to “always,” avoiding including a neutral option. The selection of a scale with six response options aligns with methodological recommendations outlined in the extant literature, which suggests that scales comprising five and seven items are optimal for capturing nuances in perception without cognitively saturating the participant (Morales et al., 2003). Conversely, an even number of options enhances the clarity of the respondent's position, as it eliminates the possibility of a neutral or equivocal response.

To ensure the questionnaire's content validity and terminological adequacy, a validation process was carried out by expert judgment. The instrument was reviewed by 11 experts, whose areas of expertise included educational research, digital technologies, and artificial intelligence. These evaluators meticulously analysed each item in the three sections of the questionnaire according to criteria of clarity, pertinence, and relevance to the study's objectives. To quantify the degree of consensus among the experts, the Aiken V coefficient, whose values ranged between .90 and .99 in the three subscales of the questionnaire, was calculated. These results indicated a highly positive evaluation by the experts and evidence of a high content validity of the items evaluated.

With regard to objective 1, an analysis of the scale's psychometric properties related to the ethical perception of the use of AI in different academic tasks was conducted. Initially, reliability was calculated (Cronbach's alpha = .877), indicating a high internal consistency of the scale's items.

In order to examine the underlying structure of the scale and verify its construct validity, an exploratory factor analysis (EFA) was conducted. To assess the suitability of the data collected for the

application of the EFA, the Kaiser-Meyer-Olkin index ($KMO = .824$) and Bartlett's sphericity ($< .001$) were calculated. It was deemed appropriate to perform the EFA to extract the dimensional structure of the instrument. The factor extraction process was executed using the maximum likelihood method, complemented by varimax rotation. Applying Kaiser's rule, seven factors were extracted, all with eigenvalues greater than 1 (Yela, 1997), which explained 61.82% of the total variance, suggesting a solid and representative factor structure of the construct evaluated.

Subsequently, confirmatory factor analysis (CFA) was performed. The model's fit results were evaluated through various indices, including the chi-square ($\chi^2 = 587$) and degrees of freedom ($df = 254$, $p < .001$), although it is acknowledged that the model is sensitive to sample size. Therefore, the relative index $\chi^2/df = 2.31$ is included, indicating a good model fit (Byrne, 2016). Additionally, other fit indices are presented, including: the comparative fit index (CFI) which was .831 and the Tucker-Lewis index (TLI) which was .800, both close to the threshold of acceptability ($\geq .90$); the standardized root-mean-square residual (SRMR) which was .0801, meeting acceptable values ($\leq .08$); and the root-mean-square error of approximation (RMSEA) which was .0982, exceeding the recommended optimal levels ($\leq .05$) (Cho et al., 2020).

Procedure

The questionnaire was administered during May 2025 through Microsoft Forms, a digital platform designed to facilitate efficient and secure data collection. The study's development was conducted by the ethical principles outlined in the Declaration of Helsinki (Hernández Merino, 2024), as well as the stipulations outlined in the Spanish jurisdiction (Boletín Oficial del Estado [BOE], 2018). A comprehensive explanation was furnished to all participants regarding the objectives and aims of the study, and their explicit consent was obtained. The responses were collected anonymously, ensuring the confidentiality of the subjects' identities throughout the study.

Data Analysis

The data processing was conducted using IBM SPSS for Windows (Version 29.0.2.0) and Jamovi (Version 2.6.26.0). A descriptive analysis of the variables was conducted, during which the mean and standard deviation were calculated. Furthermore, a range of statistical tests was employed to identify potential significant differences between groups, contingent upon adherence to the normality assumptions and variance homogeneity. The normality of the data was assessed through the analysis of skewness and kurtosis values, while the homogeneity of variances was determined using Levene's test. When both assumptions were met, student's t -tests for independent samples and one-factor analysis of variance (ANOVA) were employed. When these assumptions were not met, the nonparametric Mann-Whitney U and Kruskal-Wallis tests were also employed. In instances where the identification of group-specific differences was deemed necessary, post hoc tests were implemented using the Tukey method. The magnitude of the observed effects was ascertained using Cohen's d and η^2 metrics. The relationship between numerical variables was investigated by calculating bivariate correlations, employing Pearson's r coefficient as a metric.

Results

This section presents the primary findings derived from examining the data collected concerning the use of AI tools by future teachers in the academic setting. The approach adopted in this study was predominantly descriptive, to provide a detailed overview of current trends in the frequency and nature of trainee teachers' uses of these technologies. Furthermore, the specific objectives that guided the use of these tools were investigated, encompassing both academic and personal activities. The investigation examined the ethical dimensions of the stated use, focusing on student perceptions of appropriateness, transparency, and accountability in implementing AI in educational settings. The findings reported in this study provide a thought-provoking empirical basis for the formative and deontological implications associated with using AI in initial teacher education.

In relation to objective 2, Figure 1 presents the results obtained regarding the frequency of use of different AI tools by prospective teachers. The predominance of the use of AI tools for text generation ($M = 3.38$; $SD = 1.075$) and translation ($M = 2.74$; $SD = 1.301$) is evident. In contrast, a reduced exploitation of AI tools with a mean frequency of use below one is observed for music and video generation, project and time organisation, data visualisation and interpretation, and content authentication.

Figure 1

Frequency of Use of AI Tools

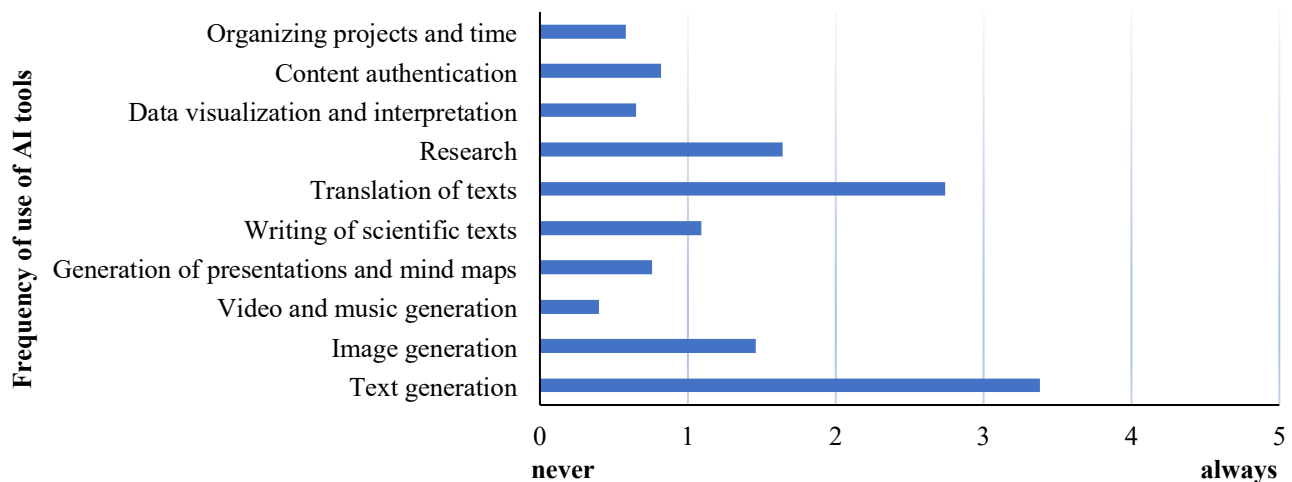


Figure 2 presents data about participants' use of AI tools for specific academic tasks, with the frequency showing unequal distribution. The findings reveal a discernible trend in use of AI tools by future teachers, with a higher frequency in activities connected to study support, preparation of written work, and exam preparation, as compared to tasks associated with organisation and time management, preparation of presentations, and research projects.

When it comes to academic assistance, an extensive use of AI instruments has been observed in tasks about cognitive mediation, underscoring content comprehension ($M = 3.12$; $SD = 1.506$) and the formulation of summaries ($M = 3.00$; $SD = 1.450$). Similarly, pertinent utilisation levels are documented in activities such as the dissemination of information and the resolution of exercises. This observation indicates an adoption of AI to enhance autonomous learning.

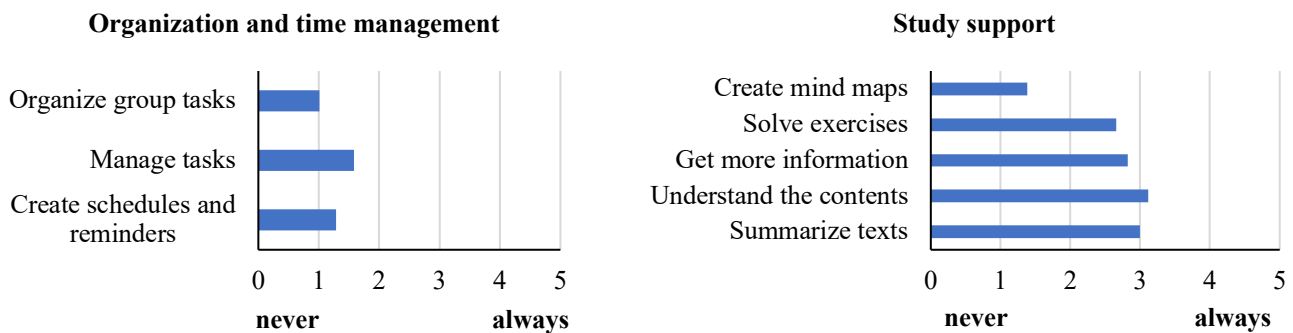
In the domain of written work elaboration, the prevailing functions pertain to brainstorming or the generation of initial concepts ($M = 3.06$; $SD = 1.562$), the enhancement of writing ($M = 2.63$; $SD = 1.587$), and the analysis of information ($M = 2.60$; $SD = 1.452$). This observation signifies the integration of these tools in both the preliminary and final phases of the academic production process.

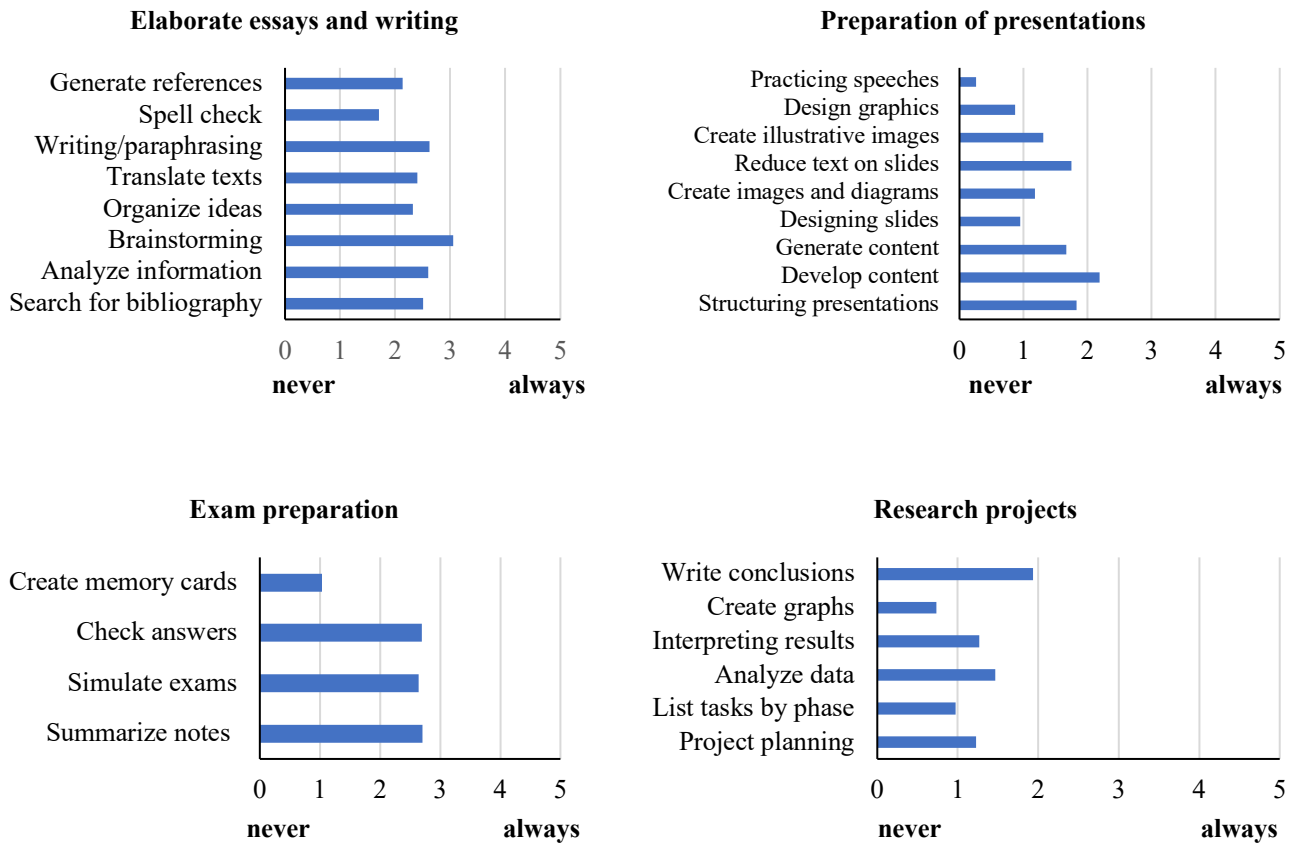
When considering exam preparation, AI tools are primarily employed to summarise notes ($M = 2.71$; $SD = 1.540$) and correct responses to potential exam questions ($M = 2.70$; $SD = 1.670$). This finding suggests a strategic use of AI tools oriented towards knowledge consolidation.

Conversely, scores were notably lower across all indicators in time organisation, particularly in group task organisation ($M = 1.01$; $SD = 1.366$). In oral presentation preparation, AI tools are not extensively used, exhibiting a notable absence in tasks associated with speech practice ($M = 0.26$; $SD = 0.644$) and slide design ($M = 0.95$; $SD = 1.363$). Evidence indicates the nascent integration of AI in research project development, as evidenced by the use of graphical representations of information ($M = 0.74$; $SD = 1.278$) and phase-based planning ($M = 0.97$; $SD = 1.350$). However, these functions have yet to attain substantial levels of significance. This comprehensive overview enables the delineation of a functional, albeit still disparate, incorporation of AI in the academic practices of future teachers.

Figure 2

Frequency of the Purposes of Using AI Tools





Concerning the ethical uses of AI in various academic endeavours, Figures 3 and 4 present the findings derived from this sample.

Figure 3

Frequency of Unethical Uses of AI Tools in Academic Tasks

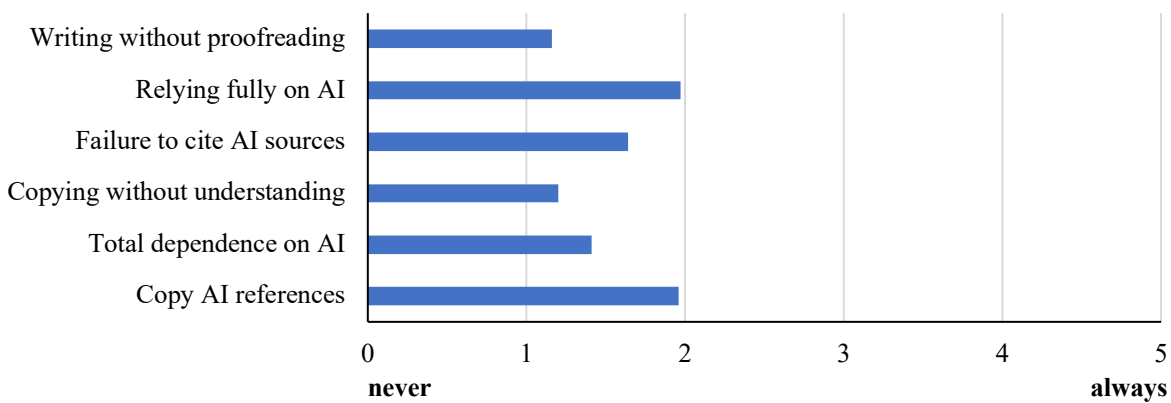
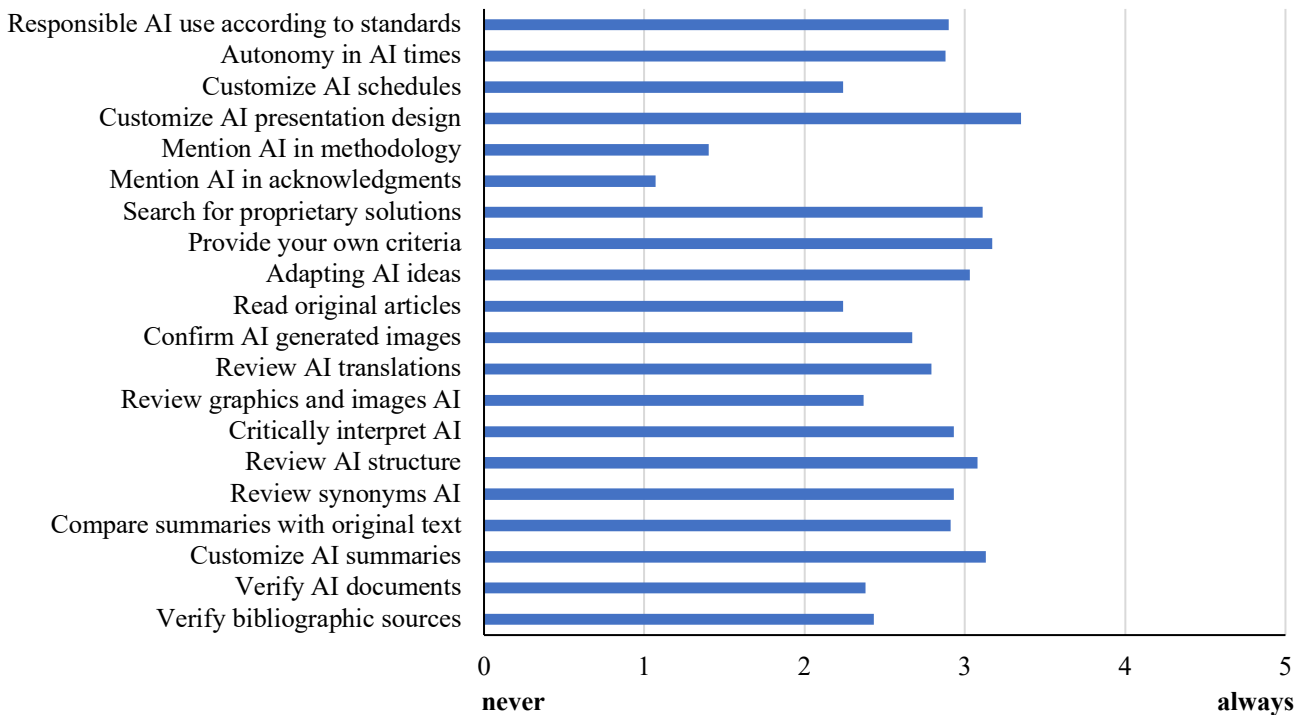


Figure 4

Frequency of Ethical Uses of AI in Academic Tasks



Concerning objective 3, the analysis of differences in ethical practices based on age shows no significant positive correlation between the age of future teachers and their ethical use of AI tools in academic tasks.

Table 1

Mean Scores for Ethical Use of AI Tools by Degree

University studies	Ethical uses		Image generation	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Primary education	76.15	19.489	1.48	1.420
Early childhood education	71.91	27.132	1.79	1.616
Physical activity and sports sciences and primary education (double degree)	70.41	17.431	0.88	1.238
Master’s degree in secondary education	74.64	17.766	2.09	1.446

Note. *N* = 136.

Regarding the university studies pursued by future teachers, slight discrepancies were observed in the mean scores (Table 1). In the context of a comparative analysis, trainee teachers enrolled in the

bachelor's or double degree program in primary education demonstrated the highest mean proficiency in the ethical use of artificial intelligence ($M = 76.15$; $SD = 19.489$). Conversely, those pursuing the double degree program in physical activity and sports sciences and primary education exhibited the lowest mean proficiency ($M = 70.41$; $SD = 17.431$).

The findings indicate that, in general, there were no substantial differences between the type of university studies and the types of AI tools used. The only exception was in image generation, where significant differences were observed between the different university studies ($F = 3.071$; $p = .030$), with a small-to-moderate effect size ($\eta^2 = 0.065$). Despite the negligible differences observed among the groups, which did not attain statistical significance in the post hoc comparisons, the descriptive data presented in Table 1 indicate that teachers enrolled in a master's degree in teaching reported the highest frequency of AI tool use for image generation ($M = 2.09$; $SD = 1.446$) in contrast to those pursuing training in physical activity and sports sciences and primary education ($M = 0.88$; $SD = 1.238$).

Also, the results indicated no substantial disparities in using AI instruments based on the academic year of enrollment. However, a notable exception was observed in the domains of information analysis ($F = 2.307$; $p = .048$) and text reduction in presentation slides ($F = 2.321$; $p = .047$). Both variables exhibited a moderate effect size ($\eta^2 = 0.082$). In the information analysis task context, third-year trainee teachers exhibited a higher propensity for using AI tools, as evidenced by a mean score of 2.88 and a standard deviation of 1.250. This tendency was notably more pronounced than that observed among first-year trainees, whose mean score was 1.74 and standard deviation was 1.573. In a similar vein, the use of these tools by second-year trainee teachers for text reduction in presentations exhibited a higher frequency than that observed among first-year trainees ($M = 2.18$; $SD = 1.701$ versus $M = 0.83$; $SD = 1.370$). These results suggest an increasing trend in the use of AI tools as the academic year progressed, particularly in tasks associated with content optimisation and synthesis.

Discussion

The present study is situated within a context of considerable educational transformation, driven, among other factors, by the eruption of artificial intelligence and the structural changes associated with the so-called Fourth Industrial Revolution (Celik, 2023). In this context, we explored the frequency and types of use that future teachers make of different AI tools in their academic tasks. Our objective was to assess future teachers' perceptions regarding the utilization of AI tools and their ethical considerations.

Integrating AI into the educational system is no longer a prospect but a present and irreversible reality (Aljemely, 2024). This emerging paradigm presents a dual challenge: first, to equip future teachers with the technical and functional proficiency to use these tools effectively, and second, to foster the development of ethical competencies that will empower them to make judicious decisions regarding their application. According to Lindner and Berges (2020), the training of teachers in the field of AI should encompass both the operational principles of the subject and a critical understanding of its ethical and social implications. Similarly, Ng et al. (2021) cautioned that educators who do not incorporate

digital technologies into their pedagogical practice may find themselves at a disadvantage in meeting the demands of both the current and future educational systems.

With regard to objective 1 about the validation of the instrument designed ad hoc for this study, the incorporation of a prior process of content validation through expert judgment ensured the items' relevance and appropriateness, thereby reinforcing the theoretical validity and consistency of the instrument with the study's objectives. Similarly, the analysis of the scale's internal consistency on ethical perceptions of the use of AI in academic tasks reflects an adequate coherence among the items. Furthermore, examining the scale's internal structure through applying EFA facilitates the identification of multiple dimensions associated with the evaluated construct. The CFA demonstrated an acceptable fit within its primary indicators. The factorial structure identified provides a robust empirical foundation for advancing research in the diagnosis, training, intervention, and development of educational policies that integrate technological ethics as a transversal axis.

In connection with objective 2, this study's findings suggest that the use of AI by future teachers is predominantly focused on tools designed for text generation and translation. In contrast, the application of AI in more intricate tasks, such as music or video creation, data visualisation, content authenticity verification, presentation development, and mind mapping, remains significantly less prevalent. The study by Bae et al. (2024) supports these findings, as it revealed that future teachers, despite recognising the potential of AI tools, primarily limit their use to basic text writing and translation functions. Similarly, Ng et al. (2023) underscored that many future teachers perceive a dearth of the competencies and understanding necessary to leverage AI tools for more sophisticated functions, constraining their use to more rudimentary tasks. This may indicate an imperative for cultivating AI literacy, which entails the development of the knowledge and skills necessary to use generative AI technologies appropriately and efficiently (Yan et al., 2024).

The results of this study indicate a clear trend among future teachers in favour of using these technologies in functions that promote text comprehension, the development of summaries, the enhancement of autonomous learning, and the refinement of academic production processes. This pattern of use aligns with prior research emphasising the potential of AI as a facilitating agent in the development of higher-order cognitive competencies (Luckin et al., 2016; Ribera & Díaz-Montesdeoca, 2024). This integration enables students to engage with more profound and customised content. Using these tools in the preliminary phases (e.g., the organisation of ideas or information search) and the final phase (e.g., text revision or correction) of academic work indicates a strategic employment of AI in the entire elaboration cycle. This has previously been identified as a differential advantage in educational contexts facilitated by emerging technologies (Zawacki-Richter et al., 2019). Furthermore, their use to consolidate knowledge through summaries or the verification of answers in preparation for exams reinforces the idea that these tools not only fulfil an instrumental function, but also contribute to autonomy in learning (Ribera & Díaz-Montesdeoca, 2024; Zawacki-Richter et al., 2019) fundamental aspects in current teacher training.

In relation to objective 3, the results indicate no significant differences in ethical practices based on age, academic major, or academic year, likely reflecting the relatively homogeneous sample in terms

of training and exposure to digital competence programs. This aligns with prior research showing that attitudes toward AI integration and related competencies are not strongly influenced by sociodemographic factors such as age or level of education (Galindo-Domínguez et al., 2024).

Our study found that the limited variability in the age of the participants—all of whom were teachers in university training—resulted in the absence of significant relationships between age and frequency of use of AI tools, both in terms of their academic applications and ethical use in educational contexts. This finding aligns with the findings of previous studies indicating that younger teachers exhibit significantly higher levels of AI competence than their older counterparts (Estrada-Araoz et al., 2024; Goenechea & Valero-Franco, 2024). This phenomenon is consistent with the broader context of digital competencies in general, as evidenced by studies such as López Belmonte et al. (2020).

Conversely, no substantial disparities were identified in university studies undertaken by future teachers or across academic years, with a few specific exceptions. This outcome may be construed as an indication of training homogeneity among the various specialities of the degrees in education and the stages of teacher training.

The findings indicate a rising trend in using AI in academic endeavours by future teachers, underscoring a shift towards ethical frameworks. The participants frequently engaged in several ethical practices, including customising presentations, contributing their criteria, searching for solutions, customising AI-generated summaries, and reviewing the structured data provided by the AI. These practices indicate an understanding of AI's potential as a support tool, rather than as a substitute for academic effort (Malik et al., 2023).

Nevertheless, an examination of unethical uses reveals significant challenges. It has been observed that future teachers tend to employ practices that, while not as prevalent, indicate a deficiency in critical awareness concerning the limitations and responsibilities associated with using AI. These practices include a tendency to place unquestioning trust in AI, failing to cite sources derived from AI adequately, and composing written work without undergoing a thorough review process. This duality indicates that while there is a foundation for ethical use, it is imperative to reinforce training in digital competencies and academic ethics. In this regard, Lim et al. (2023) and Ruiz-Lázaro et al. (2025) have underscored the necessity of fortifying ethical education in conjunction with integrating emerging technologies within higher education.

Conclusions

The present study aimed to provide empirical evidence on the use patterns and ethical perceptions associated with AI in initial teacher education. While AI tools are increasingly used in the academic practices of pre-service teachers, their full and critical integration is still in development. Contemporary university instruction frequently lacks the foundational support necessary to cultivate a pedagogically and ethically sound use of AI. This discrepancy underscores the pressing need to reevaluate teacher training from a perspective that unequivocally incorporates AI literacy, predicated on the judicious use of such instruments (García Peñalvo et al., 2025).

Considering these, the necessity to establish targeted training programs that equip future teachers with the requisite knowledge, skills, and dispositions for a pedagogical, critical, and ethical integration of AI in their academic endeavours is reiterated (Celik, 2023). As Nazaretsky (2022) and Pei et al. (2025) have noted, this preparation is essential for the academic performance of teachers during their initial training and subsequent professional practice in educational contexts that demand highly complex digital competencies. In education, there is a pressing need for a comprehensive training approach. This approach must ensure that future education professionals cannot only use these tools but also evaluate, adapt, and teach with them ethically and responsibly. The establishment of regulatory frameworks and the formation of a consensus with students regarding tools such as ChatGPT are imperative. These frameworks must explicitly delineate the purposes, contexts, and modalities of use by the principles of transparency, responsibility, and the cultivation of critical thinking (Ribera & Díaz-Montesdeoca, 2024).

It is imperative to acknowledge the limitations of the present study when interpreting the results. First, the study is cross-sectional, which makes it impossible to determine causal relationships between the variables examined. Second, as noted in the Methodology section, convenience sampling was used; this approach may limit the generalisability of the findings. Future studies should consider alternative sampling methods to enhance representativeness. Furthermore, the sample was limited to teachers training at a single university, which restricts the generalisation of the findings to other training contexts. Third, despite its psychometric validation, the instrument employed was predicated on self-reported data, a factor that may introduce biases stemming from social desirability or subjective perceptions of ethical use. It is imperative to acknowledge that the proposed scale remains in the initial stages of development and refinement. In light of the nascent and perpetually evolving nature of the ethical use of AI in educational contexts, a consensus theoretical model to guide the development of specific instruments continues to be elusive. This absence complicates the delineation of dimensions, which may consequently impact the stability of the factor structure obtained. Similarly, while the sample used was pertinent for a preliminary exploratory approximation, its limited size restricts the findings' generalizability and diminishes the statistical inferences' robustness. Therefore, it is recommended that the results be interpreted cautiously and that these analyses be considered a preliminary step towards validating a more consolidated instrument that can be applied in different educational and cultural contexts.

Consequently, future research could adopt longitudinal designs to analyse the evolution in the use and ethics of AI throughout the training process. It is also recommended that the sample be extended to other universities and countries, which would facilitate cultural and curricular comparisons and adjust the psychometric analysis of the questionnaire applied, with the priority objective of continuing to improve the instrument. In order to gain a more comprehensive understanding of the subject, it would be pertinent to incorporate qualitative methods that delve into the motivations, resistances, and ethical dilemmas teachers face in training in the use of these tools. Methodological triangulation, defined as the use of multiple sources and approaches to validate or complement the results of a study, can enhance the analysis and facilitate a more comprehensive examination of the phenomenon.

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