SECTION: AI IN TEACHING AND LEARNING PROCESSES

Teacher education in times of artificial intelligence: formative challenges and student perceptions[1]

Licenciatura em tempos de inteligência artificial: desafios formativos e percepções

Licenciatura en tiempos de inteligencia artificial: desafíos formativos y percepciones discentes

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ABSTRACT

The article analyzes the perceptions of undergraduate teacher education students regarding the use of generative artificial intelligence in higher education, based on a formative workshop conducted with students from the Physical Education, Portuguese Language, English Language, and Pedagogy programs, in the final stage of their degrees, at a community university located in a densely populated urban area in southern Brazil. The study adopts a qualitative and exploratory approach, with data collected in the second semester of 2024 through a questionnaire administered at the end of the activity. The theoretical framework draws on contemporary debates on ethics, authorship, creativity, and teacher education in the age of artificial intelligence. The results indicate that students already use tools such as ChatGPT in their academic and teaching practices, mainly to plan lessons, design activities, and organize ideas. Despite this frequent use, most participants report a lack of structured discussions on the topic during their undergraduate training. The main benefits identified include dynamism, accessibility, and creative stimulation, whereas the main concerns relate to intellectual complacency, standardization of productions, and weakened authorship. The

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workshop was evaluated as a meaningful formative experience, as it integrated practice and critical reflection on the pedagogical use of AI. It is concluded that there is an urgent need to incorporate discussions on artificial intelligence into teacher education curricula in a transversal, critical, and contextualized manner, recognizing both the challenges and opportunities that technology brings to contemporary teacher education.

Keywords: generative artificial intelligence; teacher education; higher education; undergraduate studies; educational technologies.

RESUMO

O artigo analisa as percepções de estudantes de licenciatura sobre o uso da inteligência artificial generativa no ensino superior, a partir de uma oficina formativa desenvolvida com estudantes de Educação Física, Letras/Português, Letras/Inglês e Pedagogia, em fase final da graduação, em uma universidade comunitária localizada em área urbana densamente povoada na região Sul do Brasil. A investigação baseia-se em uma abordagem qualitativa, de caráter exploratório, com coleta de dados realizada no segundo semestre de 2024, por meio de questionário aplicado ao final da atividade. O referencial teórico considera debates contemporâneos sobre ética, autoria, criatividade e formação docente em tempos de inteligência artificial. Os resultados indicam que os estudantes já utilizam ferramentas como o ChatGPT em suas práticas acadêmicas, principalmente para planejar aulas, criar atividades e organizar ideias. Apesar do uso recorrente, a maioria relata ausência de discussões estruturadas sobre o tema na formação inicial. Entre os principais benefícios percebidos, destacam-se o dinamismo, a acessibilidade e o estímulo à criatividade. Por outro lado, os participantes expressam receios quanto ao comodismo intelectual, à padronização de produções e à fragilização da autoria. A oficina foi avaliada como uma experiência formativa relevante ao articular prática e reflexão crítica sobre o uso pedagógico da IA. Conclui-se que é urgente incorporar o debate sobre inteligência artificial nos currículos de licenciatura, de forma transversal, crítica e situada, reconhecendo desafios e possibilidades que a tecnologia impõe à formação docente contemporânea.

Palavras-chave: inteligência artificial generativa; formação docente; ensino superior; licenciatura; tecnologias educacionais.

RESUMEN

El artículo analiza las percepciones de estudiantes de licenciatura sobre el uso de la inteligencia artificial generativa en la educación superior, a partir de un taller formativo desarrollado con estudiantes de Educación Física, Letras/Portugués, Letras/Inglés y Pedagogía, en la etapa final de su formación, en una universidad comunitaria ubicada en una zona urbana densamente poblada del sur de Brasil. La investigación se basa en un enfoque

cualitativo de carácter exploratorio, con recolección de datos realizada en el segundo semestre de 2024, mediante un cuestionario aplicado al final de la actividad. El marco teórico considera los debates contemporáneos sobre ética, autoría, creatividad y formación docente en tiempos de inteligencia artificial. Los resultados indican que los estudiantes ya utilizan herramientas como ChatGPT en sus prácticas académicas, principalmente para planificar clases, crear actividades y organizar ideas. A pesar del uso frecuente, la mayoría señala ausencia de discusiones estructuradas sobre el tema en su formación inicial. Entre los principales beneficios percibidos se destacan el dinamismo, la accesibilidad y el estímulo a la creatividad; mientras que los riesgos mencionados se relacionan con el conformismo intelectual, la estandarización de las producciones y la fragilización de la autoría. El taller fue evaluado como una experiencia formativa significativa al articular práctica y reflexión crítica sobre el uso pedagógico de la IA. Se concluye que es urgente incorporar el debate sobre la inteligencia artificial en los currículos de formación docente, de manera transversal, crítica y situada, reconociendo desafíos y posibilidades que la tecnología impone a la educación contemporánea.

Palabras clave: inteligencia artificial generativa; formación docente; educación superior; licenciatura; tecnologías educativas.

INTRODUCTION

In times of rapid technological transformation, higher education is challenged to keep pace with a landscape in which the presence of generative artificial intelligence (AI)[4] has shifted from a futuristic prediction to an everyday reality. If the impact of the internet in the classroom was once the central concern, a new horizon now emerges: collaboration with systems capable of drafting texts, generating images, developing assessments, and even suggesting lesson plans within seconds. The rise of tools such as ChatGPT, Midjourney, Copilot, and Gemini has not only expanded the possibilities for creating educational content but has also challenged the boundaries of what is understood as authorship, ethics, and critical formation within the university context.

The use of generative AI in higher education has raised concerns that extend far beyond the mere operationalization of tasks, as what is currently at stake is the very nature of teaching and learning. What should be taught when machines are capable of producing coherent essays and persuasive arguments? What is the role of the professor when the mediation of knowledge can, at least in appearance, be automated? And how should students position themselves in relation to a technology that at times fascinates and at others causes concern,

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[4] Although there is a technical distinction between artificial intelligence (AI) as a broad field within computer science and generative artificial intelligence (GAI), which is specifically focused on the creation of new content (texts, images, code, etc.), this article adopts the term AI in a simplified manner to refer to the generative tools currently used in the educational context.

yet has already become an integral part of their academic lives? As Mollick (2024, p. 152, authors' translation) observes, "we are undoubtedly at an inflection point in which AI will reshape how we teach and learn, both in schools and beyond." This perspective underscores that the impact of AI in the educational field goes beyond task automation, calling into question the very reconfiguration of the relationships among teaching, learning, and humanity.

Based on these questions, this article aims to analyze the perceptions of undergraduate teacher education students regarding the use of generative AI in the context of higher education. The data analyzed were collected through a questionnaire administered during a training workshop on the topic, held at a community higher education institution located in an urban area in the southern region of the country. The workshop proposal — building upon experiences developed in earlier stages of the research[5] — was not limited to presenting the technology itself, but sought to foster critical reflection on its uses, limits, and ethical-pedagogical implications.

Unlike approaches focused exclusively on the role of the professor, this study shifts the emphasis to the qualified listening of students. As future teachers, their perceptions matter not only because they express lived experiences, but also because they point to possible directions for teacher education in times of AI. By prioritizing the analysis of their voices — doubts, enthusiasms, and concerns — the study seeks to understand how AI has been appropriated, questioned, and reinterpreted in everyday academic life. The objective, therefore, is to contribute to the emerging debate on the place of AI within the university, valuing the perspective of those who are simultaneously learning and preparing to teach.

GENERATIVE AI IN EDUCATION: POTENTIAL AND CHALLENGES

Generative artificial intelligence has emerged as a transformative phenomenon in higher education, prompting debates about its potential as well as the ethical and pedagogical challenges it presents. As highlighted by Padilla (2019), the integration of generative AI into traditional educational processes is fostering a reinvention of teaching and learning practices, driven by the operational capabilities of these tools. However, this transformation does not occur without tensions, particularly with regard to the redefinition of the teaching role and the need for critical and reflective training to engage with such technologies.

Authors such as Pierre Lévy (2010, 2011) and José Moran (2017) contribute to this reflection by arguing that technological advancement reshapes not only ways of learning but also the modes of knowledge production and circulation. Lévy (2011) observes that collective

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[5] The research presented here is part of a postdoctoral project that investigates the potentialities and challenges of AI in education, with particular attention to its classroom applications, ethical implications, and its impact on teacher education.

intelligence emerges from interactions mediated by technologies, while Moran (2017) emphasizes the importance of an active and hybrid pedagogy centered on student autonomy — dimensions that are directly challenged by the presence of generative AI.

Pope Francis, in his address to the Intergovernmental Forum of the Group of Seven (G7) in 2024, emphasized that AI is both fascinating and dangerous, underscoring the importance of ensuring that its use is guided by an ethical framework oriented toward human dignity and the common good (Vatican, 2024). This perspective resonates with concerns expressed by international organizations such as UNESCO, which, in the Beijing Consensus on Artificial Intelligence and Education (UNESCO, 2019) and in more recent documents, such as the *Guidance for Generative AI in Education and Research* (UNESCO, 2024) and the *AI Competency Framework for Teachers* (UNESCO, 2025), put forward recommendations for the equitable and inclusive use of AI in education, emphasizing the need to ensure transparency, safety, and algorithmic accountability in the educational deployment of these technologies (UNESCO, 2023, 2024, 2025).

Santaella (2023) further contributes to this debate by proposing a critical reading of the limits of ChatGPT as a discursive technology, highlighting its impacts on thought and language. The author warns that the unreflective use of AI may foster cognitive standardization, reinforcing the urgency of pedagogical mediation capable of promoting authorship and ethical discernment.

In the Brazilian context, recent studies have explored university students' perceptions of AI. Silva, La Marca, and Lopes (2024) conducted a study revealing that 92.7% of students reported using generative AI tools, such as ChatGPT, recognizing benefits such as time savings, while also identifying challenges related to information verification and academic ethics. These findings underscore the need for educational approaches that equip students to use these technologies critically, fostering meaningful and ethically grounded learning.

Similarly, Chan and Hu (2023) emphasize that students' perceptions significantly influence their approaches to learning and educational outcomes, suggesting that understanding these perceptions can inform policies and pedagogical practices that are responsive to students' needs and concerns. Ethan Mollick (2024) reinforces this perspective by proposing the concept of co-intelligence, in which humans and machines collaborate in creative and ethical ways. This notion indicates that AI can enhance both teaching and learning processes, provided it is accompanied by pedagogical intentionality and critical digital literacy (Mollick, 2024).

In light of this context, this study seeks to analyze the perceptions of undergraduate teacher education students regarding the use of AI in higher education, with the aim of understanding how future teachers are positioning themselves in relation to this emerging technology. By

giving voice to students, the study intends to identify the perceived potentialities and challenges involved in integrating generative AI into pedagogical practice, thereby contributing to the debate on teacher education in times of AI and to the development of training strategies that promote the critical, creative, and ethical use of these tools in education.

PATHS TAKEN: WORKSHOP, LISTENING, AND INQUIRY

The development of this article is grounded in a qualitative, exploratory approach, centered on the attentive listening of participants involved in a training workshop on the use of generative artificial intelligence in education. More than merely an instructional session, the workshop was conceived as a dialogical space in which undergraduate teacher education students could experiment with, reflect upon, and discuss the impacts, applications, and challenges of AI within the context of teacher preparation and pedagogical practice. Lasting approximately four hours, the workshop engaged participants in a series of provocations — through guiding questions, prompt-based activities[6] and ethical discussions — with the aim of mapping their perceptions and fostering critical reflection on the role of AI in higher education[7].

During the session, discussions were not limited to the instrumental exploration of the technology but included theoretical problematizations inspired by authors who critically examine the use of AI in education. Ethan Mollick's (2024) reflections on human–algorithmic co-intelligence, José Moran's (2017) considerations regarding student autonomy in active methodologies, and Pierre Lévy's (2011) concept of collective intelligence were presented as key references for rethinking the teaching role in times of human–machine collaboration. The ethical warnings articulated by Lúcia Santaella (2023) concerning the cognitive and linguistic limits of ChatGPT were also discussed, alongside the principles of safe, equitable, and transparent AI use outlined in UNESCO documents (2019, 2023, 2024, 2025). This set of theoretical references provided the foundation for the critical analysis of the experiences lived during the workshop, enabling participants to connect pedagogical practice to a broader ethical and epistemological horizon.

At the end of the workshop, a questionnaire containing both open- and closed-ended questions was administered to the participating students. The instrument was designed to capture, in a direct and nuanced manner, the participants' experiences and perspectives regarding the use of tools such as ChatGPT. The questions ranged from frequency of AI use to

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[6] In the context of generative artificial intelligence, the term *prompt* refers to any command, question, or instruction provided by the user to guide the AI model's response. The quality and clarity of the prompt directly influence the relevance and accuracy of the generated output.

[7] The workshop was developed within the framework of an ongoing postdoctoral research project. Its structure is also grounded in two previous studies (Silva & Kampff, 2023; 2025).

perceptions of the reliability of its responses, concerns about potential model "hallucinations"[8], and positions on prohibitions, regulations, and the ethical impacts of AI in education.

The data analyzed in this study were constructed from the responses of six undergraduate teacher education students from different programs within the field of education: Physical Education, Portuguese Language and Literature, English Language and Literature, and Pedagogy. All participants were in the final semesters of their respective programs, at a stage when engagement with curricular internships and teaching practice becomes more intensive and concrete. Data collection took place at the end of the second semester of 2024, following the completion of the training workshop on generative artificial intelligence in the educational context. The workshop was held at a community university located in a densely populated urban area in southern Brazil. Most of the student teachers participate in national, state, or institutional scholarship programs due to conditions of socioeconomic vulnerability.

Although the number of participants is relatively small, the diversity of academic programs represented provides a rich and meaningful sample aligned with the objectives of this study. Bringing together the perspectives of pre-service teachers from different fields of knowledge makes it possible to grasp subtle distinctions in how artificial intelligence is perceived, questioned, and incorporated into teacher education processes. It thus constitutes a qualified and analytically relevant listening effort which, even on a limited scale, reveals trends, tensions, and potentialities that permeate the university experience in times of accelerated technological transformation.

Data analysis was guided by the principles of content analysis (Bardin, 2016), through the categorization of responses into emerging thematic axes. This approach has proven particularly appropriate in educational research, as it enables the interpretation of meanings constructed by participants within formative contexts (Dalla Valle; Ferreira, 2025). Throughout this process, care was taken to preserve the uniqueness of each response while simultaneously identifying recurring patterns, tensions, and shared meanings among participants. In this context, the workshop was not merely a setting for data collection, but also a space for learning and the production of meaning: positioned between provocation and questioning, use and uncertainty, fascination with innovation, and the ethical exercise of critical reflection.

It is important to emphasize that all stages of the research process adhered to ethical principles governing studies involving human participants, including the obtaining of informed consent and a firm commitment to the anonymity of the collected information. No personal

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[8] So-called "hallucinations" in generative artificial intelligence occur when a model produces false, inconsistent, or inaccurate information and presents it as though it were correct, often with a high degree of linguistic confidence.

data were linked to the responses, and students were clearly informed that they could withdraw from the study at any time without incurring any form of penalty or disadvantage.

By employing a workshop as both a formative and investigative device, the methodology adopted here invests in the potential of qualified listening as a means of understanding not only what students think about AI, but also how they experience and critically engage with it throughout their educational trajectories. The methodological path of this study is thus structured through the interweaving of practice, reflection, and attentive listening.

RESULTS AND DISCUSSION

Initial appropriations and forms of AI use

When beginning the analysis of students' responses, one observation stands out: all workshop participants had, at some point, used generative artificial intelligence tools in their academic or professional routines. This unanimous response not only highlights the extent to which these technologies are embedded in university life, but also points to the emergence of a new repertoire of practices among pre-service teachers. The data gathered in the workshop corroborates the landscape outlined in the introduction of this study: generative AI is already part of everyday academic routines, integrating almost naturally into students' scholarly activities. As Silva, La Marca, and Lopes (2024, p. 3) emphasize, their research "revealed that 92.7% of participants used generative AI tools for leisure or curiosity, and 83.7% also employed them for academic or professional purposes" (*our translation*) reinforcing the perception that the use of generative AI has already become an established practice, even if not always accompanied by critical reflection on its pedagogical and ethical implications. Even in the absence of consolidated institutional training on the subject — as will be discussed in the following sections — AI tools are already taking a place in the practices of pre-service teachers.

The tool most frequently mentioned was ChatGPT, explicitly cited in nearly all responses. Beyond mere curiosity, the uses reported reveal practical purposes closely aligned with the context of initial teacher training: lesson planning, development of educational projects, organizing ideas for academic assignments, and designing activities were among the examples highlighted by participants. One respondent stated, "*[I use] ChatGPT to create lesson plans and projects*", while another noted, "*I used chatgpt.com to help develop lesson plans*". The prominence of this tool among pre-service teachers reflects a broader phenomenon, linked to its rapid integration into cognitive and productive routines in the educational field. As Santaella (2023, p. 2) observes, the explosion triggered by ChatGPT is striking, evident in the "excessive volume of articles, interviews, columns, blogs, and news about ChatGPT circulating in magazines, newspapers, and online platforms every minute" (*our translation*),

demonstrating the cultural and symbolic reach of generative AI, whose presence is already reshaping study, writing, and creative practices within the university environment.

These accounts indicate that, for pre-service teachers, artificial intelligence has already become a pedagogical support technology, pragmatically integrated to address the everyday demands of teacher training — uch as planning, adapting, and designing activities. Engagement with AI occurs spontaneously, driven by the concrete requirements of supervised teaching practice and academic activities related to teaching. This spontaneous use reinforces what Mollick (2024) describes as a movement of co-intelligence, in which the interaction between humans and algorithmic systems expands the creative possibilities of work.

Despite this natural integration, the use of AI is not free from tensions and concerns. While students turn to these tools to facilitate their practices, they also demonstrate awareness of the limits and risks involved. This reality underscores the need for teacher education programs not only to acknowledge the growing use of AI, but also to commit to providing formative spaces that foster critical, ethical, and conscious engagement with these technologies in educational contexts. As Laipelt and Marques (2023, p. 133) highlight, the model's ability to generate "false information and narratives in a credible manner and at an unprecedented scale" is one of the main concerns currently among the scientific community and governmental bodies, reinforcing the urgency of teacher training capable of addressing the challenges of misinformation and algorithmic manipulation in educational settings.

Familiarity with AI: between technical use and the absence of institutional training

When asked about their level of familiarity with artificial intelligence tools, students reported moderate to high confidence in using these technologies. On a scale from 1 to 5, most responses fell in the medium (3) and high (4) range, with some indicating very high (5), reflecting a growing familiarity with AI, albeit one still characterized by a degree of empiricism. This finding aligns with Silva and Kampff (2023, p. 103), who note that "the changes occurring in our classrooms have the potential to drive growth and learning, but require a critical and ethical perspective on the educator's role in relation to AI." Such observations highlight that, although familiarity is increasing, it remains primarily grounded in hands-on experimentation rather than conceptual or critical understanding of how these tools function, their limitations, and their broader implications.

This finding becomes even more significant when contrasted with responses regarding the treatment of AI within teacher education programs. The majority of participants reported either an absence or a superficial coverage of AI during their undergraduate studies. One student stated plainly, "*Personally, I had absolutely nothing on the subject*", while another assessed it as, "*More or less, let's say a grade of 8 is okay*".

Although some reported occasional experiences — such as elective courses, lectures, or brief mentions of the topic — the general sentiment is that the university has yet to systematically and critically integrate the discussion of AI. This is particularly concerning, given that the students themselves already face the need to engage with these tools in internships, projects, and pedagogical practices.

Essa dissociação entre a experiência prática e a formação teórica pode ser lida como um vazio formativo, em que o saber-fazer se antecipa à reflexão sobre o fazer. Em outras palavras, os estudantes aprendem a usar a IA, mas não aprendem sobre a IA. Falta-lhes, muitas vezes, a mediação pedagógica que poderia contextualizar esses usos, discutir seus limites éticos e epistemológicos, e oferecer critérios para sua aplicação crítica.

As one respondent emphasizes, "*I believe it is a tool that is very important, and courses should provide more guidance on how to use it, but also on the risks involved*". This perspective highlights the urgency for teacher education programs to move beyond a purely instrumental view of AI, incorporating discussions that address its ethical, political, and pedagogical dimensions. After all, if the technology is already part of students' daily lives, it is the responsibility of training programs to offer pathways for it to be not only used, but also understood, questioned, and reconfigured within educational practice. In this context, it is essential that teacher education fosters a culture of ethical and critical discernment regarding the use of technologies, since, as Silva and Kampff (2025, p. 1) assert, "AI can both enable new learning possibilities and reinforce dehumanizing pedagogical models guided by logics of algorithmic efficiency" (*our translation*).

Perceived Potential: Dynamism, Creativity, and Accessibility

While students highlight gaps in institutional training regarding the use of generative AI, they also clearly recognize the multiple pedagogical potentials this technology can offer. Based on questionnaire responses, it is possible to identify a vision shaped by notions of dynamism, innovation, accessibility, and creative support — elements that, for future teachers, have the potential to positively transform teaching practice.

Many participants emphasized AI's ability to streamline content creation, suggest differentiated approaches for lessons, and encourage the use of more engaging strategies for primary and secondary education students. One respondent stated, "*I believe lessons can be more dynamic and varied, with activities that break the standard pattern and stimulate participation*". This perception is also reflected in the desire to foster more creative learning experiences, as illustrated by another participant's response: "*I see practical possibilities, such as the development of projects, games, and faster, more creative teaching sequences*".

The association between AI and the improvement of teaching practice appears repeatedly. For some, the tool assists in organizing ideas, refining instructional proposals, and even in the creation of assessments. It is noteworthy that this understanding is not limited to viewing AI as a mere producer of ready-made texts: the responses reveal signs of an appropriation that acknowledges the teacher's role as a curator and recontextualizer of the content generated, even if this perspective is not always fully articulated.

In this sense, the workshop appears to have contributed to broadening these understandings. One participant wrote, "*It was interesting to use the AI tool to create real activities that I can adapt for my internships and future lessons*". Another relevant aspect is the tool's accessibility, highlighted by some students as a way to "*facilitate the start of planning*", which often faces creative blocks or time constraints. As one respondent noted, "*AI helps me think through the structure of what I want to do, giving ideas when I don't know where to start*".

These responses indicate an important shift: AI does not replace planning, but rather supports it by providing repertoire, language, and suggestions that can be refined through the educator's perspective. In this context, AI's generativity does not lie in automating the process, but in expanding the range of possibilities.

These findings reveal that students recognize AI as a tool that supports pedagogical creativity and can contribute to making the teaching-learning process more engaging, collaborative, and responsive to the specific characteristics of each class. The challenge, however, remains in balancing this potential with the risks of uncritical use — a tension that will be further examined in the following section.

Challenges and concerns: complacency, standardization, and authorship

While generative artificial intelligence was viewed by many students as a catalyst for creativity and dynamism, expressions of ethical and pedagogical concerns regarding its use in the classroom were no less significant. In a reflective stance worthy of attention, several participants identified concrete risks associated with the uncritical use of AI by students themselves — and, at times, by teachers as well.

Among the most recurrent concerns, intellectual complacency stands out, expressed forcefully in the words of one participant: "*The 'laziness' of thinking. The convenience that may come with the tool and the limitation of creativity*". This observation reveals a legitimate unease: to what extent might the use of AI replace independent thought with ready-made and impersonal solutions? The critique, therefore, is not directed at the tool itself, but at the risk of its uncommitted use, as though the presence of AI in the learning process could dispense with the student's effort of reflection, analysis, and re-elaboration.

This tension finds resonance in the analysis of Mollick (2024, p. 66, authors' translation), for whom

> as AI gains greater capacity to perform tasks once considered exclusively human, we will need to confront the emotional shock and fascination of living alongside increasingly powerful nonhuman co-intelligences, as well as the anxiety and sense of loss that we will also experience (*our translation*).

The students' statements clearly reveal this very ambivalence between enchantment and apprehension, between creative potential and the threat to authorship, which characterizes the contemporary challenge of thinking with — rather than merely through — artificial intelligences.

Other respondents pointed to a second challenge: the homogenization of academic work, particularly in assessment contexts. One student observes, "Students' assignments all being produced by AI", while another adds, "The greatest challenge is associated with students' use of AI: how can we know whether they have truly learned or simply copied?".

These responses touch on a sensitive issue: the balance between productive use and concealed use of AI. The question of authorship, although not always articulated in those exact terms, permeates the accounts — after all, if a text is generated by a tool, does it still express the voice of the person who submits it? What does it mean to produce in the age of AI? How should we address the risk of cognitive dependency that may undermine students' intellectual autonomy?

It is noteworthy that these concerns are not limited to the other — the student, the colleague, the absent teacher — but also emerge as personal dilemmas, as in the case of the participant who states, "*I am afraid that ChatGPT might end up killing my creativity*". This self-reflection opens space for a more nuanced understanding of the relationship with technology: it is not a matter of simply accepting or rejecting AI, but of continuously negotiating the terms of its integration into pedagogical practice, remaining attentive to the pitfalls of automation and the dilution of formative processes.

These concerns engage directly with contemporary debates on AI ethics, particularly within the educational field. The literature indicates that tools such as ChatGPT, when used in a decontextualized manner, may reinforce biases, oversimplify complex issues, and lead to conceptual errors presented with an appearance of accuracy (Santaella, 2023; Laipelt; Marques, 2023). The risk of AI "hallucinations" — persuasive yet inaccurate responses — has not yet been fully assimilated by novice users, which underscores the urgency of educational processes that explicitly address this dimension.

In sum, the data show that students do not romanticize AI. On the contrary, they recognize that, without pedagogical intentionality, it may hinder more than it helps. Within this context, the workshop experience created space for these concerns to be named, reflected upon, and debated, moving away from the notion that AI is neutral or inevitably positive. Here, critique emerges as a sign of formative maturity.

Teacher education: when and how to address AI?

One of the most thought-provoking questions in the questionnaire asked students to indicate at what point in teacher education the discussion on artificial intelligence should be further developed. Most responses revealed a comprehensive understanding: AI should not be treated as an occasional topic or addressed only at isolated moments in the program, but rather discussed throughout the entire course of training, with particular attention to pedagogical subjects, teaching practicums, and integrative seminars.

One respondent aptly synthesizes this idea: "*I believe it should be addressed at all stages of the program. AI is present in our daily lives, and we need to understand its impacts from the outset*". Other participants, while acknowledging the importance of the topic throughout the degree, argued that the discussion should gain greater depth in the final semesters, when training allows for a more articulated integration between theory and practice.

For these students, the ideal would be to address AI in direct connection with experiences in supervised teaching practicums, enabling situated and contextualized reflection. As one student notes, "*Alongside the practicum, so that it can be discussed how to use it in the classroom, with pedagogical purpose*".

This type of response demonstrates that students are not merely seeking to become familiar with the tools, but wish to understand their pedagogical use in a critical manner, articulating technological resources with educational intentionality. The desire for a deeper debate reveals not only curiosity, but also an awareness of the complexity involved in integrating AI into the school context.

On the other hand, some responses point to the near-total absence of the topic in teacher education programs. One student states candidly, "*Personally, I have had absolutely nothing on the subject so far*". This finding resonates with the previous analyses: although students use AI with relative frequency, they do so without that use being supported by systematic discussions in their initial training. The gap between practical use and theoretical preparation persists — and is concerning. By failing to debate the implications of AI, teacher education risks naturalizing its presence without considering its impacts on authorship, planning, assessment, and, above all, professional ethics.

Within this context, the workshop was perceived as a meaningful initial formative experience. Many participants emphasized the importance of initiatives like this to address a demand that is already present in everyday training contexts and in practicum settings. As one student highlighted, "*[The workshop] was essential to better understand what AI can do, but above all to know how I can use it without losing my role as an educator*".

What the data ultimately reveal, therefore, is the urgency of a teacher education that does not hand over protagonism to technology, but instead reinforces the centrality of pedagogical mediation and critical awareness in the face of emerging challenges. AI can — and should — be part of teacher preparation, but it is teaching itself — understood as a reflective and ethical practice — that must remain at the center of the scene.

The workshop as a meaningful experience

At the end of the questionnaire, students were invited to evaluate the generative artificial intelligence workshop in terms of its relevance to teacher education and the practical outcomes they perceived. The evaluation was overwhelmingly positive: most participants rated the workshop as highly relevant, emphasizing the opportunity to understand AI from a critical, applied, and pedagogical perspective.

Beyond the praise for how the activity was conducted, what emerges in the responses is the perception that the workshop filled an existing gap in teacher education programs. In one of the comments, a student wrote, "*I found it extremely valuable for helping us better understand how to use AI properly and without fear*". Another participant reinforces this view: "*It was interesting to use the AI tool to create real activities that I can adapt for my practicums and future classes*".

These statements point to two simultaneous movements: the workshop was experienced as a space for technical training insofar as it introduced tools and concrete possibilities for use, and as a space for ethical formation by addressing dilemmas related to authorship, reliability, and mediation. In this context, AI was not presented as a ready-made solution, but as a tool that requires pedagogical intentionality and critical awareness in its use.

When asked about the practical outcomes of the workshop, students mentioned: developing projects with greater agility; creating more engaging activities; learning how to craft prompts; and expanding their repertoire to guide students in their own inquiries. As one participant summarized, "*I definitely learned the right way to research on ChatGPT*".

These responses reveal that, beyond introducing tools, the workshop prompted shifts in attitudes toward AI by fostering a more conscious and strategic relationship with these resources. The accounts suggest that students began to view AI not as a substitute for

pedagogical thinking, but as a potential partner in the creation of more creative and reflective practices, provided they are grounded in intentionality and critical awareness.

In this sense, the collected statements indicate not merely a momentary interest, but a genuine desire for continuity and further development, signaling that there is room — and, above all, a concrete need — to integrate initiatives such as this into institutional training in a systematic way. In sum, the data reinforce the value of workshops as critical, active, and contextualized formative spaces, capable of weaving together practice and theory, inquiry and intentionality, technology and pedagogy. In light of the lack of structured approaches to AI within teacher education programs, initiatives like this emerge as spaces of experimentation and listening, where the future of teaching is rehearsed through dialogue with the challenges of the present.

FINAL CONSIDERATIONS

Listening to pre-service teachers revealed a scenario in which generative artificial intelligence is already present, even when institutional training has not yet recognized it as an urgent agenda. Used spontaneously and pragmatically, especially through tools such as ChatGPT, AI has been incorporated into the everyday practices of students who work — or are preparing to work — in diverse school contexts. This use, however, occurs largely without critical mediation, without ethical grounding, and without appropriate pedagogical guidance.

This finding highlight that the central challenge is not limited to the technical mastery of tools, but also involves understanding their cognitive and epistemological effects on the processes of teaching and learning. As Santaella (2023) warns, before discussing the applications and epistemological shifts brought about by AI chat systems,

> educators must reflect on the extent to which they transform the very notions of education that we have cultivated since the Enlightenment. Going even further, it is necessary to ask what kind of human subject is emerging in symbiosis with AI. It is the ontology of the human that is at stake. This must be reconsidered without delay (Santaella, 2023, p. 10, *our translation*).

Such reflection reinforces that the challenge of teacher education in the age of artificial intelligence goes beyond the technical dimension and calls for a critical reconstruction of the human, ethical, and epistemological foundations of teaching and learning.

Throughout this article, the aim was to understand not only what students think about AI, but how they think: how they experience it, adapt it, fear it, or celebrate it. What emerges from this analysis is a set of perceptions marked by ambivalence — between fascination and apprehension, potential and risk, creativity and complacency. Participants recognize AI as an ally in lesson planning, in the creation of teaching materials, and in the organization of

pedagogical thinking, yet they also warn of the dangers arising from its uncommitted use: the replacement of authorship, the standardization of responses, and the weakening of reflective effort.

The questionnaire responses indicate that students do not expect ready-made formulas nor the demonization of technology. What they call for is qualified training, with time for discussion, space for experimentation, and mediation for understanding. It is not, therefore, a matter of defending or condemning AI, but of building a formative repertoire that enables engagement with it in an ethical, critical, and pedagogical manner. As Chan and Hu (2023, p. 10, authors' translation) emphasize, "*institutions must provide clear policies and pedagogical guidelines to ensure the responsible and ethical use of generative artificial intelligence in teaching and learning*". Teacher education, therefore, must reclaim human protagonism, intellectual autonomy, and the ethical dimension of educational practice.

In this sense, the workshop analyzed here proved to be a powerful mechanism: it created space for the practical experimentation of AI, prompted ethical reflections, and broadened the horizons of possible pedagogical uses. More than a one-time activity, it was perceived as a formative experience — and, perhaps more importantly, as a sign of what is still lacking: a structured and continuous approach to AI within teacher education programs.

In light of this, it is proposed that the discussion of AI be incorporated transversally into teacher education curricula, with particular attention to teaching practicums, pedagogical subjects, and interdisciplinary components. It is urgent to acknowledge that future teachers are already using AI, and that universities must accompany them — not merely by providing tools, but by fostering the conditions for critical reflection upon them.

Finally, it is reaffirmed that teaching, in times of artificial intelligence, remains an irreplaceable practice. Not out of resistance to the new, but because of its commitment to what AI cannot provide: attentive listening, human mediation, and the collective creation of knowledge. May the contemporary challenge not be to compete with the machine, but to learn to think with it — and, above all, beyond it.

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