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TEACHER EDUCATION IN ALGORITHMIC TIMES: ETHICAL IMPLICATIONS OF ARTIFICIAL INTELLIGENCE USE IN DISTANCE EDUCATION IN LIGHT OF RESOLUTION CNE/CP NO. 4/2024

FORMAÇÃO DOCENTE EM TEMPOS ALGORÍTMICOS: IMPLICAÇÕES ÉTICAS DO USO DA INTELIGÊNCIA ARTIFICIAL NA EDUCAÇÃO A DISTÂNCIA À LUZ DA RESOLUÇÃO CNE/CP N° 4/2024

FORMACIÓN DOCENTE EN TIEMPOS ALGORÍTMICOS: IMPLICACIONES ÉTICAS DEL USO DE LA INTELIGENCIA ARTIFICIAL EN LA EDUCACIÓN A DISTANCIA A LA LUZ DE LA RESOLUCIÓN CNE/CP N° 4/2024

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ABSTRACT: This study aimed to analyze the ethical implications of the use of Artificial Intelligence (AI) in teacher education within Distance Education programs, based on Resolution CNE/CP No. 4/2024. Through qualitative research of bibliographic and documentary nature, it is evidenced that the uncritical adoption of resources such as automated tutoring, adaptive platforms, and algorithmic assessment tools undermines essential formative principles: qualified human mediation, articulation between theory and practice, and dialogical evaluation. The results point to risks of pedagogical depersonalization, deepening of educational inequalities, and weakening of the ethical-relational dimension of teaching, in disagreement with the Resolution's guidelines. It is concluded that generative systems should function as a subsidiary technology, expanding, not replacing, human mediation, grounded in algorithmic transparency and a commitment to formative emancipation.

KEYWORDS: Formative processes. Generative systems. Virtual teaching.

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***RESUMO*:** *Este estudo teve como objetivo analisar as implicações éticas do uso da Inteligência Artificial na formação docente em cursos de Educação a Distância, à luz da Resolução CNE/CP n.º 4/2024. Por meio de pesquisa qualitativa, de base bibliográfica e documental, evidencia-se que a adoção acrítica de recursos como tutoria automatizada, plataformas adaptativas e corretores algorítmicos compromete princípios formativos essenciais: mediação humana qualificada, articulação entre teoria e prática e avaliação dialógica. Os resultados apontam riscos de despersonalização pedagógica, aprofundamento das desigualdades educacionais e esvaziamento da dimensão ético-relacional da docência, em desacordo com as diretrizes da Resolução. Conclui-se que os sistemas generativos devem operar como tecnologia subsidiária, expandindo, e não substituindo, a mediação humana, com base na transparência algorítmica e no compromisso com a emancipação formativa.*

***PALAVRAS-CHAVE*:** *Processos formativos. Sistemas generativos. Docência virtual. Implicações deontológicas.*

RESUMEN: *Este estudio tuvo como objetivo analizar las implicaciones éticas del uso de la Inteligencia Artificial (IA) en la formación docente en cursos de Educación a Distancia, a la luz de la Resolución CNE/CP n.º 4/2024. Mediante una investigación cualitativa, de base bibliográfica y documental, se evidencia que la adopción acrítica de recursos como tutoría automatizada, plataformas adaptativas y correctores algorítmicos compromete principios formativos esenciales: mediación humana calificada, articulación entre teoría y práctica, y evaluación dialógica. Los resultados señalan riesgos de despersonalización pedagógica, profundización de las desigualdades educativas y vaciamiento de la dimensión ético-relacional de la docencia, en desacuerdo con las directrices de la Resolución. Se concluye que la IA debe operar como tecnología subsidiaria, ampliando, y no sustituyendo, la mediación humana, con base en la transparencia algorítmica y el compromiso con la emancipación formativa.*

PALABRAS CLAVE: *Procesos formativos. Sistemas generativos. Docencia virtual.*

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INTRODUCTION

Teacher education in Brazil, historically marked by structural inequalities and expansion policies guided by quantitative targets, has been radically reconfigured over the last two decades by the consolidation of Distance Education (DE) as the main mode of delivery for undergraduate teaching programs. This transformation, although often presented from the perspective of democratizing access to higher education, has generated a profound shift in the epistemological, ethical, and pedagogical foundations of teaching.

The institutionalization of DE, especially following the regulation established by Decree No. 5,622/2005, elevated this modality to a strategic axis of public education policies, promoting accelerated enrollment growth while inaugurating a new regime for the genesis of the teaching profession: characterized by the logic of scalability, curricular standardization, and mass technological mediation.

This movement does not occur in a historical vacuum. Distance education emerged in Brazil as a complementary and remedial strategy, primarily aimed at populations historically excluded from formal educational circuits. With the advent of digital convergence and the widespread adoption of learning management platforms (Learning Management Systems [LMS]), DE has come to occupy a central position in higher education, particularly in teacher training programs.

It is at the intersection of DE expansion and the accelerated incorporation of AI-based technologies that the present investigation is situated. What is at stake is not only the efficiency of training processes but also the very meaning of teaching and public education in the country.

The CNE/CP Resolution No. 4, dated May 29, 2024 (Brasil, 2024a), which establishes the guidelines for the exercise of teaching in basic education, affirms the centrality of articulating theory and practice, the presence of the educator as an ethical mediator of knowledge, the commitment to diversity and social justice, as well as the need for formative and dialogical assessments. These principles come into direct conflict with the indiscriminate use of technologies that neglect active listening, qualified teaching mediation, and the commitment to reflective educational praxis.

In this context, the objective of this article is to analyze the ethical and pedagogical implications of AI use in distance-teaching undergraduate programs, in light of the formative foundations established by CNE/CP Resolution No. 4/2024 (Brasil, 2024a). More than mapping technology use in DE, the aim here is to critically reflect on how its application can clash with the ethical-pedagogical assumptions that support critical professional teacher development as an emancipatory practice.

From a methodological standpoint, this is a qualitative study of a bibliographic and documentary nature. The choice of a qualitative approach is justified by the focus on critical

interpretation of normative discourses, pedagogical practices, and educational technologies in use, prioritizing the analysis of meanings and values that permeate the current teacher training trajectory.

As an empirical corpus, legal documents (especially CNE/CP Resolution No. 4/2024) and official reports from the National Institute for Educational Studies and Research Anísio Teixeira (Inep) and the United Nations Educational, Scientific and Cultural Organization (Unesco) were selected. The investigation is anchored in a theoretical-critical approach, primarily based on the contributions of Freire (1996), Bauman (2001), Selwyn (2019), and Kenski (2012), articulating the political, ethical, and epistemological dimensions that structure current modes of teacher education in Brazil.

The relevance of this study lies in the urgency of establishing ethical, pedagogical, and regulatory criteria to guide the use of AI in the educational trajectory, particularly in contexts of social vulnerability, high dropout rates, and institutional precarization. By proposing a critical perspective on AI use in DE, the article seeks to contribute to the construction of a pedagogy of presence in times of automation, where the human is not replaced by the machine but expanded in their capacity to listen, interpret, and transform the world with and through others.

The article is organized into two central analytical sections: the first examines the consolidation of DE as the dominant modality in the practice of teacher formation and the resulting tensions between regulation, human mediation, and the logic of scalability; the second deepens the discussion on the impacts of AI use on the teaching trajectory, emphasizing ethical risks, depersonalization practices, and emancipatory pedagogical possibilities.

Teacher education in virtual environments: regulation, human mediation, and new technologies

DE in Brazil historically emerged on the margins of the educational system, initially associated with ad hoc and complementary projects, often marked by distrust regarding pedagogical quality. The genesis of DE is situated in a context of institutional and epistemological marginality, initially linked to isolated initiatives such as the correspondence courses of the Instituto Universal Brasileiro (1940s–1960s) and remedial education projects.

This phase was marked by a paradigm of emergency substitution, in which DE functioned as a palliative for populations excluded from the formal system. Kenski (2012) demonstrates that the paradigmatic shift occurred with the digital convergence of the 2000s, catalyzed by the Law of Guidelines and Bases (LDB 9.394/1996) and regulated by Decree No. 5,622/2005, which recognized DE as a legitimate modality.

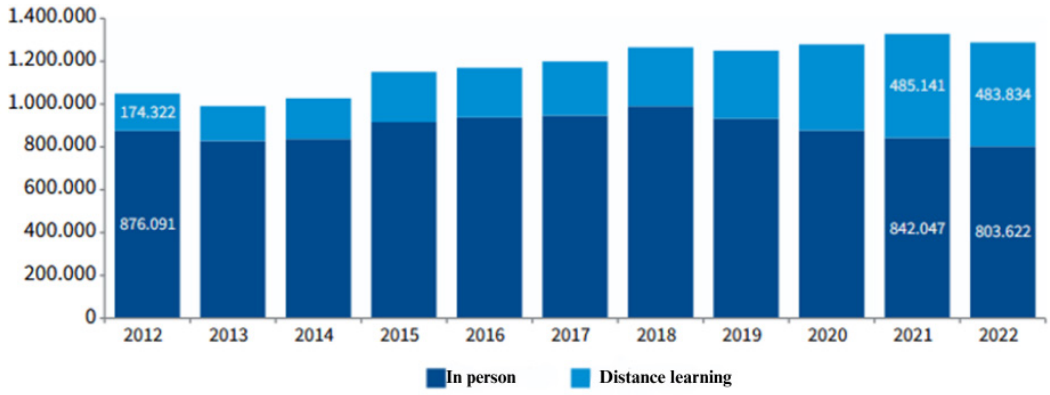
This milestone transformed it from a "peripheral practice" into a strategy of structural educational policy, driven by three vectors: technological (mass adoption of broadband

internet and LMS platforms), political (PNE targets for democratizing access), and economic (reduction of cost per student to expand enrollment). The COVID-19 pandemic (2020–2022) accelerated this process, consolidating DE as a central axis of the educational system, although tensions persist between its pedagogical potential and market-oriented models.

As Kenski (2012) emphasizes, this modality shifted from a peripheral and experimental position to the center of public higher education policies over the past two decades. This displacement was driven by the convergence of technological advances, demands for democratized access, and government directives aimed at rapidly expanding enrollment. DE ceased to be an emergency alternative to consolidate as a structuring strategy, reconfiguring the map of Brazilian higher education and challenging traditional paradigms of time, space, and pedagogical relationships.

In this scenario of tensions between apparent inclusion and structural exclusion, the data not only record: they denounce. Graph 1 quietly illustrates the unequal trajectory of educational modalities in Brazil, revealing how the expansion of Distance Education, far from signifying educational justice by itself, has often operated as an extension of the marginalization logics that mark the Brazilian social fabric.

Graph 1 – Number of graduates in undergraduate programs, by mode of delivery – 2012–2022



Source: Prepared by Deed/Inep based on microdata from the Higher Education *Census* (Brasil, 2023, p. 27).

The graph above, though silent, speaks loudly. In its overlapping bars, it reveals more than a statistical series: it draws a country in transition, in tension, and, above all, in resistance. Observing the evolution in the number of graduates between 2012 and 2022, one notes not only the quantitative rise of DE but also the emergence of a modality that was recently considered peripheral and is now central.

Between 2012 and 2022, DE grew from 174,000 to nearly half a million graduates, while face-to-face education fluctuated and, recently, declined. This transformation, contrary to the assumptions of technocratic discourse, cannot be read solely as modernization or

technological progress. It must be understood as an expression of structural inequalities, reflecting the living conditions and material impossibilities that shape the educational paths of millions of Brazilians.

The silent migration from physical presence to virtuality was not only a choice: it was a necessity, contingency, and survival. DE has been the possible refuge for subjects historically excluded from traditional spaces of knowledge: single mothers, exhausted workers, inhabitants of forgotten rural areas and unpaved peripheries, Indigenous peoples, riverside communities, quilombolas, incarcerated youth, and elderly individuals hungry for belated dignity.

However, the apparent democratization suggested by the data cannot be taken uncritically. The numerical explosion of DE raises questions: what is the quality of this education? Which epistemologies circulate on these platforms? Who profits from the expansion of this model? The educational market, which for decades has privatized diplomas and flexibilized curricula, has transformed access into a product and the student into a consumer. Thus, what appears as inclusion may, in many cases, be a simulation of emancipation.

The 0.3% drop in DE graduates in 2022 is, therefore, not merely a statistical cooling. It signals exhaustion, the overlap of vulnerabilities. What the graph does not say, but what emerges under critical scrutiny, is that DE students often study in the gaps between fatigue and childcare, with precarious internet access, inadequate teaching mediation, and on platforms that prioritize metrics over meaningful learning.

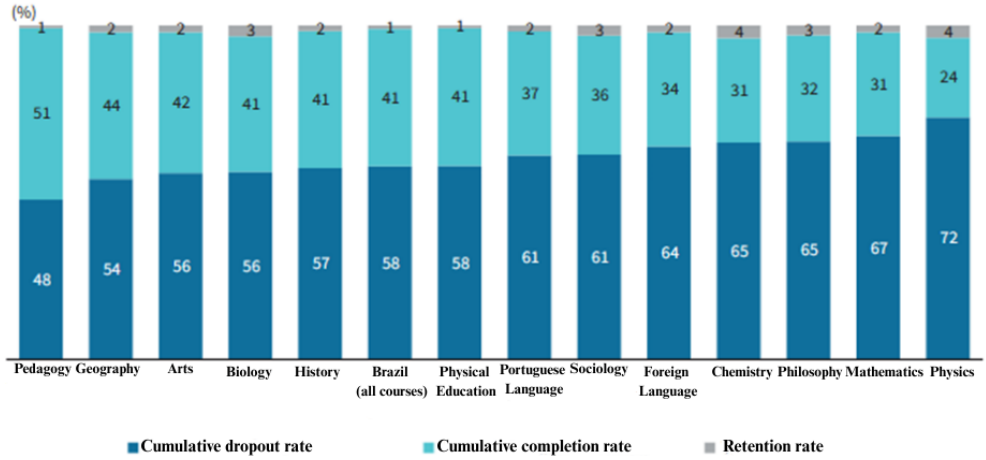
Distance education is not inherently inferior, but its implementation under the aegis of profit and massification renders it hostage to a neoliberal educational project. When knowledge is formatted by algorithms, when tutoring replaces dialogue, and when the diploma is valued more than the knowledge itself, education is emptied of meaning (Kenski, 2012).

Thus, the graph before us is not just technical data; it is a political document. It demands from us, as educators, the ethical commitment to re-enchant DE, to rebuild it on decolonial, inclusive, and affective epistemologies, where distance learning serves as a bridge, not a wall; a passage, not a shortcut. We need DE to be a real presence in the absence of the State, to cultivate autonomy without abandoning collectivity, to form critical subjects and not just certified individuals.

Above all, we must listen to what the numbers silence: there remains a vast historical debt to those who complete higher education without ever truly being included in it, neither as full subjects nor as authors of their own destinies. And if retention rates already reveal the failure of formative trajectories, enrollment data broaden the scope of urgency: they show that it is precisely teacher education—essential for the country's educational future—that has been predominantly pushed into the virtual corridors of DE.

The following graph reveals this silent concentration, where robust numbers conceal pedagogical absences, ethical misalignments, and the dilution of a truly emancipatory project of teacher education.

Graph 2 – Average trajectory indicators in 2022 of students who entered in 2013 in undergraduate programs for Basic Education teacher training – Brazil – 2013–2022



Source: Prepared by Deed/Inep based on data from the Higher Education *Census* (Brasil, 2024b, p. 39).

Graph 2 is, above all, an opaque mirror of Brazilian educational policy. It invites us to read, between columns and percentages, the cartography of teacher education marked by interruption, withdrawal, and institutionalized fragility. It shows the national average of trajectory indicators for students who entered teacher education programs in 2013, a decade-long journey that, for many, did not reach its destination. What it reveals is alarming: in all teacher training programs, more than half of the students drop out before completing their degree. In programs such as Physics, only 24% graduate, while 72% drop out—the highest attrition rate among all areas. These numbers are not neutral statistics; they are indicators of a pedagogical and ethical collapse.

In Pedagogy, a foundational course for early childhood and primary education, 48% abandon the program. What does it mean to train teachers for childhood if nearly half cannot complete the course? Instead of consolidating consistent formative trajectories, the data reveal a scenario of massive interruption in teacher education, with alarming dropout rates that, in some programs, exceed 70%. The graph further highlights that exclusion is inscribed within the trajectory itself, turning the promise of access to higher education into a path of widespread abandonment. Even more striking is the national data: only 41% of entrants complete teacher education programs. This confirms that attrition is not an accident, but a systemic symptom. In

light of this, the expansion of AI use in distance teacher education programs raises an urgent question: are we employing technologies to include or to automate failure?

The CNE/CP Resolution No. 4/2024 (Brasil, 2024a) asserts that teacher education must be anchored in principles such as human mediation, engagement with local contexts, epistemological plurality, and commitment to human rights. However, the trajectory indicators presented in the graph, with dropout rates exceeding 70% in programs such as Physics and Mathematics, and national averages below 50% completion, indicate that the pedagogical structure currently adopted is in flagrant disagreement with the formative principles established in CNE/CP Resolution No. 4/2024 (Brasil, 2024a), revealing a model that fails to ensure retention, comprehensiveness, or quality completion.

AI, without critical regulation, becomes a structure of pedagogical neglect. It does not educate; it merely processes. It does not listen; it merely delivers. It does not care; it calculates. That is why the graph is not just a snapshot: it is a cry. It denounces that teacher education, when mediated by algorithms and devoid of humanity, does not emancipate; it institutionalizes abandonment. In this scenario, it becomes urgent to reflect on the role of AI in teacher education. The issue is not rejecting technology, but interrogating the meanings it assumes when operating within a model that naturalizes dropout and precarizes the pedagogical bond. It is in this context that the following discussion is situated.

Artificial intelligence in teacher education: ethical risks, depersonalization, and pedagogical potentials

The use of AI in undergraduate teacher education programs offered in distance mode has expanded significantly, driven both by pressures for scalability and the promise of personalized learning. Within these formative experiences, different AI resources have been integrated into the daily operation of courses: automated tutoring systems, adaptive platforms, algorithmic grading, and performance analysis mechanisms are among the most common tools.

Although these innovations are often presented as technological advances, their use in the domain of teacher formation demands a careful analysis of the ethical, pedagogical, and epistemological implications involved, particularly when considered in light of the guidelines established by CNE/CP Resolution No. 4, dated May 29, 2024 (Brasil, 2024a).

The gradual replacement of human tutoring with automated service systems, such as chatbots and tutor robots, compromises central dimensions of the formative process. While these mechanisms may efficiently respond to operational questions, they cannot replace the dialogical and human nature of pedagogical mediation, which, according to Freire (1996), is constitutive of the educational act. The presence of another—of the educator as an ethical and responsive subject—is irreplaceable in the journey of teacher professionalization. Automated

tutoring, by depersonalizing listening and guidance, reduces education to a flow of data managed by pre-programmed instructions (Weller, 2020).

This condition is exacerbated by the fragility of interpersonal bonds in virtual environments, as analyzed by Bauman (2001), who identifies the weakening of human relationships in the era of digital instantaneity as one of the most acute symptoms of liquid modernity. In teacher education programs, where the professional subjectivation process is central, the absence of authentic formative bonds can compromise the construction of teacher identity.

In this context, a central paradox in distance teacher education emerges: the tension between scalability and the formative essence. Empirical data collected from longitudinal studies of DE teacher education programs indicate that the pursuit of quantitative expansion, through the automation of pedagogical processes, frequently collides with the fundamental formative principles outlined in CNE/CP Resolution No. 4/2024 (Brasil, 2024a).

Specifically, Article 5, items III and IV, reaffirm the centrality of qualified human mediation and the integration of theory and practice—dimensions that automated systems cannot reproduce. The liquidity of relationships in digital environments already constitutes a challenge, and the automation of tutoring only intensifies this fragility, compromising the space for listening, interaction, and ethical refinement between educators and students (Bauman, 2001).

Another widely adopted resource is so-called adaptive platforms, which use AI algorithms to provide individualized learning paths based on students' prior performance. At first glance, these tools suggest a student-centered pedagogy; however, as Selwyn (2019) observes, this is a simulated centrality, structured from statistical patterns and pre-coded rules. According to Unesco:

> *Researchers, teachers, and students must adopt a critical perspective regarding the value orientations, cultural norms, and social practices embedded in generative AI training models. Public policy makers must remain vigilant and take measures to address the exacerbation of inequalities caused by the widening gap in access to training and control of generative AI models … Moreover, despite calls for regulation from within the AI industry itself, the development of legislation aimed at the creation and use of AI—including generative AI—frequently lags behind the rapid pace of technological advancement. This helps explain the challenges faced by national or local agencies in understanding and governing the legal and ethical issues involved. Although generative AI can enhance human capacities in performing certain tasks, there is limited democratic control over the companies that develop it. This raises questions regarding the need for regulation, particularly concerning access to and use of national data, including data on local institutions and individuals, as well as data generated within each country's territory. Appropriate legislation must be developed so that local governmental agencies*

> *can exert some control over the growing waves of generative AI, thereby ensuring governance of this resource as a public good (Unesco, 2023, p. 14).*

The alleged personalization promoted by certain digital platforms corresponds, in practice, to adapting the student to standardized response models, reproducing, under the guise of innovation, the same foundations of traditional programmed learning. By reducing the formative process to a sequence of data-driven decisions, these technologies ignore the complex nature of human learning, which involves disruptions, intuitions, contradictions, and experiences that cannot be submitted to algorithmic logic. In the context of teacher education programs, this structure compromises the construction of a critical and creative pedagogical practice, lowering the role of the student to that of a mere task executor and that of the educator to a simple validator of performance (Selwyn, 2019).

This critique becomes even more compelling when confronted with Article 6 of Resolution No. 4/2024 (Brasil, 2024a), which requires theory-practice integration grounded in diversity and the complexity of reality. Human learning, especially in the development of teachers' knowledge, is situated, non-linear, relational, and traversed by affect and historical contexts. Algorithmic personalization, operating on past patterns and predictable responses, constitutes a disguised "one-path" pedagogy, transforming future educators into procedural technicians at the expense of their development as critical and creative subjects (Selwyn, 2019).

The application of automated grading systems also warrants critical attention. Many DE teacher education programs have adopted algorithmic graders to assess essay writing, arguing that such evaluation reduces faculty workload and ensures greater uniformity. However, all assessment carries cultural, subjective, and ideological dimensions.

The purported neutrality of algorithms conceals the biases embedded in the very data with which they were trained. When automatic graders are applied, there is a risk of normalizing discursive structures and penalizing voices expressed in non-hegemonic ways. This contradicts the Bakhtinian perspective of language as an encounter of social voices and undermines authorship as a formative process. In contexts focused on cultivating ethical teaching practices, such a procedure compromises the development of pedagogical listening, situated interpretation, and evaluative responsibility expected of future teachers (Weller, 2020).

Specialized literature confirms the risks of these automated assessment systems. Algorithms reproduce hegemonic writing patterns and structural silencing, disproportionately disadvantaging students who express themselves through non-normative languages or who come from different cultural repertoires. Contrary to Article 5, item V, of Resolution No. 4/2024—which values processual, formative, and interpretative assessment—algorithmic evaluation adheres to a statistical and binary logic, incompatible with the ethical and dialogical principles of teaching.

Another recurring use of AI in distance education is the continuous analysis of student behavior through the tracking of interactions, access logs, forum participation, and response patterns. These data are used to evaluate performance, predict dropout, and recommend automated interventions. While such tools can contribute to monitoring learning, their uncritical adoption inaugurates a logic of permanent algorithmic surveillance, which tends to disregard the concrete and subjective conditions of students.

As Kranzberg (1986) reminds us, no technology is neutral: its impact depends on the values and contexts that guide its use. When applied in programs with high dropout rates, as is the case with many DE teacher education programs, algorithmic surveillance can operate as a mechanism of control, punishment, and exclusion, rather than as a device for listening and support. According to Unesco:

> *Generative AI depends on enormous amounts of data and massive computational power, in addition to its iterative innovations in AI architectures and training methods—resources that are largely available only to the largest international technology companies and a few select economies (primarily the United States, the People's Republic of China, and, to a lesser extent, Europe). This means that the capacity to create and control generative AI is beyond the reach of most companies and countries, especially those located in the Global South. As access to data becomes increasingly essential for countries' economic development and individuals' digital opportunities, those countries and populations without access to, or unable to afford, sufficient data find themselves in a situation of data poverty. The situation is similar regarding access to computational power. The rapid dissemination of generative AI in technologically advanced countries and regions has exponentially accelerated data generation and processing, while simultaneously intensifying the concentration of AI wealth in the Global North. As an immediate consequence, data-poor regions have been further excluded and face a long-term risk of being colonized by the patterns embedded in GPT models. Current ChatGPT models are trained with internet user data that reflect the values and norms of the Global North, rendering them unsuitable for AI algorithms that are locally relevant in data-poor communities across the Global South, or even in more disadvantaged communities within the Global North itself (Unesco, 2023, p. 14).*

Educational institutions often reinforce inequalities by masking exclusionary practices under the guise of meritocracy and technical efficiency. AI, if managed uncritically, can deepen this gap. At this point, the risk emerges of transforming the educational environment into a digital panopticon, in which the mass collection of data serves less to promote learning and more to enforce social control and the dominance of hegemonic powers disguised as

pedagogical intervention. Such practice directly contravenes the principles of equity and social justice established in Article 5, items I and II, of CNE/CP Resolution No. 4/2024 (Brasil, 2024a), especially in contexts of social and economic vulnerability that characterize a large portion of the DE teacher education student population in Brazil.

In light of these considerations, it is necessary to assert that the use of AI in consolidating the educational commitment of distance teacher education cannot dispense with consistent ethical and pedagogical foundations. CNE/CP Resolution No. 4/2024 (Brasil, 2024a) establishes principles that should guide the entire initial teacher education trajectory in basic education, such as the articulation between theory and practice, the centrality of the educator as a knowledge mediator, and the commitment to diversity and social justice.

These principles cannot be dissociated in the digital context. The incorporation of AI into teacher education programs, if separated from qualified human mediation and critical pedagogical intentionality, risks transforming the clarity of educational aims into an automated and impoverished process, detached from the complexities of teaching.

For AI to play a genuinely constructive and emancipatory role in fostering awareness for teaching mediated by DE, its integration into courses must go beyond an instrumental or technicist project. AI in this field needs to be conceived as a mediation technology, not a substitution. This implies recognizing that its use must be subordinated to the principle of subsidiarity, according to which automated technologies are legitimate only when they expand, rather than replace, qualified human mediation. In particular, tutoring and formative assessment are dimensions that require listening, interpretation, and ethical presence—qualities still irreducible to algorithmic logic (Williamson, 2017).

Similarly, the issue of transparency arises as not only a technical but also a political demand. It is imperative that the algorithms operating on educational platforms be understandable and auditable, enabling teachers and students to know the criteria guiding automated pedagogical decisions. More than providing information, this is about ensuring conditions for argumentation, critique, and reformulation—central elements of democratic educational practice (Williamson, 2017).

Furthermore, it is necessary to shift the focus from AI as an instrument for reducing costs, time, and complexities to its potential for expansion. Using AI should not merely mean automating existing processes, but creating pedagogical possibilities: interactive simulations, multimodal analysis of teaching practices, aesthetic and collaborative experiments, among other ways of reinventing the formative space. When properly utilized, AI can be a catalyst for experiences that would be difficult to realize in traditional face-to-face contexts.

This critical and inventive appropriation of AI, however, requires pedagogical-technological preparation that goes beyond technical mastery. It is necessary to include, in teacher education curricula, components that help future educators understand the epistemic, ethical,

and political foundations of the technologies with which they will coexist and, often, have to confront. Training teachers for responsible AI use is, ultimately, training individuals capable not only of operating technologies but also of contesting the meanings these technologies assume in schools and society.

Finally, one cannot rely solely on the goodwill of institutions or on belated regulation of systems. The creation of permanent ethics committees, composed of educators, data scientists, jurists, and students, represents a necessary safeguard for the critical monitoring of AI use in teacher preparation programs. Such bodies allow not only the assessment of risks but also the questioning of uses, the proposal of alternatives, and the maintenance of the public and emancipatory dimension of education (Williamson, 2017).

In short, AI can indeed have a relevant place in the practice of teacher formation. But this place must be politically earned and anchored in a pedagogy committed to social justice, attentive listening, and pluralism. Without this, it risks deepening inequalities, automating biases, and silencing what matters most: the living presence of the educator and the student in the act of learning.

The potential of AI in distance education is undeniable. However, in the construction of teacher identity—central subjects in the development of a democratic and transformative public education—its use demands an even higher ethical, scientific, and pedagogical rigor. CNE/CP Resolution No. 4/2024 is not an obstacle to innovation but a normative framework that can, and should, guide the development of educational technologies that meet the formative demands of contemporary teaching.

FINAL CONSIDERATIONS

At the conclusion of this reflection, it becomes evident that the presence of AI in the development of critical teacher professionalism mediated by distance education constitutes a field of disputes, paradoxes, and possibilities. Far from denying the potential of digital technologies as pedagogical instruments, this study has highlighted the risks of uncritical adherence to devices that, under the guise of innovation and efficiency, can exacerbate historical inequalities, drain formative dialogue, and compromise the development of teachers as critical agents committed to social transformation. Teaching, by its nature, is a relational, situated, and ethical practice, and any attempt to reduce it to procedural or automated logics distorts its deepest meaning.

Throughout the analysis, it was observed that the massification of distance education teacher programs, while expanding access to higher education, often operates according to instrumental rationalities oriented by quantitative targets, cost-benefit goals, and

productivity metrics. In this scenario, AI emerges not as an ally of pedagogical mediation but as a partial substitute for fundamental human instances, especially in formative monitoring, dialogical assessment, and the construction of relationships that support the emergence of teacher authorship.

The integration of adaptive platforms, automated graders, and algorithmic surveillance systems introduces a new regime of control and standardization, disguised as personalization. Paradoxically, the more individualization is promised through algorithms, the narrower the space becomes for unpredictability, fruitful error, and productive doubt—elements that have always constituted the core of learning and teaching.

What is emerging is a technically modulated pedagogy, in which apparent flexibility conceals a standardized framework that guides behavior and normalizes trajectories. This has serious implications for the practice of teacher formation: rather than cultivating individuals capable of critically intervening in reality, there is a risk of producing implementers of protocols, domesticated by pre-programmed models and pathways.

However, the critique presented here is not technophobic, nor does it advocate a return to analog models out of nostalgia or unfounded resistance. Rather, it seeks to assert that the incorporation of AI into professional formation requires intentional mediation, ethical grounding, and political commitment.

The CNE/CP Resolution No. 4/2024 (Brasil, 2024a), by reaffirming the centrality of human mediation, social justice, diversity, and formative assessment, provides a powerful normative framework—not to hinder innovation, but to ensure that it is embedded within an emancipatory perspective, aligned with the contemporary challenges of teaching.

The future cultivation of teachers' ethical know-how, therefore, will not be constructed solely with codes and algorithms, but through listening, presence, corporeality, and relational bonds. The educator is not merely a content reproducer, but an agent who interprets, reconfigures, challenges, and recreates the world alongside their students. AI can and should be mobilized to expand experiences, enhance resources, and enrich the formative trajectory, provided it does not silence what is irreplaceable: the human experience of education.

It is urgent to contest, on all fronts, the pedagogical meaning of technologies. This requires investing in the critical formation of future teachers, in curricula that integrate theory and practice, and in public policies that do not treat distance education as a second-class modality. It is also necessary to establish permanent bodies for the ethical evaluation of technologies applied to education, with democratic and multisectoral participation. Only then will it be possible to break free from technocratic determinisms and affirm a pedagogy of presence—a pedagogy sustained by encounter, incompleteness, and the dignity of the educational experience.

At the crossroads between scalability and comprehensive formation, between technical efficiency and ethical commitment, teaching demands far more than intelligent platforms: it demands sensitive listening, political commitment, and shared responsibility. Digital tools must not obscure the essential: the encounter between individuals who, through teaching and learning, transform themselves and the world.

After all, as the trajectory of public education in Brazil reminds us, what sustains the school as a space of reinvention and resistance is not algorithms, but the living, concrete, and irreplaceable presence of the educator and the student in the act of learning. Despite all technological advances, this presence remains—and perhaps now more than ever—irrevocably human.

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