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THE EDUCATOR IN THE 21ST CENTURY: NEW CHALLENGES, EMERGING PARADIGMS, AND RECONFIGURATIONS OF TEACHING PRACTICE

O educador no século XXI: novos desafios, paradigmas emergentes e reconfigurações da prática docente

El educador en el siglo XXI: nuevos desafíos, paradigmas emergentes y reconfiguraciones de la práctica docente

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ABSTRACT: This article analyzes the challenges and emerging paradigms that reconfigure teaching practice in the 21st century, considering the cultural, technological, cognitive, and institutional transformations that strain the relationships among teachers, students, knowledge, and the school. The aim is to critically discuss how such transformations affect the contemporary classroom, student profiles, the pedagogical use of digital technologies and generative artificial intelligence, pedagogical authority, and teacher education, considering the

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objective working conditions in which educators operate. Methodologically, the study adopts a qualitative critical narrative review, based on structured searches in the SciELO, Scopus, Web of Science, ERIC, and CAPES Periodicals Portal databases, with a time frame from 1984 to 2010 for seminal works and from 2014 to 2026 for specific literature on digital culture, platformization, and artificial intelligence in education, complemented by consultation of Brazilian and international normative documents and official reports (BNCC, BNC-Formação, Cetic.br, INEP, UNESCO). The study is positioned as an analysis centered on the Brazilian educational context, aiming to dialogue with international debates. It is argued that the 21st-century educator operates under an unprecedented configuration of demands, marked by the need to act as a critical mediator of knowledge in environments characterized by attention fragmentation, platformization of learning, and intensification of institutional pressures. Theoretical-interpretive propositions sustain that effective educational transformation requires, more than tool adoption, pedagogical intentionality, professional recognition, adequate infrastructure, and institutional commitment to meaningful learning, equity, and integral formation.

Keywords: teacher education; educational technologies; artificial intelligence in education; pedagogical practice; teacher professionalism.

RESUMO: Este artigo analisa os desafios e paradigmas emergentes que reconfiguram a prática docente no século XXI, a partir das transformações culturais, tecnológicas, cognitivas e institucionais que tensionam a relação entre professor, estudante, conhecimento e escola. O objetivo consiste em discutir, de modo crítico, como tais transformações incidem sobre a sala de aula contemporânea, o perfil discente, o uso pedagógico de tecnologias digitais e da inteligência artificial generativa, a autoridade pedagógica e a formação docente, considerando as condições objetivas de trabalho do educador. Adota-se, do ponto de vista metodológico, uma revisão narrativa crítica de natureza qualitativa, fundamentada em busca estruturada nas bases SciELO, Scopus, Web of Science, ERIC e Portal de Periódicos da CAPES, com recorte temporal entre 1984 e 2010 para obras seminais e entre 2014 e 2026 para a literatura específica sobre cultura digital, plataformização e inteligência artificial na educação, complementada pela consulta a documentos normativos e relatórios oficiais brasileiros e internacionais (BNCC, BNC-Formação, Cetic.br, INEP, UNESCO). O estudo posiciona-se como análise centrada no contexto educacional brasileiro, com pretensão de diálogo com debates internacionais. Argumenta-se que o educador do século XXI opera sob uma configuração inédita de exigências, marcada pela necessidade de atuar como mediador crítico do conhecimento em ambientes caracterizados pela dispersão da atenção, pela plataformização da aprendizagem e pela intensificação das demandas institucionais. Sustenta-se, em proposições teórico-interpretativas, que a transformação educacional efetiva requer, mais do que adoção de ferramentas, intencionalidade pedagógica, valorização profissional, infraestrutura adequada e compromisso institucional com a aprendizagem significativa, a equidade e a formação integral.

Palavras-chave: formação docente; tecnologias educacionais; inteligência artificial na educação; prática pedagógica; profissionalidade docente.

RESUMEN: Este artículo analiza los desafíos y paradigmas emergentes que reconfiguran la práctica docente en el siglo XXI, a partir de las transformaciones culturales, tecnológicas, cognitivas e institucionales que tensionan la relación entre profesor, estudiante, conocimiento

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y escuela. El objetivo consiste en discutir, de modo crítico, cómo tales transformaciones inciden sobre el aula contemporánea, el perfil del alumnado, el uso pedagógico de tecnologías digitales y de la inteligencia artificial generativa, la autoridad pedagógica y la formación docente, considerando las condiciones objetivas de trabajo del educador. Metodológicamente, se adopta una revisión narrativa crítica de naturaleza cualitativa, fundamentada en búsqueda estructurada en las bases SciELO, Scopus, Web of Science, ERIC y Portal de Periódicos de la CAPES, con recorte temporal entre 1984 y 2010 para obras seminales y entre 2014 y 2026 para la literatura específica sobre cultura digital, plataformización e inteligencia artificial en la educación, complementada por la consulta de documentos normativos e informes oficiales brasileños e internacionales (BNCC, BNC-Formação, Cetic.br, INEP, UNESCO). El estudio se posiciona como análisis centrado en el contexto educativo brasileño, con pretensión de diálogo con debates internacionales. Se argumenta que el educador del siglo XXI opera bajo una configuración inédita de exigencias, marcada por la necesidad de actuar como mediador crítico del conocimiento en entornos caracterizados por la dispersión de la atención, la plataformización del aprendizaje y la intensificación de las demandas institucionales. Se sostiene, en proposiciones teórico-interpretativas, que la transformación educativa efectiva requiere, más que la adopción de herramientas, intencionalidad pedagógica, valoración profesional, infraestructura adecuada y compromiso institucional con el aprendizaje significativo, la equidad y la formación integral.

Palabras clave: formación docente; tecnologías educativas; inteligencia artificial en la educación; práctica pedagógica; profesionalidad docente.

1 INTRODUCTION

Teaching constitutes one of the most complex and historically situated social practices of modern societies. Throughout the 20th century, it was traversed by significant transformations that altered its institutional configuration, its theoretical foundations, and its conditions of practice. It is, however, in the first decades of the 21st century that this transformation process reaches a qualitatively distinct dimension, driven by the convergence between deep cultural changes, the expansion of digital communication technologies, the emergence of generative artificial intelligence as a phenomenon of broad social and educational reach (UNESCO, 2023; HOLMES; TUOMI, 2022), and the intensification of demands directed at teachers within educational systems increasingly pressured by logics of productivity, standardization, and accountability.

The contemporary educator operates within a context marked by constitutive ambiguities. On the one hand, the educator witnesses the proliferation of didactic resources, learning platforms, and digital tools that promise to expand pedagogical possibilities and personalize learning experiences. On the other hand, the educator faces frequently deteriorated

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working conditions, an overload of responsibilities, gaps in continuing education, and an institutional culture that, in many contexts, holds the teacher individually accountable for problems whose origins are structural, curricular, and social. The tension between innovation discourse and the reality of the material and symbolic conditions of the profession constitutes one of the central knots this article seeks to untangle, positioning itself critically against techno-solutionist perspectives that tend to displace toward instruments what is, in essence, a pedagogical, political, and ethical problem (SELWYN, 2014; 2022; WILLIAMSON, 2017).

The question that guides this reflection can be formulated in the following terms: in what ways do the cultural, technological, cognitive, and institutional transformations of the 21st century reconfigure the challenges, responsibilities, and paradigms of teaching practice, especially in the face of students more exposed to digital culture, to phenomena of attentional fragmentation reported in part of the literature, and to new forms of relating to knowledge? To address this question, the article articulates, in sequence, the analysis of the transformations of the contemporary classroom, the examination of student profiles under current conditions, the problematization of digital technologies and artificial intelligence applied to education, the discussion of pedagogical authority as critical mediation, the challenges related to teacher education and professional recognition, and the indication of possible pedagogical paths for the construction of meaningful learning in contexts of growing complexity.

It is also important to make explicit the epistemic and contextual positioning of the study. This is an analytical review centered on the Brazilian educational context, with the aim of dialoguing with international debates. National normative frameworks, institutional data, and Brazilian references constitute the articulating axis of the analysis, while the international literature on platformization, generative artificial intelligence, and digital culture provides the analytical framework that allows situating such specificities within transnational educational discussions. The central propositions presented herein have a theoretical-interpretive character, anchored in a grounded synthesis of the literature and institutional documents, and should be read as qualified analytical hypotheses, subject to validation, refinement, or refutation by subsequent empirical research.

The relevance of the investigation is justified by the need to articulate, in a unified analysis, dimensions frequently treated in fragmented form in educational studies: the cognitive transformations associated with digital culture, the effects of platformization on teacher

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autonomy and on the governance of school data, the implications of generative artificial intelligence for authorship and assessment, and the concrete conditions in which Brazilian teaching work is performed. The text is therefore positioned within the contemporary debate on teacher professionalism (NÓVOA, 2017; TARDIF, 2002) and on the critique of uncritical uses of educational technologies (KENSKI, 2007; SELWYN, 2014; 2022; WILLIAMSON, 2017; WILLIAMSON; EYNON, 2020; VAN DIJCK; POELL; DE WAAL, 2018).

1.1 Theoretical framework

The theoretical framework that supports the analysis rests on four articulated conceptual pillars, although distinct in their epistemic traditions. The first is critical pedagogy (FREIRE, 1987), which provides the ethical-political basis for the problematization of knowledge and the rejection of banking or technocratic models of teaching, while also offering the horizon of education as an emancipatory practice. The second is sociocultural theory (VYGOTSKY, 1984), which grounds the understanding of learning as a process mediated by signs, instruments, and social relationships, and which offers conceptual support for thinking of teaching as symbolic mediation in culturally complex environments. The third is the sociology of the teaching profession (TARDIF, 2002; NÓVOA, 2017), which sustains the discussion on professional knowledge, working conditions, teacher identity, and professionalism, articulating individual and collective dimensions of educational practice.

The fourth pillar is the field of critical studies on platforms, data, and artificial intelligence in education (SELWYN, 2014; 2022; WILLIAMSON, 2017; WILLIAMSON; EYNON, 2020; VAN DIJCK; POELL; DE WAAL, 2018; COULDRY; MEJIAS, 2019; PERROTTA; SELWYN, 2020; HOLMES; TUOMI, 2022), which offers analytical tools to examine the political, economic, and ethical implications of platformization and algorithmic governance in educational contexts. The articulation between these pillars does not aim at a harmonizing synthesis — it is acknowledged that Freirean critical pedagogy and critical platform studies, although sharing emancipatory horizons, operate with distinct epistemologies; and that Vygotskian mediation, when placed in dialogue with algorithmic systems, requires conceptual caution about what can or cannot be considered symbolic mediation in a genuine sense. The choice to mobilize these pillars jointly is justified by the interdisciplinary nature of

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the object, which demands complementary theoretical lenses to apprehend the multiple dimensions of contemporary teaching practice.

2 METHODOLOGICAL APPROACH

This article is configured as a qualitative critical narrative review, a modality pertinent to the interpretive analysis of broad and rapidly transforming thematic fields, in which the integration of seminal theoretical works, recent empirical literature, and normative documents requires flexible analytical procedures, while remaining grounded in explicit criteria for bibliographic selection and validation (ROTHER, 2007; GRANT; BOOTH, 2009; SNYDER, 2019). The choice of this modality, rather than a strict systematic review, is justified by the essayistic-analytical nature of the object, which demands broad conceptual articulation between distinct pedagogical, sociological, philosophical, and techno-critical traditions, while not relinquishing transparency about the search process and about the criteria that guided corpus composition.

The construction of the corpus followed a structured protocol in four stages. In the first, the universe of consulted databases was defined, encompassing SciELO, Scopus, Web of Science, ERIC (Education Resources Information Center), and the CAPES Periodicals Portal, supplemented by searches in institutional repositories and recognized academic publishers. In the second stage, descriptors in Portuguese, English, and Spanish were applied, organized into four thematic blocks articulated by Boolean operators, as summarized in Table 1. In the third stage, screening was conducted by reading titles, abstracts, and selected excerpts, applying the established inclusion and exclusion criteria. In the fourth stage, full-text reading of retained texts and thematic-categorical analysis were carried out.

Table 1 — Summary of the search and screening procedure by thematic block

Thematic block	Representative Boolean string	Records identified (approx.)	After screening (title/abstract)	Incorporated into corpus
Block 1: teaching and pedagogical practice	(“docência” OR “prática docente” OR “teacher professionalism” OR “teacher knowledge”)	≈ 180	≈ 30	4
Block 2: digital culture and cognition	(“cultura digital” OR “digital culture” OR “attention” OR “digital literacy”)	≈ 140	≈ 22	1

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Block 3: technologies, platformization, and data governance	("tecnologias educacionais" OR "educational technologies" OR "platformization" OR "platform society" OR "data colonialism")	≈ 190	≈ 35	6
Block 4: artificial intelligence in education	(("inteligência artificial" AND "educação") OR ("generative AI" AND "education") OR ("AI literacy" AND "education"))	≈ 270	≈ 48	5
Total via structured search	—	≈ 780	≈ 135	16
Added by directed selection (seminal works, methodological references, normative documents)	Targeted selection guided by theoretical relevance and legal framework	—	—	22
Final analytical corpus	—	—	—	38

Source: prepared by the author. Consistent with the critical narrative review modality adopted, the retrieval numbers express approximations after cross-database deduplication; exhaustive PRISMA tracking was not applied. Transparency on screening stages and retention criteria is, nonetheless, maintained.

The temporal scope was stratified by analytical function: for seminal theoretical works founding the pedagogical traditions mobilized, the interval between 1984 and 2010 was considered, encompassing the conceptual elaborations that sustain the theoretical framework of the work; for the specific literature on digital culture, platformization, generative artificial intelligence, teacher professionalism, working conditions, and cognitive implications of immersion in digital environments, the 2014–2026 scope was adopted, prioritizing publications that respond to the current stage of development of these themes. Inclusion criteria considered: (i) peer review or recognized institutional nature; (ii) conceptual adherence to the scope of the study; (iii) original contribution to the theoretical or empirical discussion of the topic; (iv) representativeness in contemporary debates of the field. Excluded were texts of strictly opinionated nature, non-academic materials, studies redundant in relation to others already incorporated into the corpus, and texts without indication of verifiable methodological procedures.

After applying the criteria, the final analytical corpus that directly sustains the argumentation of this article is composed of 38 sources, distributed as follows: 14 theoretical and classical works published between 1984 and 2010, which sustain the founding pedagogical, sociological, and philosophical framework; 16 contemporary academic studies published between 2014 and 2026, focused specifically on teacher professionalism, digital culture,

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platformization, generative artificial intelligence, AI literacy, and the cognitive implications of immersion in digital environments; 3 transversal methodological references on literature review; and 5 Brazilian and international normative documents and institutional reports. The documentary corpus specifically comprises the National Common Curricular Base (BRASIL, 2018) and the National Common Base for the Education of Basic Education Teachers (BRASIL, 2019); data from the Census of Basic Education (INEP, 2024); the ICT in Education survey (CETIC.BR, 2024); and the UNESCO (2023) guidance on generative artificial intelligence in education.

Categorization by evidentiary function was adopted as a mechanism for qualifying the incorporated sources. Acknowledging that the corpus integrates productions of distinct natures, sources were classified into the following types, with corresponding evidentiary weights: (i) theoretical-conceptual works, with the function of interpretive grounding and argumentative articulation; (ii) contemporary empirical studies, with the function of evidence on processes and phenomena investigated in field research, surveys, or documentary analysis; (iii) methodological references, with the function of procedural orientation on literature review; (iv) normative documents, with the function of delimiting the legal and curricular framework; and (v) institutional reports, with the function of empirical-descriptive support of the Brazilian and international context. This classification does not establish a rigid hierarchy among sources but makes explicit the distinction of evidentiary weights: empirical claims about the Brazilian educational system were anchored, primarily, in official reports (INEP, 2024; CETIC.BR, 2024); conceptual claims were supported by theoretical works and qualified empirical studies; normative claims were referenced in institutional documents (BRASIL, 2018; 2019; UNESCO, 2023).

The analysis of textual data followed a thematic categorization procedure, with the organization of meaning units around five articulated axes that structure the subsequent sections of the article. The axes resulted from a hybrid (deductive-inductive) procedure: the first approximation to the categories derived from the research question itself, which projects broad thematic dimensions (classroom, student profile, technologies and platforms, pedagogical authority, teacher education and working conditions), and was subsequently refined by the systematic reading of the corpus, from which subcategories emerged and the final configuration of the axes was consolidated. This procedure, characteristic of critical narrative reviews, allows

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combining argumentative coherence with sensitivity to the nuances revealed by the literature. Table 2 summarizes the five analytical axes, the key authors associated with them, and the predominant evidentiary function of each axis.

Table 2 — Analytical axes, key authors, and predominant evidentiary function

Analytical axis	Key authors and sources	Predominant evidentiary function
(i) Reconfigurations of the classroom	Bauman (2001); Libâneo (1994); Nóvoa (2017); Selwyn (2014; 2022)	Cultural-pedagogical diagnosis
(ii) Student profile and digital culture	Prensky (2001); Bennett, Maton, and Kervin (2008); Carr (2010); Vygotsky (1984); Firth et al. (2019); Cetic.br (2024); INEP (2024)	Concept-empirical articulation, with inferential caution
(iii) Technologies, platformization, and artificial intelligence	Lévy (1999); Castells (1999); Kenski (2007); Van Dijck, Poell, and De Waal (2018); Williamson (2017); Williamson and Eynon (2020); Couldry and Mejias (2019); Selwyn (2014; 2022); Perrotta and Selwyn (2020); Holmes and Tuomi (2022); Zawacki-Richter et al. (2019); Ng et al. (2021); UNESCO (2023); Paixão (2026b)	Critical mapping of the technological field
(iv) Pedagogical authority and critical mediation	Freire (1987); Vygotsky (1984); Nóvoa (2017); Hattie (2009); Van Dijck, Poell, and De Waal (2018)	Ethical-epistemological grounding
(v) Teacher education, recognition, and working conditions	Tardif (2002); Nóvoa (2017); Perrenoud (2000); Morin (2000); Pressley (2021); Paixão (2026a; 2026c); Paixão et al. (2026c); INEP (2024); Cetic.br (2024); Brasil (2018; 2019)	Structural-formative diagnosis

Source: prepared by the author.

It is worth noting, as a limitation inherent to the modality adopted, that critical narrative review prioritizes interpretive integration over quantitative exhaustiveness, so that the results presented here should be read as grounded analytical articulation rather than statistical synthesis of the field. The evidentiary heterogeneity of the incorporated sources is, simultaneously, an analytical virtue and a methodological limitation, requiring the reader to understand that different evidentiary weights were combined in an interpretive synthesis.

3 THE 21ST-CENTURY CLASSROOM: PERMANENCES, RUPTURES, AND NEW PEDAGOGICAL MEDIATIONS

The classroom, as an institutional space for the encounter between teachers, students, and knowledge, has never been a neutral or static environment. Its configuration has always reflected the historical, political, and cultural conditions of each era, responding to specific social expectations about what it means to teach and learn. The set of transformations that

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characterizes the early 21st century, however, imposes qualitatively distinct challenges from those faced by previous generations of educators, not because the classroom has lost its social function, but because the context in which it operates has been profoundly altered.

The presence of digital devices, ubiquitous connectivity, the accelerated circulation of information, and the reconfiguration of forms of youth sociability tend to redesign — in proportions that vary according to socioeconomic, regional, and institutional context — the conditions of attention, engagement, and participation within school institutions. As Bauman (2001) points out, liquid modernity is characterized by the instability of references, the acceleration of changes, and the weakening of institutional forms that previously provided meaning and stability to individual trajectories. The school, as an institution founded on the logic of the orderly transmission of knowledge and normative socialization, finds itself strained by a culture that values immediacy, fragmentation, and the simultaneous multiplicity of stimuli.

This observation does not mean, however, that the classroom is doomed to obsolescence or that the traditional dimensions of teaching have lost value. What is observed, rather, is a rearticulation of the pedagogical functions of the teacher, who comes to operate in a more complex environment, requiring the mastery of multiple languages and the ability to articulate different resources and methodologies around clearly defined formative objectives. Libâneo (1994), when discussing didactics as systematic reflection on teaching practice, already evidenced that the quality of teaching depends on pedagogical intentionality, the clarity of objectives, and the educator's ability to organize the conditions of learning in a manner consistent with students' needs.

It is in this horizon that the analytical distinction between permanences and ruptures is situated. Permanences refer to the mediating function of the teacher and to the irreplaceable value of the pedagogical bond as a condition for meaningful learning. Ruptures, in turn, refer to the need to reconfigure practices, resources, and forms of interaction within the classroom, without reducing teaching to the operation of digital platforms or to the uncritical reproduction of trendy methodologies. The tension between permanence and rupture thus constitutes the horizon within which the 21st-century educator must build their professional identity and orient their practice (NÓVOA, 2017).

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The relational dimension of the classroom remains, moreover, an indispensable condition for any educational process worthy of the name. The bond between teacher and student, qualified listening, the recognition of each learner's singularities, and the creation of an environment of intellectual and affective trust constitute elements whose substitution by automated systems is, in the current state of knowledge, problematic from a pedagogical, ethical, and cognitive standpoint (SELWYN, 2022; HOLMES; TUOMI, 2022). In this perspective, the transformation of the classroom is not a technical problem, but a pedagogical, ethical, and cultural challenge that requires from the educator a permanent reflective stance.

4 THE CONTEMPORARY STUDENT PROFILE: DIGITAL CULTURE, ATTENTION, AND ENGAGEMENT CHALLENGES

One of the transformations most frequently invoked in debates on contemporary education concerns changes in the student profile. The notion of digital natives, popularized by Prensky (2001) in the early 2000s, held that generations raised in digital environments would possess innate abilities to deal with technologies and would form, as a corollary, a radically different type of learner. This formulation, although exerting considerable discursive influence, was systematically criticized for its empirical imprecision and for disregarding the deep inequalities of access and qualified use of technologies among different social and regional strata. Bennett, Maton, and Kervin (2008), in a seminal critical review, demonstrate that the digital natives thesis lacks robust empirical evidence, being based on generalizations that do not withstand systematic studies on the effective digital competencies of young people.

Selwyn (2014) reinforces this critique by demonstrating that mere exposure to digital technologies does not guarantee the development of critical, creative, or collaborative competencies. Familiarity with entertainment devices and platforms does not automatically translate into mastery of tools for the purposes of learning, research, or knowledge production. In the Brazilian context, data from the ICT in Education survey (CETIC.BR, 2024) and from the Census of Basic Education (INEP, 2024) evidence persistent inequalities in infrastructure, connectivity, equipment availability, and digital literacy between public and private schools, between urban and rural regions, and between municipal, state, and federal networks, with expressive differences, in particular, in the proportion of teachers with specific training for the pedagogical use of digital technologies and in the presence of minimal infrastructure for the

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curricular integration of these tools. Such data compromise any generalization about the profile of contemporary Brazilian students at the level of digital culture, recommending differentiated analyses by educational stage, socioeconomic context, and type of institution.

What may be affirmed with greater caution is that an expressive portion of students currently enrolled in basic and higher education grow up in environments characterized by high exposure to digital stimuli, by the algorithmic logic of platforms, by the instantaneity of interactions, and by informational fragmentation. Analyses of the cognitive effects of prolonged immersion in high-speed digital environments, such as those developed by Carr (2010) and, in a more recent systematic review, by Firth et al. (2019), suggest that such immersion may be associated with alterations in the forms of sustained attention, in patterns of in-depth reading, and in processes of memory and social cognition, although the literature remains in debate regarding the magnitude, the causal direction, and the mediation by socioeconomic and developmental factors of these effects. It is worth noting that such relationships should not be interpreted as evidence of an intellectual deficit on the part of students, but as analytical hypotheses about interactions among cultural, technological, and cognitive conditions that require additional empirical investigation, differentiated by educational level, context, and socioeconomic profile.

Vygotsky (1984), in theorizing about symbolic mediation and the zone of proximal development, offers a perspective that remains relevant for understanding student engagement in contexts of complexity. For the author, learning occurs in the interaction between the learner and a mediator capable of operating in the zone of proximal development, mobilizing capacities not yet consolidated to lead the student to new levels of understanding. In this sense, the contemporary challenge does not consist in adapting teaching to the lowest level of available attention, but in creating pedagogical conditions that progressively expand students' capacity to engage with objects of knowledge of increasing complexity, in line with what Hattie (2009), in a synthesis of meta-analyses, identifies as a decisive factor for visible learning: the clarity of objectives and the quality of teaching mediation.

It is equally important to avoid the trap of naturalizing disinterest as an inherent characteristic of contemporary youth. Student engagement is, to a large extent, a product of the pedagogical, relational, and institutional conditions that configure the school experience. Students who perceive relevance in the content studied, who feel recognized in their singularity,

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and who experience pedagogical relationships marked by respect and intellectual demand tend to demonstrate capacities for concentration and elaboration superior to those manifested in impoverished, mechanical, or disconnected learning environments.

5 TECHNOLOGIES, PLATFORMS, AND ARTIFICIAL INTELLIGENCE: POTENTIALS, LIMITS, AND RISKS FOR TEACHING PRACTICE

5.1 Digital technologies and pedagogical mediation

The debate about the role of digital technologies in education has been marked, in recent decades, by a pendulum oscillation between excessive enthusiasm and conservative rejection. On the one hand, techno-optimistic narratives project onto digital tools the almost magical capacity to solve historical educational problems, such as lack of engagement, learning difficulties, and inequalities of access to knowledge. On the other hand, more skeptical positions tend to refuse any form of technological integration, invoking risks of superficiality, dependence, and dehumanization of the educational process.

Lévy (1999), in analyzing the emergence of cyberculture, anticipated with precision some of the potentialities of digital networks as spaces for the collective production of knowledge and for the expansion of forms of intelligence. Castells (1999), in turn, evidenced how the network society reorganizes structures of power, communication, and culture, creating both opportunities and new forms of exclusion for those who do not have qualified access to digital infrastructures. Kenski (2007) was a pioneer in Brazil in arguing that technologies are not neutral instruments, but devices that carry with them logics, values, and forms of organization of time and attention that need to be critically examined by the educator.

5.2 Platformization of education and governance of school data

The contemporary discussion on educational technologies cannot dispense with the problematization of the phenomenon of platformization. Van Dijck, Poell, and De Waal (2018), in their analysis of the so-called platform society, demonstrate that digital platforms do not constitute mere technical channels for content circulation, but socioeconomic infrastructures that shape practices, institutions, and public values. Williamson (2017) and Williamson and Eynon (2020), in dialogue with this debate, evidence that educational big data technologies and

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AI-mediated learning systems reconfigure school governance, pedagogical decision-making, and the very definition of what constitutes measurable learning, with political implications for institutional autonomy and for data sovereignty.

Couldry and Mejias (2019), in discussing what they call data colonialism, warn of the ethical and political risks of the capitalist appropriation of everyday experiences as raw material for predictive models, with specific implications for the educational field, in which students, teachers, and institutions become progressively captured by algorithmic architectures external to public governance. Perrotta and Selwyn (2020), in a relational analysis of the use of deep learning in school, suggest that the integration of AI systems into school environments entails reconfigurations that extrapolate the technical aspect, reaching pedagogical, professional, and institutional relations in ways that require careful investigation. In the Brazilian context, the accelerated adoption of commercial learning platforms, especially after the COVID-19 pandemic, often without rigorous evaluation of their pedagogical assumptions, of the models of data collection and use, or of their adequacy to local realities, may intensify institutional dependencies and strain teachers' pedagogical autonomy.

5.3 Generative artificial intelligence: potentials and ethical tensions

In the specific field of artificial intelligence applied to education, the potentialities reported in the literature are considerable, although their effective realization remains the object of ongoing empirical investigation. Intelligent tutoring systems, learning data analysis tools, adaptive platforms, and writing assistants are presented as instruments capable of expanding the possibilities of personalized teaching, supporting the identification of specific difficulties, and offering the teacher relevant information for pedagogical decision-making. In a systematic review of AI applications in higher education, Zawacki-Richter et al. (2019) identify an expressive concentration of studies on adaptive systems and predictive analytics, but also signal the relative absence of educators' perspectives in research conducted in the field, indicating a gap to be addressed by future investigations. In line with consolidated critical perspectives on educational technology (KENSKI, 2007; SELWYN, 2014; 2022), Paixão (2026b) points out that pedagogical innovation mediated by digital technologies presents real formative potential when articulated with teaching intentionality, with clarity of pedagogical objectives, and with critical evaluation of learning processes.

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The emergence of generative artificial intelligence intensifies ethical and pedagogical challenges. Holmes and Tuomi (2022) synthesize the state of the art of AI applications in education and emphasize that the responsible use of these systems depends on the education of teachers capable of critically evaluating the assumptions, limits, and implications of each tool. Selwyn (2022) adds relevant cautions by pointing to risks of depoliticization of the educational debate when AI-based solutions are presented as inherently positive. The UNESCO (2023) guidelines for the use of generative AI in education recognize the potential of these technologies for personalizing learning, but warn of risks related to academic integrity, the protection of personal data, equity of access, teacher education, and the very definition of intellectual authorship in environments of algorithm-assisted textual production. Ng et al. (2021), in an exploratory review on AI literacy, propose a conceptual framework that articulates cognitive, ethical, and operational dimensions of education for the critical use of these systems, offering subsidies for teacher professional development programs.

The critical integration of technologies thus requires that the educator be educated not only as a competent user of digital tools but as an intellectual capable of evaluating their implications, limits, and possibilities in light of the formative objectives that guide their practice, keeping in view questions related to algorithmic biases, ethical responsibility, data sovereignty, and the protection of teacher professional autonomy (VAN DIJCK; POELL; DE WAAL, 2018; WILLIAMSON, 2017; WILLIAMSON; EYNON, 2020; HOLMES; TUOMI, 2022; UNESCO, 2023).

6 THE EDUCATOR AS CRITICAL MEDIATOR: PEDAGOGICAL AUTHORITY, KNOWLEDGE CURATION, AND HUMAN FORMATION

One of the most significant conceptual shifts in the field of contemporary education concerns the redefinition of teacher authority. For a long time, the authority of the teacher was understood in terms of disciplinary control and monopoly over the knowledge transmitted in the classroom. In this perspective, the teacher was the exclusive holder of legitimate knowledge, while the student assumed the posture of passive receiver of content defined externally. This configuration, criticized at least since Freire's (1987) contributions through the concept of banking education, proved insufficient from both an epistemological and a pedagogical standpoint.

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Banking education, as described by Freire (1987), treats knowledge as a deposit that the teacher makes in the student, conceived as an empty receptacle awaiting filling. Against this view, the author proposed a pedagogy based on dialogue, on the problematization of reality, and on the valorization of subjects' experience as a starting point for the collective construction of knowledge. Such a contribution, far from having lost relevance, acquires new urgency in a context in which the proliferation of information and discursive fragmentation imposes on the educator the task of helping students develop critical tools to select, evaluate, and articulate knowledge from heterogeneous sources.

Nóvoa (2017) argues that teacher professionalism in the 21st century requires the ability to assume intellectual and ethical positions in the face of contemporary challenges, without abdicating the rigor and formative responsibility that characterize teaching as a qualified social practice. For the author, the teacher needs to reaffirm their centrality not as a transmitter of content, but as an organizer of learning experiences, guide of the intellectual and ethical development of students, and agent committed to the formation of autonomous and critical subjects.

In this perspective, knowledge curation emerges as one of the central competencies of the contemporary educator. In an environment of informational abundance in which algorithms determine, to a large extent, what each individual sees and consumes digitally (VAN DIJCK; POELL; DE WAAL, 2018), the teacher must guide students in navigating complex informational landscapes, contributing to the development of the ability to distinguish information from disinformation, to evaluate the quality and reliability of sources, and to construct evidence-based arguments. This formative dimension is, simultaneously, pedagogical, epistemological, and ethical, and cannot be reduced to a technical skill nor replaced by algorithmic filters.

Pedagogical authority, understood in these terms, differs substantially from authoritarianism and disciplinary control. It is constituted in the intellectual credibility of the teacher, in the coherence between their values and their practice, in the ability to create an environment that reconciles demand and welcoming, rigor and openness to dialogue. Such a form of authority is not granted exclusively by the institution but is built daily in the relationship with students and in the quality of the pedagogical work performed.

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7 TEACHER EDUCATION, RECOGNITION, AND WORKING CONDITIONS IN THE FACE OF NEW EDUCATIONAL DEMANDS

The intensification of demands directed at teachers contrasts sharply with the effective conditions in which most Brazilian educators exercise their profession. The rhetoric of pedagogical innovation and the digital transformation of education is rarely accompanied by investments in infrastructure, teacher education, institutional planning, and salary recognition necessary for the proposed changes to materialize in a sustainable and equitable manner. Data from the Census of Basic Education (INEP, 2024) and from the ICT in Education survey (CETIC.BR, 2024) confirm the persistence of structural asymmetries between Brazilian networks and regions, expressed in differences in physical and digital infrastructure, in the proportion of teachers with higher education in the discipline they teach, in the availability of protected institutional time for collective planning, and in the adequacy of spaces for the critical integration of digital technologies.

Tardif (2002), in examining the knowledge that grounds teaching practice, demonstrates that the teacher is not a mere executor of techniques or applier of methodologies conceived externally, but a professional who mobilizes, throughout their trajectory, experiential, disciplinary, curricular, and pedagogical knowledge in a synthesis that is at once personal and collective. This perspective has direct implications for teacher education: it must be understood as a continuous and reflective process, which is not exhausted in the undergraduate course or in specialization courses, but unfolds throughout the entire career, in permanent dialogue with practice, with peers, and with the transformations of the educational context.

In the Brazilian normative context, the National Common Curricular Base (BRASIL, 2018) and the National Common Base for the Education of Basic Education Teachers (BRASIL, 2019) establish horizons for initial and continuing education that articulate professional competencies, disciplinary knowledge, and contextualized pedagogical practices. The effectiveness of these frameworks, however, depends on the objective conditions of course offering, on the quality of the articulation between theory and practice, and on the existence of State policies, and not only government policies, capable of sustaining coherent formative trajectories throughout the career.

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Perrenoud (2000), in proposing a repertoire of competencies for teaching in the 21st century, included among them the ability to work in teams, to manage learning progression, to use new technologies, and to participate in school management. The author himself recognized that the development of these competencies depends on institutional conditions that are not always available, especially in schools of countries with educational systems marked by deep structural inequalities. In Brazil, the situation is aggravated by the fragmentation of the teaching career between different networks and systems, by the insufficiency of continuing education programs, by the lack of institutional time for collective planning and for reflection on practice, and by the growing individual responsibility of the teacher for educational results that depend on conditions much broader than their performance in the classroom. In dialogue with Tardif (2002) and Nóvoa (2017), Paixão et al. (2026c) emphasize that effective teacher education must overcome the dichotomy between theory and practice, articulating pedagogical, technological, socioemotional, and ethical knowledge in an integrated and contextualized perspective.

The mental health of teachers constitutes a frequently invisibilized dimension in this debate. Work overload, the multiplicity of roles attributed to the teacher, the weakening of social recognition of the profession, and the growing judicialization of school relations are factors associated, in the specialized literature, with worrying indicators of teacher illness. Pressley (2021), in a study conducted during the COVID-19 pandemic, identifies as factors associated with teacher burnout the overload of demands for technological adaptation, anxiety about pedagogical effectiveness in screen-mediated environments, and institutional uncertainty — dimensions whose intensification during the pandemic period remains a relevant analytical reference for understanding, in comparative terms, the contemporary configuration of teacher malaise. Consistent initiatives for educational transformation must therefore confront this dimension as a structural issue, and not as an individual fragility of teachers.

Morin (2000), in reflecting on education for the future, insists on the need for a reform of thought that allows confronting the complexity of the real without reductionisms. Applied to teacher education, this perspective implies preparing the teacher to deal with uncertainties, to make decisions in situations of ambiguity, and to construct creative pedagogical responses to problems for which no predefined solutions exist. This is, possibly, the most demanding horizon, and the most necessary, of teacher professionalism in the 21st century.

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8 POSSIBLE PATHS: METHODOLOGIES, CURRICULUM, ASSESSMENT, AND MEANINGFUL LEARNING IN CONTEXTS OF COMPLEXITY

The acknowledgment of the challenges that mark contemporary education does not imply resignation, but the recognition that the necessary transformations require collective effort, public investment, political will, and pedagogical commitment. Some dimensions deserve special attention as paths for the construction of more meaningful, inclusive, and responsive educational practices to the complexity of the current context.

From a methodological standpoint, in line with the synthesis of meta-analyses developed by Hattie (2009), Paixão (2026a) argues that active learning methodologies offer relevant contributions to student engagement and to the development of 21st-century competencies, provided they are applied with clear pedagogical intentionality, rigorous evaluation of processes, and attention to institutional conditions and student profiles. Problem-based learning, the flipped classroom, collaborative learning, and educational gamification do not constitute panaceas, but are instruments that, when adequately contextualized and critically evaluated, can expand student participation and favor deeper forms of knowledge elaboration. Hattie (2009) reinforces this consideration by demonstrating, based on a broad synthesis of meta-analyses, that the impact of pedagogical strategies on learning depends less on the method itself and more on the clarity of objectives, the quality of feedback, and the intentionality of teaching mediation.

It is important to highlight that the adoption of innovative methodologies without reflection on pedagogical intentionality and without evaluation of learning outcomes can become mere fashion, without real contribution to the quality of teaching. Pedagogical innovation is not defined using cutting-edge technology or by the novelty of format, but by the ability to create conditions that favor meaningful learning, the development of critical thinking, and the formation of subjects capable of acting with autonomy and responsibility.

In the curricular field, the challenges are equally significant. Morin (2000) proposed a reflection on the knowledge necessary for the education of the future that points to the need to develop in students the ability to contextualize, to deal with uncertainty, and to understand the interconnections between apparently distinct phenomena. This perspective has profound implications for the school curriculum: it is not a matter of abandoning disciplinary content, but

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of articulating it around questions and problems that make sense to students and that allow the development of more complex forms of thought and action.

In the field of assessment, the challenges are equally expressive. The presence of digital technologies and generative artificial intelligence systems in education requires rethinking not only the forms of summative assessment, but the very objects of assessment: what is assessed, how it is assessed, for what and for whom the results serve. Formative assessment, which accompanies the learning process and offers the student and the teacher information to continuously adjust the pedagogical path, gains renewed relevance in a context in which the production of knowledge is increasingly procedural, collaborative, and multidimensional.

Finally, inclusion and attention to student diversity constitute non-negotiable dimensions of any pedagogical proposal that aims to be adequate to the 21st century. The heterogeneity of Brazilian classrooms, marked by differences in social, ethnic, regional, and cultural origin, requires from the educator the ability to recognize and value this diversity as a pedagogical resource, and not as an obstacle to teaching. This positioning requires, simultaneously, ethical commitment to equity and mastery of pedagogical strategies capable of ensuring that all students have access to meaningful and challenging learning experiences.

As a conceptual synthesis of the discussions developed up to this point, Table 3 systematizes, in matrix format, seven interdependent dimensions that configure, within the analytical framework proposed here, the profile of the 21st-century educator. This formalization does not aim to exhaust the complexity of teaching practice, but to offer an analytical cartography that may guide education policies, professional self-evaluations, and curricular designs for undergraduate teaching programs and continuing education.

Table 3 — Dimensions of the 21st-century educator

Dimension	Characterization	Supporting authors and sources
Pedagogical mediation	Knowledge curation in contexts of informational abundance, articulation between disciplinary knowledge and critical formation	Freire (1987); Vygotsky (1984); Nóvoa (2017); Hattie (2009)
Critical-digital competence	Reflective evaluation of platforms, data flows, and algorithmic outputs; pedagogically intentional use of digital tools	Selwyn (2014; 2022); Williamson (2017); Williamson and Eynon (2020); Van Dijck, Poell, and De Waal (2018); UNESCO (2023)
Ethical responsibility	Attention to algorithmic biases, academic integrity, data sovereignty, and authorship issues in AI-mediated environments	Couldry and Mejias (2019); Holmes and Tuomi (2022); Selwyn (2022); UNESCO (2023)

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Dimension	Characterization	Supporting authors and sources
Knowledge curation	Distinction between information and disinformation, qualification of sources, and evidence-based argumentative construction	Carr (2010); Firth et al. (2019); Van Dijck, Poell, and De Waal (2018)
Assessment redesign	Rethinking objects, forms, and purposes of assessment in environments mediated by generative AI; valorization of formative assessment	Hattie (2009); UNESCO (2023); Selwyn (2022)
Professional autonomy	Resistance to deprofessionalization processes and affirmation of pedagogical agency vis-à-vis platforms and algorithmic systems	Tardif (2002); Nóvoa (2017); Selwyn (2022); Pressley (2021)
Institutional conditions	Demand for infrastructure, protected institutional time, continuing education, and professional recognition as conditions of practice	Perrenoud (2000); Brasil (2018; 2019); INEP (2024); Cetic.br (2024); Paixão et al. (2026c)

Source: prepared by the author based on the analyzed literature.

9 CONCLUDING REMARKS

The analytical path developed in this article allows affirming that the new challenges and paradigms of the 21st-century educator do not result simply from the presence of technologies in school, but from broader and deeper transformations that reconfigure the cultural, cognitive, institutional, and pedagogical foundations on which teaching is exercised. The contemporary classroom is constituted as a space traversed by real tensions, between tradition and innovation, between the demands of digital culture and the rhythms proper to deep learning, between the rhetoric of educational transformation and the material conditions in which most teachers act.

It is important to note, before formulating the central propositions, the epistemic status of the claims presented herein. These are theoretical-interpretive propositions, anchored in a grounded synthesis of the literature and in institutional documents, and not empirical findings derived from direct measurement. Such propositions function as qualified analytical hypotheses, subject to validation, refinement, or refutation by subsequent empirical research, and should therefore be read as analytical contribution and not as a statistically generalizable conclusion.

As a synthesis of the analyses developed, four central propositions can be formulated to address the guiding question of the study. First, 21st-century teaching is configured, within the analytical framework proposed here, as a practice of critical mediation in environments of informational abundance and attentional dispersion, which repositions knowledge curation, and

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not the simple transmission of content, as the core of the teaching function. Second, the integration of digital technologies and artificial intelligence into education is pedagogically justified only when subordinated to formative intentionality, requiring from the teacher critical competencies to evaluate platforms, data governance, and ethical implications of algorithmic systems. Third, teacher professionalism in the current context requires the articulation of pedagogical, disciplinary, technological, socioemotional, and ethical knowledge in a continuous, reflective, and contextualized perspective. Fourth, any consistent educational transformation depends, simultaneously, on changes in pedagogical practices and on structural changes in the objective working conditions of teachers, with the disregard of this simultaneity being the main fragility of contemporary innovation discourses.

The 21st-century educator cannot be reduced to the figure of a platform operator or a facilitator of pre-packaged content. Their function remains essentially mediating, critical, and formative, although the exercise of this function today demands competencies, dispositions, and knowledge that differ, at least in part, from those that characterized teaching in previous historical contexts. Pedagogical authority, understood as intellectual, ethical, and relational authority, continues to be a condition for meaningful learning, and needs to be constantly reconstructed in dialogue with the concrete conditions of the context and with the subjectivities of students.

It is appropriate to make explicit, with greater analytical rigor, the limitations of this study. First, this is a review of qualitative and theoretical nature, without generation of primary empirical data, which limits the capacity to directly test the formulated propositions. Second, although the search was structured and guided by explicit criteria, no systematic quantitative synthesis, exhaustive bibliometric mapping, or meta-analysis was carried out, so the corpus may reflect selection biases stemming from the very construction of descriptors and from the choice of consulted databases. Third, the strong anchoring in Brazilian references and data, although justified by the contextual positioning of the study, restricts the direct transferability of findings to educational contexts with distinct structural configurations, recommending caution in comparative generalizations. Fourth, the evidentiary heterogeneity of the incorporated sources — theoretical works, empirical studies, institutional reports, and normative documents — requires the reader to understand that different evidentiary weights were combined in an interpretive synthesis, an analytical virtue in critical reviews but a

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methodological limitation in relation to systematic reviews and meta-analyses. Fifth, although the text sought to permanently articulate international discussions with Brazilian specificities, it was not possible, within the scope of an article, to exhaust the complexity of the South American, African, or Asian regional debates around correlated themes.

As a research agenda, five priority directions are suggested: (i) longitudinal empirical studies on the pedagogical effects of the use of generative artificial intelligence in Brazilian basic and higher education, with differentiation by stage, socioeconomic context, and type of institution; (ii) qualitative investigations on the processes of reconfiguration of teacher authority in platform-mediated learning environments; (iii) critical analyses of the models of governance of school data in the Brazilian context, in dialogue with the General Data Protection Law; (iv) research on the implications of platformization for the mental health, burnout, and professional autonomy of teachers, in continuity with post-pandemic findings; and (v) comparative studies on policies for teacher education for the critical use of digital technologies and AI literacy in different educational networks.

It is important to recognize, in summary, that effective educational transformation does not constitute an exclusively pedagogical or technological issue, but is configured as a political, ethical, and social issue. It requires collective commitment to the valorization of the teaching profession, sustained investment in education and in dignified working conditions, and the construction of educational systems committed to meaningful learning, equity, and the formation of autonomous, critical, and responsible subjects.

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