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THE PEDAGOGICAL USE OF ARTIFICIAL INTELLIGENCE AND TEACHER MEDIATION

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Abstract

The expansion of Artificial Intelligence (AI) has significantly transformed educational environments, creating new possibilities for teaching, learning, assessment, and knowledge production. Among the most impactful developments are generative AI systems capable of producing texts, images, summaries, feedback, and instructional materials in real time. While these technologies offer important opportunities for innovation and personalization, they also raise concerns regarding authorship, critical thinking, ethical responsibility, and the role of teachers in educational processes. This chapter aims to discuss the pedagogical use of Artificial Intelligence and the centrality of teacher mediation in contemporary education. The study adopts a qualitative approach based on a narrative review of the literature, drawing upon contributions from scholars in education, digital culture, Artificial Intelligence, and critical digital literacy. The discussion highlights that AI can support more dynamic, personalized, and participatory learning experiences when integrated into pedagogically meaningful practices. However, the findings also indicate that technological innovation alone does not guarantee educational quality. Teacher mediation remains essential for fostering critical reflection, ethical awareness, human interaction, and meaningful learning. It is concluded that the educational value of Artificial Intelligence depends not on its technical sophistication, but on the ways educators integrate it into teaching practices guided by human, ethical, and pedagogical principles.

Keywords: Artificial Intelligence, Teacher mediation, Digital education, Learning, Educational innovation.

INTRODUCTION

Education has always evolved in dialogue with the social, cultural, and technological transformations of its time. Throughout history, new means of communication, different forms of language, and distinct systems of knowledge production have challenged educational institutions to rethink their practices and redefine their purposes. In the twenty-first century, the accelerated

advancement of Artificial Intelligence represents one of the most significant technological transformations affecting educational systems on a global scale. More than a technological innovation, AI has become a phenomenon capable of influencing the ways in which knowledge is produced, accessed, shared, and interpreted.

The growing availability of generative Artificial Intelligence systems has intensified debates about the future of education. Tools capable of producing texts, answering questions, creating images, organizing information, and assisting with academic tasks have rapidly become part of the daily lives of teachers and students. Consequently, educational institutions have begun to face, simultaneously, new opportunities and new challenges related to learning, authorship, assessment, critical thinking, and the practice of teaching.

Recent studies indicate that Artificial Intelligence can contribute to educational innovation by fostering personalized learning experiences, expanding access to information, and enhancing forms of student engagement. However, such possibilities require careful reflection on the pedagogical purposes that guide the use of these technologies. In discussing the impacts of AI on educational systems, Holmes and Tuomi observe:

“The educational implications of Artificial Intelligence go far beyond the automation of administrative tasks. AI has the potential to reconfigure learning environments, modify relationships between teachers and students, and transform the way knowledge itself is constructed and accessed.” (Holmes; Tuomi, 2022, p. 12).

The authors’ observation highlights a fundamental aspect for understanding this phenomenon. Educational discussions about Artificial Intelligence cannot be restricted to the technical functioning of tools or the efficiency of computational systems. The central issue lies not only in what technology is capable of doing, but in how educational communities choose to use it. Technologies, by themselves, do not determine pedagogical outcomes. Their impacts depend on the educational conceptions,

methodological choices, and ethical principles that guide their incorporation into teaching and learning processes.

This perspective becomes even more relevant when teacher mediation is considered. In many contemporary debates, Artificial Intelligence is presented either as a revolutionary solution capable of transforming education or as a threat to traditional teaching practices. Both interpretations tend to minimize the importance of the teacher in the construction of meaningful learning experiences. Even in highly digitalized contexts, learning remains a human process grounded in dialogue, interpretation, social interaction, and critical reflection.

In this context, Paulo Freire's contributions remain current. His understanding of education as a dialogical and emancipatory practice challenges merely instrumental perspectives on teaching and learning. For Freire, teaching does not mean transferring ready-made knowledge, but creating conditions for subjects to construct their own understandings of the world. This principle assumes particular relevance in an era marked by the automated production of information and by the growing presence of intelligent systems in educational environments.

Another relevant aspect concerns the influence of Artificial Intelligence on practices of language, authorship, and digital literacy. Recent research has shown that AI not only makes information available but also actively participates in processes of discursive production, content generation, and meaning-making. In view of this scenario, it becomes necessary to prepare students not only to use digital tools, but also to critically understand their limits, implications, and potential impacts on knowledge production.

The educational debate surrounding Artificial Intelligence therefore requires a balanced perspective, one capable of simultaneously recognizing its transformative potential and its limitations. Technological innovation can enrich educational experiences, but it does not replace the ethical, relational, and pedagogical dimensions that characterize education as an essentially human practice.

Thus, this chapter aims to discuss the pedagogical use of Artificial Intelligence and the importance of teacher mediation in contemporary educational contexts. To achieve this purpose, the text is organized

into four main moments. First, it discusses the relationship between Artificial Intelligence and contemporary education. Next, it analyzes the role of teacher mediation in AI-mediated learning environments. Subsequently, it discusses the pedagogical possibilities and ethical challenges associated with generative Artificial Intelligence. Finally, the chapter reflects on human agency, critical thinking, and the future of education in a society increasingly marked by automation.

ARTIFICIAL INTELLIGENCE AND CONTEMPORARY EDUCATION

The presence of Artificial Intelligence in educational spaces constitutes one of the most visible expressions of the transformations that characterize contemporary society. In recent decades, the advancement of digital technologies has profoundly modified forms of communication, knowledge production, and access to information. However, the emergence of intelligent systems introduces a new element into this scenario: the capacity to produce content, interpret commands, establish relationships among information, and interact with users in increasingly sophisticated ways. This condition places Artificial Intelligence in a unique position among the educational technologies developed to date.

Education is directly traversed by these changes. Artificial Intelligence tools are already used to support research processes, the preparation of teaching materials, the personalization of learning, content translation, the monitoring of academic performance, and the production of educational resources. The speed with which these technologies have been incorporated into the daily lives of students and teachers demonstrates that the discussion about AI has ceased to be a future projection and has become a concrete reality within educational institutions.

In this context, it is important to understand that Artificial Intelligence is not merely a set of digital tools. It is a technology that directly interferes in the production and circulation of knowledge. By producing answers, texts, summaries, images, and interpretations, intelligent systems begin to participate in processes traditionally associated with human intellectual activity. This characteristic requires broader reflection on their educational impacts.

The analyses developed by UNESCO emphasize that Artificial Intelligence has the potential to expand educational opportunities in different social and cultural contexts. However, the organization warns that such benefits can only be achieved when the technology is used responsibly, transparently, and in alignment with the principles of inclusive education. In this regard, the document *Guidance for Generative AI in Education and Research* states:

“Generative Artificial Intelligence offers new possibilities for learning, creativity, and knowledge production. However, its use must be accompanied by strategies that promote equity, inclusion, human supervision, and the development of critical competencies capable of preparing students for a changing society.” (UNESCO, 2023, p. 13).

This recommendation shows that the debate about AI cannot be limited to gains in productivity or efficiency. The focus must remain on learning, human formation, and the construction of competencies that enable subjects to act critically in relation to the technologies they use.

The most recent studies have indicated that one of the main contributions of Artificial Intelligence to education is related to the personalization of learning. The possibility of adapting content, suggesting differentiated pathways, and offering individualized support has frequently been identified as a significant advance for educational processes. In analyzing this phenomenon, Silva et al. observe that AI has been expanding opportunities to adapt pedagogical practices to students’ needs, contributing to more flexible and responsive learning experiences.

This capacity for personalization becomes particularly relevant in contexts marked by diversity in profiles, interests, and learning rhythms. However, the literature also shows that personalization should not be confused with excessive individualization. Learning remains a social process, constructed through interaction, dialogue, and participation in learning communities. Technology can support these processes, but it cannot replace them.

Another relevant aspect concerns the changes produced by Artificial Intelligence in processes of intellectual production. For centuries, the elaboration of texts, syntheses, and analyses was directly

associated with human labor. With the popularization of generative systems, part of these activities has begun to be carried out automatically, creating new possibilities but also new concerns.

The reflections developed by Junqueira et al. point precisely to this transformation by highlighting that AI does not operate merely as an auxiliary tool, but interferes directly in processes of language and authorship. According to the authors:

“Generative Artificial Intelligence not only expands access to information, but also begins to act as a participating agent in discursive production, influencing forms of writing, the circulation of meanings, and the construction of knowledge. This movement requires education to develop new frameworks for understanding authorship, language, and learning in digital contexts.” (Junqueira et al., 2026, p. 7).

This observation makes it possible to understand that contemporary educational challenges are not limited to the adoption of new technologies. They involve the need to reinterpret traditionally consolidated concepts such as authorship, research, textual production, and knowledge construction.

At the same time, the growth of Artificial Intelligence has also prompted reflections on the preparation of students for an increasingly automated society. If, on the one hand, intelligent systems broaden access to information, on the other, they require competencies related to critical analysis, content validation, and the contextualized interpretation of available information. Simple access to knowledge is no longer sufficient. It becomes necessary to understand how this knowledge is produced, by whom it is produced, and what interests may be present in the processes through which information is generated.

In this sense, contemporary education faces a complex challenge: integrating the potential of Artificial Intelligence without relinquishing the critical formation of subjects. Technology offers new opportunities for teaching and learning, but its use must be associated with the development of intellectual autonomy, ethical responsibility, and the capacity for reflection.

Thus, understanding the relationship between Artificial Intelligence and contemporary education requires recognizing both its potentialities and its limitations. Technological innovation can enrich

educational processes, expand learning possibilities, and foster new forms of knowledge construction. However, such benefits are only realized when accompanied by qualified pedagogical mediation, critical reflection, and commitment to the humanizing principles that have historically underpinned education.

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PEDAGOGICAL POSSIBILITIES AND ETHICAL CHALLENGES OF GENERATIVE ARTIFICIAL INTELLIGENCE

The rapid expansion of generative Artificial Intelligence has caused profound transformations in contemporary educational processes. Tools capable of producing texts, preparing lesson plans, generating images, synthesizing content, translating information, and answering complex questions have become part of the daily lives of students and teachers at different levels of education. As a consequence, new possibilities for learning emerge, while questions related to ethics, authorship, and educational responsibility intensify.

Among the main pedagogical potentialities of generative Artificial Intelligence is its capacity to expand access to information and support personalized learning processes. Students can receive explanations adapted to their level of understanding, explore different ways of presenting content, and obtain almost immediate feedback on certain activities. For teachers, these tools can assist in the

preparation of teaching materials, the organization of activities, and the planning of more diversified learning experiences.

The impacts of these technologies on education have been observed in different studies. In analyzing the transformations produced by AI in academic contexts, Freitas et al. emphasize that:

“Artificial Intelligence enables new forms of monitoring learning, offering more detailed analyses of students’ performance and allowing more precise and contextualized pedagogical interventions.” (Freitas et al., 2025, p. 2746).

This observation shows that intelligent systems can contribute to improving educational processes when used as tools to support pedagogical work. Rather than replacing teaching action, technology provides information that assists decision-making related to teaching and learning.

Another possibility frequently identified in the literature concerns the strengthening of practices aimed at the personalization of learning. Intelligent systems are capable of identifying patterns, suggesting differentiated pathways, and adapting educational resources to students’ needs. In contexts marked by diversity of profiles and learning rhythms, this characteristic may represent an important contribution to the development of more flexible and inclusive educational experiences.

However, the same technologies that expand opportunities also produce challenges that cannot be ignored. One of the main challenges concerns the issue of authorship. The capacity of generative systems to produce complete texts, structured arguments, and elaborate answers challenges traditionally consolidated conceptions of intellectual production and knowledge creation. In many cases, it becomes difficult to distinguish what was produced directly by the student from what was generated by automated systems.

This scenario calls for new reflections on the objectives of education. More than verifying the origin of a text or identifying the use of a particular tool, it becomes necessary to rethink assessment practices and pedagogical strategies capable of valuing processes of analysis, interpretation, creativity,

and critical construction of knowledge. The challenge does not consist solely in controlling the use of technology, but in developing forms of learning that keep students' intellectual participation as a central element of the educational process.

UNESCO has drawn attention to this issue by emphasizing that generative Artificial Intelligence systems should not be used uncritically in educational contexts. In one of its most recent documents, the organization observes:

“The educational use of generative Artificial Intelligence requires continuous human supervision, the development of critical competencies, and an understanding of the risks associated with the automated production of content, including inaccuracies, biases, and misinformation.” (UNESCO, 2023, p. 18).

This concern is particularly relevant because generative systems do not operate with human understanding of the content they produce. Although they often present coherent and well-structured responses, they may generate incorrect information, reproduce prejudices existing in the databases used for their training, or present inadequate interpretations of certain contexts.

The studies by Silva et al. also point to the need for attention to ethical aspects related to the use of AI in education. Among the main challenges identified by the authors are the protection of users' privacy, the reliability of the information produced, and the need for constant human supervision to ensure the quality of educational processes.

Another aspect that deserves emphasis concerns algorithmic transparency. Many tools widely used by students and teachers operate on the basis of models whose internal logic remains poorly understood by users. This situation can hinder critical analyses of the criteria used to produce responses, organize information, or recommend content.

In this context, education assumes a fundamental role in forming subjects capable of understanding not only the technical functioning of tools, but also their social, political, and cultural

impacts. The development of competencies related to critical digital literacy becomes an indispensable condition for students to use Artificial Intelligence ethically and responsibly.

The discussions developed by Junqueira et al. reinforce this need by arguing that contemporary education must overcome instrumental conceptions of technology:

“Education cannot be limited to teaching the efficient use of digital tools. It becomes necessary to understand the ways in which these technologies participate in the construction of discourses, influence processes of knowledge production, and interfere in the formation of subjects.” (Junqueira et al., 2026, p. 11).

The reflection proposed by the authors significantly broadens the debate. The educational challenge does not consist only in teaching students to use Artificial Intelligence, but in preparing them to critically understand the effects of these technologies on their practices of reading, writing, research, communication, and learning.

Thus, the pedagogical possibilities of generative Artificial Intelligence are unquestionably relevant. However, its incorporation into educational environments requires responsibility, human supervision, and ethical commitment. The transformative potential of these technologies depends less on their technical sophistication and more on the capacity of educational institutions to use them in favor of learning, intellectual autonomy, and the critical formation of students. Ultimately, technological innovation only acquires educational meaning when it remains subordinated to the human principles that guide education.

HUMAN AGENCY, CRITICAL THINKING, AND THE FUTURE OF EDUCATION

Discussions about Artificial Intelligence in education often focus on the technical capacities of digital systems, productivity gains, and the possibilities of automation. However, one of the most important questions for the future of education does not concern what machines can do, but the role that

human beings will continue to play in a society increasingly mediated by algorithms. In other words, the central issue is not technological, but profoundly educational.

The advancement of intelligent systems has expanded the capacity for access to information, automated processes, and offered answers to previously complex problems. Nevertheless, the abundance of information does not eliminate the need for human judgment. On the contrary, it makes even more necessary the ability to interpret, select, validate, and assign meaning to knowledge produced in digital environments. In this scenario, the formation of critical thinking emerges as one of the main responsibilities of contemporary education.

Biesta argues that education cannot be limited to the transmission of knowledge or the development of technical competencies. Its purpose also involves the formation of subjects capable of acting in the world responsibly, ethically, and consciously. In discussing the aims of education, the author states: “The fundamental educational question is not only what students learn, but who they become through educational processes and how they come to exist as subjects in a world shared with others.” (Biesta, 2022, p. 34).

This reflection shifts the focus from technology to human formation. In contexts marked by Artificial Intelligence, this perspective becomes even more relevant, as it reminds us that education does not exist merely to develop operational skills, but to contribute to the formation of citizens capable of participating critically in social life.

Another important concept for this discussion is that of human agency. Holmes and Tuomi observe that intelligent systems can support educational processes, but should not replace the capacity of subjects to make decisions, construct interpretations, and exercise intellectual autonomy. According to the authors:

“Educational development should strengthen human agency, not reduce it. Artificial Intelligence should expand the possibilities for learning and participation without compromising individuals’ capacity to act, decide, and construct knowledge autonomously.” (Holmes; Tuomi, 2022, p. 41).

This observation has significant implications for pedagogical practice. In a context in which automated systems can provide rapid responses to numerous demands, it becomes essential to create educational experiences that value investigation, creativity, argumentation, and decision-making. The objective is not to compete with Artificial Intelligence, but to develop human capacities that remain fundamental even in the face of technological advances.

This reflection also extends to the role of educational institutions. Castells observes that the network society has profoundly altered the modes of production and circulation of knowledge. The school is no longer the main source of access to information, but it remains a privileged space for the construction of meanings, for the development of citizenship, and for the critical formation of subjects. In this context, its relevance does not diminish; it is transformed.

UNESCO has reinforced this perspective by arguing that educational systems must prepare students to act in environments characterized by uncertainty, complexity, and constant technological transformation. This implies developing competencies related to ethics, critical thinking, collaboration, and social responsibility—dimensions that cannot be automated by computational systems.

Thus, the future of education in times of Artificial Intelligence will not depend exclusively on the capacity to incorporate new technologies into classrooms. It will depend, above all, on the capacity to preserve and strengthen what makes education a genuinely human activity: the construction of meanings, dialogue, ethical reflection, creativity, and the formation of subjects capable of acting critically in an increasingly complex society. Artificial Intelligence will continue to evolve, but the responsibility of forming human beings remains an essentially educational task.

FINAL CONSIDERATIONS

The discussion developed throughout this chapter sought to analyze the pedagogical use of Artificial Intelligence and the permanence of teacher mediation as a central element of contemporary educational processes. The growing presence of intelligent systems in educational institutions shows that

Artificial Intelligence has ceased to represent a future possibility and has become a concrete reality that influences pedagogical practices, assessment processes, forms of knowledge production, and learning experiences at different educational levels.

The literature analyzed demonstrates that Artificial Intelligence has significant potential to contribute to educational innovation. The personalization of learning, the expansion of access to information, support for the preparation of teaching materials, and the diversification of pedagogical strategies are among the main possibilities offered by these technologies. When integrated into well-structured educational proposals, intelligent systems can foster more flexible, participatory formative experiences aligned with students' needs.

However, the findings also show that the mere incorporation of technologies does not guarantee improvement in educational quality. Issues related to authorship, critical thinking, algorithmic transparency, data privacy, and ethical responsibility remain central challenges for schools, universities, and educational systems. The pedagogical relevance of Artificial Intelligence depends less on its technical sophistication and more on the principles that guide its use.

One of the most important reflections developed in this chapter concerns the preservation of human agency in educational processes. Although intelligent systems are capable of supporting numerous activities related to learning, they do not replace essentially human capacities such as interpretation, judgment, creativity, empathy, dialogue, and ethical responsibility. Education remains a social practice grounded in human relationships and in the shared construction of meanings.

In this context, teacher mediation emerges as one of the most important elements for the critical and responsible use of Artificial Intelligence. Teachers continue to play a fundamental role in guiding students, problematizing the information produced by automated systems, and promoting the intellectual autonomy necessary to act in a society increasingly marked by the presence of digital technologies.

The contributions of authors such as Holmes, Tuomi, Biesta, Castells, and UNESCO documents reinforce the need to understand educational innovation beyond the technological dimension. More than

adapting to technical changes, educational systems need to strengthen the formation of subjects capable of acting ethically, critically, and responsibly in the face of contemporary challenges. Education cannot be limited to learning how to use tools; it must contribute to understanding the social, cultural, and political impacts produced by them.

It is therefore concluded that the future of the relationship between education and Artificial Intelligence will depend less on the evolution of algorithms and more on the choices made by teachers, administrators, researchers, and educational institutions. The true challenge does not consist only in incorporating new technologies into classrooms, but in ensuring that these technologies serve learning, citizenship, and human development. In an era marked by increasing automation, the responsibility of education to form subjects capable of thinking, questioning, creating, and participating critically in the construction of society remains current.

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**GIFTEDNESS BEYOND TALENT: FROM CREATIVE PRODUCTIVITY TO
NEURODEVELOPMENTAL FUNCTIONING**

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Abstract

This paper analyzes the historical, theoretical, and scientific evolution of the understanding of giftedness, discussing the transition from models centered on measurable intelligence and creative productivity to more comprehensive developmental and neuroscientific approaches. This is a theoretical bibliographical study based on a critical analysis of national and international specialized literature on high abilities/giftedness. The study aims to examine the main references that have influenced the construction of knowledge in the field, highlighting the contributions of Joseph Renzulli, Linda Silverman, and authors linked to the developmental perspective, as well as discussing the dialogues established with contemporary neuroscience. The methodology consisted of a review and comparative analysis of works, scientific articles, and classic and contemporary studies related to the identification, development, and functioning of gifted individuals. The results indicate that the progressive expansion of the field has allowed for overcoming restricted interpretations based exclusively on performance, visible creativity, or manifest talent, incorporating concepts such as developmental asynchrony, emotional intensity, twice-exceptionality, invisible suffering, and neurocognitive differences. It is concluded that giftedness constitutes a multidimensional phenomenon, the understanding of which requires integration between educational, psychological, developmental, and neuroscientific perspectives, contributing to more

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comprehensive identification processes and to the construction of educational practices compatible with human diversity.

Keywords: Giftedness, High abilities, Neurodevelopment, Educational identification, Neuroscience.

INTRODUCTION

Few topics in the field of high abilities/giftedness generate as many conceptual disagreements as the very definition of the phenomenon. Over the last century, researchers from different areas of knowledge have sought to understand who gifted people are, how to identify them, and which characteristics distinguish them from the general population. As a result, multiple theories, explanatory models, and identification proposals have emerged, often constructed on the basis of distinct epistemological assumptions and guided by equally different objectives.

This theoretical diversity does not necessarily represent a weakness of the field. On the contrary, it reflects the complexity of a human phenomenon that involves cognitive, emotional, developmental, educational, social, and, more recently, neurobiological aspects. As has occurred in various areas of science, the understanding of giftedness has not remained static over time. New questions have generated new investigations, new methods have enabled new observations, and new evidence has led to broader ways of understanding the phenomenon.

Historically, the first attempts to understand giftedness focused primarily on the measurement of intelligence. For much of the twentieth century, the prevailing idea was that gifted individuals could be identified through psychometric tests and high scores on measures of intelligence. This perspective exerted enormous influence on education, psychology, and identification policies, contributing to the consolidation of a view of giftedness strongly associated with intellectual capacity measurable through the Intelligence Quotient (IQ).

However, as research advanced, it became evident that intelligence alone was not capable of explaining the full diversity observed among individuals considered gifted. New questions then emerged. Why did some people make extraordinary creative and productive contributions while others did not? Why did many individuals identified as gifted exhibit similar emotional, social, and developmental characteristics, regardless of their level of performance? Why did some students demonstrate exceptional talents, while others remained invisible despite presenting clear indicators of high cognitive abilities?

It was in this context that different lines of investigation emerged, among which the contributions of Joseph Renzulli and Linda Kreger Silverman stand out. Although they are frequently mentioned within the same field of study, both began from substantially different scientific questions. While Renzulli sought to understand the factors associated with the emergence of creative productivity and socially relevant achievements, Silverman sought to understand the psychological and developmental functioning of gifted people. This distinction, often neglected in contemporary debates, has profound implications for how giftedness is understood, identified, and addressed in the educational context.

In recent decades, the discussion has become even more complex with the advancement of fields such as neuropsychology, cognitive neuroscience, and studies on human development. Themes such as developmental asynchrony, emotional intensity, twice-exceptionality, invisible suffering, social masking, and neurocognitive differences have increasingly occupied space in the specialized literature. At the same time, neuroscientific research has begun to investigate possible biological correlates associated with high cognitive abilities, expanding the field of knowledge and reinforcing the need for a multidimensional approach.

The relevance of this discussion extends beyond the theoretical level. The models used to understand giftedness directly influence identification processes, the development of public policies, the organization of specialized educational services, and the developmental opportunities offered to students. In contexts in which giftedness is understood predominantly through observable performance, manifest talent, or creative productivity, individuals who present differentiated cognitive functioning but do not

demonstrate these characteristics in an evident manner may remain invisible to identification systems. Understanding the epistemological foundations of the main models therefore becomes a scientific, educational, and socially relevant issue.

In view of this scenario, the following question is defined as the research problem: how do the theoretical, methodological, and epistemological differences between models centered on creative productivity and developmental and neuroscientific approaches influence the contemporary understanding of giftedness and its processes of educational identification?

The general objective of this article is to analyze the historical and scientific evolution of the understanding of giftedness, with special attention to the contributions of Joseph Renzulli, Linda Silverman, authors from the developmental perspective, and contemporary studies in neuroscience. Its specific objectives are to examine the historical foundations of the psychometric era, discuss the Three-Ring Conception and its explanatory limits, analyze the developmental approach to giftedness, present convergent evidence from the specialized literature, distinguish talent, potential, and gifted functioning, and reflect on the educational, social, and scientific implications of these conceptions for the identification and support of students with high abilities/giftedness.

To this end, the study is characterized as theoretical research of a bibliographical nature, based on the critical analysis of classic and contemporary works on giftedness, education, human development, psychology, neuroscience, and educational inclusion. It seeks to demonstrate that the differences among the models examined do not arise merely from divergent conclusions, but mainly from the scientific questions that guided their investigations. In addition, it aims to show how the later development of the literature and advances in neuroscience have contributed to broadening the contemporary understanding of giftedness, enabling a more comprehensive view of a phenomenon that remains under continuous scientific construction.

METHODOLOGY

The present study is characterized as theoretical research of a bibliographical nature, with a qualitative approach and an exploratory-descriptive character. The investigation was conducted through the review and critical analysis of classic and contemporary works, scientific articles, book chapters, and academic publications recognized in the fields of high abilities/giftedness, developmental psychology, education, cognitive neuroscience, and educational inclusion.

Priority was given to works that have exerted significant influence on the historical and scientific construction of knowledge about giftedness, including authors associated with the psychometric tradition, the Three-Ring Conception, the developmental perspective, and contemporary neuroscience. The theoretical corpus analyzed included studies by Joseph Renzulli, Linda Silverman, Leta Stetter Hollingworth, Kazimierz Dąbrowski, Michael Piechowski, James Webb, Susan Daniels, Deborah Ruf, Miraca Gross, Richard Haier, Rex Jung, David Lubinski, Camilla Benbow, and Paulo Freire, among other researchers widely recognized in national and international literature.

The selected materials were subjected to historical-comparative and epistemological analysis, seeking to identify the scientific problems that gave rise to the different conceptions of giftedness, their theoretical assumptions, their original objectives, and their implications for processes of identification and educational support. Recent neuroscientific studies with the potential to dialogue with developmental approaches were also considered, while respecting the methodological and interpretive limits specific to each area of knowledge.

RESULTS AND DISCUSSION

THE PSYCHOMETRIC ERA: WHEN GIFTEDNESS WAS MEASURED MAINLY BY IQ

To understand the relevance of Joseph Renzulli's contributions and, later, those of Linda Silverman, it is necessary to return to the origins of scientific research on giftedness. After all, no theory

emerges in isolation. Every scientific proposal is constructed in dialogue with the prevailing ideas of its time, whether to refine them or to challenge them.

For much of the twentieth century, the understanding of giftedness was strongly associated with the concept of measurable intelligence. The development of the first intelligence tests and the consolidation of psychometrics exerted a profound influence on the way researchers, educators, and educational systems began to identify individuals considered intellectually superior.

Although studies on individual differences had existed previously, it was the work of Alfred Binet and Théodore Simon, at the beginning of the twentieth century, that inaugurated a new stage in the scientific investigation of cognitive abilities. Initially designed to identify students who needed educational support, intelligence tests quickly began to be used also to identify individuals whose cognitive performance was significantly above average.

Subsequently, Lewis Terman, a professor at Stanford University, adapted and expanded the original instruments, giving rise to the Stanford-Binet Intelligence Scale. Based on his longitudinal studies with children who presented high IQ scores, a perspective was consolidated according to which giftedness could be understood primarily as a manifestation of high general intelligence.

The influence of this approach was enormous. For decades, the identification of gifted students was strongly linked to cut-off points on psychometric tests. In many contexts, having an IQ significantly above average became practically synonymous with being considered gifted.

This perspective brought important contributions to the development of the field. Psychometric tests enabled the systematic identification of individuals with high cognitive abilities, contributed to recognizing the existence of significant intellectual differences among individuals, and favored the emergence of educational programs aimed at students with high abilities.

However, as studies advanced, important questions began to arise.

Did intelligence as measured by tests fully explain the phenomenon of giftedness?

Would it be possible to understand the complexity of human development solely through psychometric scores?

Why did individuals with similar levels of intelligence present such different academic, professional, creative, and personal trajectories?

These questions began to reveal a fundamental limitation of exclusively psychometric models. Although they were capable of measuring certain aspects of cognitive functioning, they did not adequately explain phenomena related to creativity, motivation, leadership, scientific production, innovation, social adaptation, emotional development, and personal achievement.

At the same time, some researchers began to observe characteristics that seemed to transcend the results of intelligence tests. Highly able children demonstrated unusual developmental patterns, intense interests, differentiated forms of learning, and emotional experiences that could not be fully understood only through psychometric indicators.

Among these researchers, Leta Stetter Hollingworth stands out, frequently considered one of the pioneers of modern research on giftedness. In her studies with exceptionally intelligent children, Hollingworth observed phenomena that decades later would once again occupy a central position in the specialized literature, including difficulties in social adjustment, uneven development across different areas of life, and challenges related to belonging and to being understood by the school environment.

Although psychometrics remained the main reference for the identification of giftedness, signs were beginning to emerge that the phenomenon was more complex than initially imagined.

It was in this scenario that, from the 1960s and 1970s onward, new questions began to gain ground in the scientific field. Rather than asking only who possessed high intelligence, some researchers began to investigate why certain people produced creative and socially relevant contributions while others did not. Others began to question how gifted people developed throughout life and which psychological characteristics seemed to accompany them regardless of their observable performance.

It is within this historical context that the contributions of Joseph Renzulli and Linda Silverman would later emerge—authors who would significantly broaden the boundaries of the debate on giftedness and influence generations of researchers, educators, and professionals in the field.

THE SCIENTIFIC PROBLEM THAT LED RENZULLI TO THE THREE-RING CONCEPTION

Contrary to what is often assumed, Joseph Renzulli did not begin his research by attempting to answer the question “what is giftedness?” Nor was he seeking to formulate a theory about the psychological or neurobiological nature of gifted people. His scientific interest arose from a different problem, directly related to the limitations of the predominant models of his time.

During the 1960s and 1970s, the identification of giftedness was strongly linked to intelligence tests. In many educational contexts, students considered gifted were those who presented significantly high scores on psychometric assessments. Although this model made it possible to identify individuals with high cognitive abilities, it did not seem to adequately explain a phenomenon that drew the attention of many researchers.

If high intelligence were sufficient to explain exceptional human achievement, why did not all highly intelligent individuals produce significant creative, scientific, artistic, or social contributions? Likewise, why did some people recognized for their creativity, leadership, or capacity for innovation not always appear among those with the highest scores on intelligence tests?

It was from this concern that Renzulli began to review extensively the literature related to creativity, leadership, innovation, scientific productivity, academic achievement, and exceptional performance. His objective was to identify which characteristics appeared recurrently among individuals recognized for relevant contributions in different areas of knowledge and human activity.

The result of this work was published in 1978 in the article *What Makes Giftedness? Reexamining a Definition*, considered one of the most influential texts in the history of gifted education.

The very title of the publication reveals the nature of his proposal. Renzulli was not claiming to discover an essence of giftedness or to propose a definitive definition of the phenomenon. What he sought was to reexamine the definitions then in existence and to broaden the debate beyond the limits imposed by exclusively psychometric models.

Based on his theoretical review, he concluded that individuals capable of producing outstanding creative and productive achievements often seemed to present the interaction of three fundamental characteristics: above-average ability, creativity, and task commitment.

This formulation gave rise to what later became known as the Three-Ring Conception of Giftedness.

It is important to note that each of these elements had a specific meaning within Renzulli's proposal.

Above-average ability was not necessarily restricted to an exceptionally high IQ. The author recognized both general abilities and specific aptitudes in certain domains of knowledge.

Creativity referred to the capacity to produce original ideas, establish unusual connections, formulate innovative solutions, and approach problems from differentiated perspectives.

Task commitment concerned the persistence, motivation, invested energy, dedication, and involvement required to transform potential into concrete achievement.

According to Renzulli, it would be the interaction among these three factors that favored the emergence of what he called gifted behavior.

This point deserves special attention.

One of the aspects most frequently ignored in contemporary interpretations of the theory is that Renzulli predominantly used the expression gifted behavior rather than gifted person.

The distinction is not merely semantic.

While the expression gifted person refers to the idea of a relatively stable characteristic of the individual, the expression gifted behavior emphasizes the observable manifestation of certain behaviors associated with productive creativity.

In other words, the central focus of the theory was not necessarily the gifted person as the object of investigation, but rather the behaviors that emerge when certain cognitive, creative, and motivational conditions come together.

This difference helps explain why the Three-Ring Conception exerted such a significant influence in the educational field. Its potential lay not in the identification of students, but in the construction of strategies capable of stimulating the emergence of these behaviors.

The graphic representation of the theory became one of its best-known elements. Through a Venn diagram composed of three overlapping circles, Renzulli illustrated the interaction among above-average ability, creativity, and task commitment. At the intersection of these three sets, he placed what he called gifted behavior.

However, it is important to understand its epistemological nature.

The model did not result from a neurological, genetic, or neurobiological discovery of giftedness. Nor did it empirically demonstrate that these three factors constituted the totality of the phenomenon. It was a theoretical construction developed from the observation of characteristics frequently found in highly achieving individuals.

This distinction is fundamental for understanding both the relevance and the limits of the proposal.

The strength of the theory lay in broadening the debate beyond IQ and offering an educational model capable of guiding practices of enrichment and talent development.

At the same time, its emphasis on the observable manifestation of productive creativity would raise, in the following decades, new questions that would ultimately lead researchers down different paths. After all, what happened to highly able individuals who did not demonstrate visible creativity? What about those who presented emotional suffering, school demotivation, adaptation difficulties, or

associated conditions that interfered with the expression of their potential? Would they remain outside the understanding of giftedness?

These questions did not invalidate Renzulli's contribution. On the contrary, they showed that his proposal had broadened the debate sufficiently to allow new scientific questions to emerge. And it is precisely at this point that the history of giftedness begins to move closer to the contributions of authors such as Linda Silverman, who would go on to investigate not only what gifted people produce, but how they function.

The Three-Ring Diagram: Scope, utility, and explanatory limits

The Three-Ring Conception also became widely known through its graphic representation. Renzulli presents his conception by means of three overlapping circles: above-average ability, creativity, and task commitment. In the zone of intersection among these three elements lies what the author calls gifted behavior, that is, gifted conduct or behavior associated with giftedness..

At first glance, the image appears simple. However, its interpretation requires care.

The three-ring model is visually presented as a Venn-type diagram because it works with interconnected circles and an area of intersection. However, it should not be treated as a mathematical Venn diagram in the strict sense. In a Venn diagram properly speaking, closed geometric forms represent sets, exclusive areas indicate elements belonging only to one group, and the intersection zone indicates elements common to the crossed sets.

In Renzulli's case, the circles do not gather individuals classified into independent categories. They represent three clusters of human characteristics which, when interacting, may favor the emergence of creative and productive behaviors. Therefore, the intersection should not be read as mathematical proof of the existence of giftedness, but as a conceptual representation of the interaction among variables associated with creative productivity.

This detail is decisive.

The image does not state that the gifted person exists only when above-average ability, creativity, and task commitment appear simultaneously and visibly. What the model seeks to demonstrate is that certain gifted behaviors tend to emerge when these three dimensions combine in favorable contexts of development and expression.

Renzulli's later text, entitled *The Three-Ring Conception of Giftedness: A Developmental Model for Promoting Creative Productivity*, reinforces this interpretation by situating his proposal within the field of educational practices of identification and programming. The author states that definitions of giftedness have direct implications for identification procedures and for the educational services offered to students, emphasizing that his conception was developed as a theoretical basis for enrichment programs and the development of creative productivity.

This point is very important in order to avoid an absolutized reading of the theory.

Renzulli was not proposing a neurobiological, genetic, or clinical marker of giftedness. He was constructing an operational conception aimed at guiding school practices, especially in the field of curricular enrichment, talent development, and creative productivity.

This is why the model had an enormous impact on education. It offered an alternative to models centered exclusively on IQ and allowed schools to consider creativity, engagement, interest, and production as relevant dimensions in supporting students with high potential.

One unforeseen effect of the broad educational dissemination of the model was the interpretation of its components as mandatory criteria for recognizing giftedness. In some contexts, visible creativity, productivity, and high task commitment began to function as requirements for identification, although this was not the purpose originally proposed by the author.

However, this same educational strength reveals its explanatory limit.

A model developed to stimulate and identify creative and productive behaviors does not necessarily explain the entire subjective, emotional, developmental, and neuropsychological experience of the gifted person. It may be extremely useful for thinking about curricular enrichment, but insufficient for

understanding phenomena such as developmental asynchrony, twice-exceptionality, invisible suffering, social masking, emotional intensity, or difficulties in school adaptation.

This distinction prevents two misconceptions.

The first would be to unfairly disqualify Renzulli, as if his theory had no relevance. It did, and continues to have, historical and educational importance.

The second would be to transform his conception into a total definition of giftedness. This use exceeds the original scope of the model and may produce serious practical consequences, especially when the demonstration of visible creativity, productivity, or commitment to school tasks is required in order to recognize the existence of giftedness.

A depressed gifted student may not show high task commitment.

A gifted child may have difficulty sustaining attention in repetitive activities, although presenting advanced thinking and intense intellectual curiosity.

A gifted autistic student may express creativity in a non-conventional manner, without corresponding to the pattern expected by the school.

A child subjected to years of understimulation may appear uninterested when, in fact, they are intellectually mismatched with the environment.

In these cases, the absence of visible gifted behavior does not eliminate the possibility of giftedness. It merely reveals that the potential may not be encountering adequate conditions for expression.

For this reason, the more careful contemporary reading of the Three-Ring Conception does not consist of discarding it, but of situating it properly. It is a relevant model for understanding the emergence of creative-productive behaviors and for guiding practices of educational enrichment. However, it should not be used as an exclusive instrument of identification, nor as a comprehensive explanation of giftedness as complex human functioning.

The very evolution of the debate suggests that Renzulli's theory should be understood within its scope: talent development, creative productivity, curricular enrichment, and the identification of gifted behaviors. When the objective becomes understanding the gifted person in their cognitive, emotional, developmental, and neuropsychological complexity, it becomes necessary to turn to other theoretical and empirical contributions, such as those developed by Linda Silverman and by authors of the developmental perspective.

FROM CREATIVE PRODUCTIVITY TO HUMAN DEVELOPMENT: THE EMERGENCE OF NEW SCIENTIFIC QUESTIONS

The influence of the Three-Ring Conception on gifted education was profound and remains visible to this day. By broadening the debate beyond IQ, Renzulli contributed to the inclusion of creativity, motivation, and achievement potential in processes of identification and talent development. This is a historically relevant contribution, especially because it challenged the exclusively psychometric view prevailing at the time.

However, in various educational systems, the practical application of this conception ultimately shifted the focus from understanding the gifted person to observing productive behaviors and visible performances. When manifest creativity, differentiated production, and task commitment came to be interpreted as indispensable requirements for recognition, many students with high cognitive potential, but without evident expression of these attributes, remained invisible to formal identification processes.

Among these students are learners who are demotivated, masked, twice-exceptional, emotionally overwhelmed, or situated in contexts that hinder the manifestation of their talents.

This limitation began to motivate new investigations aimed not only at the observation of creative productivity, but also at understanding the psychological and developmental functioning of gifted people, a theme that would be deepened by authors of the developmental perspective.

As the field advanced, new questions began to emerge. Although the Three-Ring model explained important aspects of creative productivity, it did not fully respond to phenomena observed by professionals who worked directly with gifted people in clinical, family, and educational contexts.

As the field advanced, researchers began to question why intellectually advanced individuals often presented emotional suffering, low school productivity, difficulties in social adaptation, persistent feelings of inadequacy, and other characteristics that could not be fully explained by models centered on creative achievement.

These observations began to indicate that there might be an important difference between studying what a person produces and studying how that person functions.

This shift in perspective represents a significant epistemological transformation.

While part of the earlier literature sought to understand the factors associated with creative achievement and the production of socially relevant contributions, a growing group of researchers began to investigate aspects related to the psychological, emotional, cognitive, and social development of gifted people.

The focus progressively shifted from productivity to functioning.

Instead of asking only who produces extraordinary results, some researchers began to ask how individuals who present significantly differentiated intellectual functioning develop.

This movement did not arise as a rejection of previous contributions.

In reality, it represented the expansion of a scientific field that was beginning to recognize the existence of phenomena that could not be explained exclusively by performance indicators.

Everyday experience showed that many gifted people remained invisible.

Many presented school difficulties, masking strategies, emotional suffering, or associated conditions that made it difficult to recognize their advanced cognitive abilities.

These observations contributed to the emergence of a new generation of studies concerned not only with what the person accomplishes, but also with how they perceive the world, process information, experience emotions, and interact with the environment.

It is in this context that researchers such as Linda Silverman, Michael Piechowski, James Webb, Susan Daniels, Deborah Ruf, and Miraca Gross gain prominence.

Although they present distinct approaches, these authors share a fundamental characteristic: they seek to understand giftedness as a complex human phenomenon involving cognitive, emotional, developmental, and relational aspects.

From this new set of investigations, concepts such as developmental asynchrony, emotional intensity, overexcitabilities, uneven development, socioemotional vulnerability, masking, and twice-exceptionality began to occupy a central position in the specialized literature.

The focus was no longer exclusively on the question “what does this person produce?” but came to include an equally important question:

“How does this person function?”

This change did not eliminate the importance of creativity, motivation, or productive achievement. However, it significantly broadened the field of investigation, making it possible to understand that giftedness may exist independently of the immediate presence of extraordinary performance, public accomplishments, or socially recognized productions.

It was in this scenario that Linda Silverman began one of the most influential contributions in contemporary literature on giftedness.

LINDA SILVERMAN AND THE CONSTRUCTION OF A DEVELOPMENTAL PERSPECTIVE ON GIFTEDNESS

While Joseph Renzulli sought to understand the factors associated with the emergence of creative productivity and socially relevant achievements, Linda Kreger Silverman followed a substantially

different investigative path. Her interest was not centered on the identification of highly productive individuals, but on understanding the psychological and developmental functioning of gifted people.

Over decades of work at the Gifted Development Center, Silverman assessed thousands of children, adolescents, and adults, gathering a broad set of clinical, educational, and developmental observations. Unlike models guided by the observation of performance, her investigations focused on identifying recurring characteristics present in gifted individuals regardless of the manifestation of visible talents or exceptional achievements.

Based on these observations, Silverman began to describe patterns related to emotional intensity, heightened sensitivity, depth of thought, rapid learning, the search for meaning, difficulties in social adaptation, and developmental asynchrony. These phenomena appeared recurrently in different individuals and contexts, suggesting the existence of characteristics associated with the very functioning of the gifted person.

This perspective was progressively consolidated in scientific articles, book chapters, clinical research, and reference works, among which *Counseling the Gifted and Talented* (1993) and *Giftedness 101* (2013) stand out. Rather than proposing a single theory or a closed model, Silverman contributed to the construction of a developmental understanding of giftedness, centered on the way the individual perceives, learns, feels, and develops throughout life.

One of her most influential contributions was her participation in consolidating the definition proposed by the Columbus Group, according to which giftedness constitutes a form of asynchronous development. This conception describes individuals whose advanced cognitive abilities interact with high levels of emotional intensity and differentiated internal experiences, producing developmental patterns distinct from those observed in the general population.

The Columbus Group's definition became a milestone in contemporary literature by shifting the understanding of giftedness from the field of abilities alone to the field of human development, significantly influencing later research on asynchrony, emotional intensity, and twice-exceptionality.

The notion of asynchrony became particularly relevant because it made it possible to understand why many gifted individuals present significant advances in certain areas and, simultaneously, challenges in others. From this perspective, giftedness ceases to be understood exclusively as a matter of performance or intellectual capacity and begins to be analyzed as a phenomenon related to human development in its complexity.

This shift in focus produced significant impacts on contemporary literature. By redirecting attention to cognitive, emotional, and developmental functioning, Silverman's perspective contributed to broadening the understanding of phenomena such as emotional intensity, invisible suffering, difficulties with belonging, the masking of characteristics, and twice-exceptionality—themes that have increasingly occupied space in research on giftedness in recent decades.

Although it did not arise in opposition to Renzulli's contributions, the developmental approach responded to a different scientific question. While the Three-Ring Conception sought to understand the emergence of creative productivity, Silverman sought to understand the developmental experience of the gifted person. This epistemological distinction helps explain why both authors arrived at different conclusions and why their contributions can be understood as complementary, even though they are guided by distinct objectives.

The developmental perspective significantly expanded the field of investigation of giftedness and contributed to consolidating approaches centered on human development, subjective experience, and specific educational needs. This expansion would pave the way for the later convergence among developmental psychology, inclusive education, and neuroscience, discussed in the following sections.

In this study, functioning refers to the set of cognitive, emotional, developmental, and neuropsychological characteristics that influence the way the individual perceives, processes information, learns, interprets experiences, and interacts with the environment.

CONVERGENT EVIDENCE IN CONTEMPORARY LITERATURE

One of the most consistent ways to evaluate the robustness of a scientific hypothesis is to verify whether different researchers, using distinct methods and working in diverse contexts, observe similar phenomena. In the field of giftedness, this aspect is especially relevant, since the contemporary understanding of the phenomenon is not based exclusively on the production of a single author, but on a growing body of evidence from psychology, education, neuropsychology, and studies on human development.

In this context, it is noteworthy that various researchers, over decades, have begun to describe recurring characteristics in gifted people that are not limited to academic performance or the manifestation of visible talents. Although they use distinct theoretical frameworks, many of these authors have identified patterns related to developmental asynchrony, emotional intensity, heightened sensitivity, complex thinking, difficulties with belonging, and specific educational needs.

The studies of Leta Stetter Hollingworth are among the first to indicate that children with high intellectual abilities frequently present challenges that go beyond the academic field. In investigating exceptionally advanced children, the author observed difficulties in social adjustment, significant differences in interests compared to same-age peers, and educational needs incompatible with conventional curricula. Her research helped demonstrate that accelerated intellectual development does not always occur homogeneously across all areas of a child's life.

Decades later, research conducted by Miraca Gross reinforced these observations by demonstrating that highly advanced students may experience feelings of isolation, incomprehension, and inadequacy when they remain in educational environments unable to keep pace with their learning rate. Her longitudinal studies showed that measures such as acceleration and curricular flexibility can favor not only the academic development but also the socioemotional adjustment of these students.

Another important set of contributions concerns the understanding of the emotional intensity frequently observed in gifted people. In this field, the works of Kazimierz Dąbrowski, Michael

Piechowski, and Susan Daniels stand out. Although their approaches present conceptual differences, all contributed to consolidating the understanding that many gifted people experience emotions, interests, concerns, and internal experiences in a particularly intense manner. The so-called overexcitabilities described by Dąbrowski, later developed in greater depth by Piechowski and Daniels, began to offer a theoretical framework for understanding phenomena frequently reported by gifted individuals, including heightened emotional sensitivity, intense intellectual curiosity, rich imagination, and strong involvement with existential, ethical, or social issues.

In parallel, researchers such as James Webb and Deborah Ruf drew attention to a phenomenon that would become central in contemporary literature: the invisibility of giftedness. Their studies demonstrated that many gifted people remain unidentified throughout much of their lives, especially when they present associated conditions, emotional difficulties, or characteristics that do not correspond to stereotypes traditionally linked to high performance. This discussion became particularly relevant with the advancement of research on twice-exceptionality, showing that high cognitive abilities can coexist with neurodevelopmental disorders, specific learning difficulties, or other conditions that hinder the visible manifestation of potential.

Perhaps the most significant aspect of these contributions is not the absolute identity among their conclusions, but the convergence observed across different lines of research. Despite using distinct methodologies and investigating varied populations, these authors identified similar phenomena related to uneven development, emotional intensity, difficulties in social adaptation, invisible suffering, and the need for differentiated educational responses.

This convergence has great scientific relevance because it broadens the understanding of giftedness beyond observable manifestations of performance. These findings reinforce the existence of recurring characteristics already described in the developmental literature and demonstrate the progressive convergence among different lines of investigation on giftedness.

Longitudinal studies conducted by David Lubinski and Camilla Benbow followed individuals with high cognitive abilities for decades, demonstrating that early intellectual differences can significantly influence academic, scientific, professional, and creative trajectories throughout life. These findings reinforce the relevance of early identification and of offering educational opportunities compatible with the specific needs of this population.

It is precisely this broadening of the scientific perspective that prepares the ground for discussions about talent, potential, and manifestation.

TALENT, POTENTIAL, AND THE MANIFESTATION OF GIFTEDNESS

One of the most recurrent issues in the literature on giftedness concerns the relationship among potential, talent, performance, and achievement. Although these concepts frequently appear associated, they are not equivalent and cannot be used as synonyms.

Historically, part of the identification processes focused on the observation of visible manifestations of potential, such as high academic performance, exceptional creativity, leadership, differentiated productions, or socially recognized achievements. This perspective contributed significantly to the development of educational programs aimed at enrichment and the promotion of talents. However, it also brought an important challenge: the tendency to confuse the manifestation of potential with the very existence of potential.

From a conceptual standpoint, talent can be understood as an observable expression of abilities developed in a given area. Talent manifests itself through performances, productions, competencies, or achievements that stand out in relation to the reference group. Giftedness, in turn, refers to differentiated cognitive and developmental functioning, which may favor the emergence of talents but is not limited to them.

This distinction becomes particularly relevant because the development of talent depends on multiple factors. High cognitive abilities may favor the rapid acquisition of knowledge, the understanding

of complex concepts, and the efficient resolution of problems. However, the transformation of this potential into observable performance also involves educational opportunities, family support, socioeconomic conditions, learning experiences, motivation, mental health, social belonging, and access to contexts that enable the development of existing abilities.

In this sense, talent and giftedness are not equivalent phenomena. Although many gifted people develop expressive talents throughout life, not every gifted person will have the opportunity to manifest them in an evident manner. Likewise, the presence of talent does not constitute sufficient evidence to characterize giftedness, since high performance may result from intensive training, deliberate practice, prolonged dedication, cultural factors, or specific opportunities for development.

The absence of manifestation does not equate to the absence of potential. The visible expression of human abilities depends on factors that transcend the individual's cognitive characteristics. Among them are the available educational opportunities, the quality of learning experiences, the family context, emotional support, and the existence of favorable conditions for development.

This distinction becomes particularly evident in situations of twice-exceptionality and school understimulation. In the first case, high cognitive abilities may coexist with conditions such as autism, attention-deficit/hyperactivity disorder, dyslexia, dyscalculia, or other neurodevelopmental differences, producing complex profiles that hinder identification based exclusively on observable performance. In the second, the absence of challenges compatible with the student's level of functioning may generate demotivation, disengagement, apparently low achievement, and progressive reduction in the expression of potential.

Under these circumstances, the central issue ceases to be the simple observation of manifest talent and comes to involve the analysis of the conditions that favor or limit its expression. The contemporary identification of giftedness requires recognizing that performance, productivity, and achievement constitute possible manifestations of potential, but not its only form of expression nor its condition of existence.

This understanding is supported by different contemporary authors who describe giftedness as a multidimensional phenomenon involving cognitive, emotional, developmental, and contextual aspects. From this perspective, identification should not seek exclusively individuals who already demonstrate exceptional achievements, but also those whose functioning reveals specific educational needs resulting from significantly advanced abilities.

While developed talent tends to be easily recognized through observable indicators of performance, unmanifested potential requires broader assessment processes capable of considering development, context, cognitive functioning, and specific educational needs.

The data analyzed throughout this study indicate that talent, performance, and productivity should not be confused with the very existence of giftedness. Talent may constitute one possible manifestation of giftedness, but not its definition. Likewise, the absence of exceptional performance does not authorize the conclusion that high abilities are absent. Giftedness refers to differentiated cognitive and developmental functioning whose manifestation depends on the interaction among biological, emotional, educational, social, and environmental factors. Thus, potential and manifestation constitute related but not equivalent dimensions. This distinction is fundamental for understanding phenomena widely discussed in contemporary literature, such as the invisibility of giftedness, twice-exceptionality, the masking of characteristics, and the underidentification of students with specific educational needs. For this reason, the differentiation among functioning, potential, and manifestation will be adopted as an interpretive reference for the discussions presented in the subsequent sections of this work.

NEUROSCIENCE AND GIFTEDNESS: CONVERGENCES WITH THE DEVELOPMENTAL PERSPECTIVE

For much of the twentieth century, giftedness was studied predominantly in the fields of psychology, education, and psychometrics. Researchers sought to understand cognitive differences, learning patterns, and developmental characteristics through psychological tests, clinical observations,

and educational studies. With the advancement of cognitive neuroscience, especially from the final decades of the twentieth century onward, it became possible also to investigate the neurobiological correlates associated with high cognitive abilities.

This advance does not mean that giftedness has become identifiable through brain imaging examinations. More precisely, it means that neuroimaging studies have begun to demonstrate associations among high intelligence, neural connectivity, cerebral metabolism, cortical development, and the functional organization of brain networks. Although such findings do not constitute diagnostic instruments, they have contributed to broadening the scientific understanding of the phenomenon and have enabled the establishment of relevant dialogues with the developmental literature.

Among the most influential contributions is the work of Richard Haier, whose research investigated the neural bases of individual differences in cognitive performance. One of the best-known concepts in this line of investigation is neural efficiency. Studies using positron emission tomography (PET) observed that individuals with higher intellectual performance could present lower glucose consumption in certain brain regions while performing cognitive tasks, suggesting more efficient information processing. These results challenged the intuitive idea that superior intelligence would necessarily correspond to greater cerebral effort. In certain situations, more efficient brains appear to achieve better results while using fewer metabolic resources.

The neural efficiency hypothesis should not be interpreted simplistically. Brain performance varies according to the complexity of the task, the individual's familiarity with the problem, and the specific characteristics of the context. Even so, these studies offer a plausible explanation for a phenomenon frequently described by families and educators: the speed with which some children understand content, establish complex relationships, and solve problems that require high levels of abstraction.

Another important contribution emerged from studies on cortical development. Shaw and collaborators demonstrated that intelligence is not related only to static measures of brain volume or cortical thickness. Their findings suggest that individuals with greater intellectual capacity present

differentiated trajectories of brain maturation, characterized by specific patterns of cortical development and reorganization throughout childhood and adolescence. These results reinforce the idea that high intelligence is associated with dynamic developmental processes, and not only with fixed anatomical characteristics.

Research on gray matter and brain organization has also contributed to broadening the understanding of individual cognitive differences. Although there is no single brain structure responsible for giftedness, studies indicate that certain regions associated with abstract reasoning, planning, problem solving, and information integration may present structural and functional differences in individuals with high intellectual performance. More important than the existence of a specific area seems to be the way different brain regions interact with one another.

In this context, the Parieto-Frontal Integration Theory (P-FIT), proposed by Jung and Haier, stands out. According to this perspective, intelligence emerges from the coordinated interaction among multiple brain regions distributed mainly across the frontal and parietal lobes. Rather than locating intelligence in a single structure, the model suggests that high cognitive performance results from the capacity of different neural systems to integrate information efficiently. This conception reinforces the idea that intelligence constitutes a complex phenomenon, dependent on communication among brain networks and not merely on the isolated functioning of certain areas.

Despite the advances observed, there remains no scientific consensus regarding the existence of a specific neurobiological marker of giftedness. Part of the literature emphasizes structural and functional differences observed in population studies, while other researchers highlight the heterogeneity of findings and the methodological limits inherent in neuroimaging research.

Another particularly relevant field of investigation involves studies on brain connectivity. Recent research indicates that high cognitive differences may be associated with the quality of communication among brain regions, the integrity of white matter, and the functional organization of neural networks. These findings are especially interesting because they dialogue with descriptions frequently found in the

developmental literature, according to which many gifted people demonstrate a high capacity to establish relationships among apparently disconnected ideas, integrate information from different areas of knowledge, and produce complex forms of reasoning.

The emotional dimension has also received increasing attention from neuroscience. Although there is still no evidence capable of identifying a specific neurobiological signature of giftedness, several studies investigate the role of structures related to emotional processing, such as the amygdala, the hippocampus, and regions of the prefrontal cortex. Some findings suggest differences in the way certain individuals process emotional, sensory, and social stimuli. These results do not authorize the claim that gifted people necessarily have larger or more active amygdalae. However, they offer promising avenues for understanding phenomena described for decades by authors such as Dąbrowski, Piechowski, and Silverman, especially those related to emotional intensity, heightened sensitivity, and the depth of subjective experiences.

It is at this point that neuroscience begins to dialogue more directly with the developmental perspective on giftedness. The rapprochement between these areas should not be understood as a definitive validation of any specific theory. However, it is striking that various phenomena clinically observed by developmental researchers have begun to find partial correspondences in studies on brain functioning.

The developmental literature frequently describes gifted people as individuals who learn quickly, present complex thinking, demonstrate intense intellectual curiosity, experience emotions deeply, and may manifest asynchrony among different areas of development. Neuroscience, in turn, identifies differences related to neural efficiency, brain connectivity, energy metabolism, cortical maturation, and the functional integration of cognitive networks. Although these fields use distinct methods and investigate different dimensions of the phenomenon, both point to the existence of differentiated forms of functioning that cannot be reduced exclusively to observable performance.

Developmental asynchrony constitutes an important example of this convergence. Silverman and the Columbus Group defined giftedness as a process of asynchronous development, in which advanced cognitive abilities coexist with different rhythms of emotional, social, or motor maturation. Neuroscience does not directly confirm this definition, but it demonstrates that brain development occurs heterogeneously, with different systems maturing at their own rhythms. This finding makes the existence of non-linear developmental trajectories biologically plausible and helps explain why individuals who are highly advanced in certain domains may present significant challenges in others.

Despite the advances observed, it is important to recognize the current limits of scientific knowledge. To date, there is no neuroimaging examination capable of identifying giftedness individually with clinical or educational validity. Neither in Brazil nor abroad are there diagnostic protocols based on magnetic resonance imaging, tomography, PET, or any other neuroimaging technique that make it possible to determine objectively whether a person is or is not gifted. Existing studies make it possible to understand differences between groups, formulate hypotheses, and expand knowledge about the mechanisms involved, but they do not replace psychological, neuropsychological, educational, or developmental assessments.

The main contribution of neuroscience to the field of giftedness does not lie in offering a definitive biological marker, but in reinforcing the understanding that high cognitive differences have observable neurobiological bases. This finding strengthens the understanding of giftedness as a multidimensional phenomenon involving cognition, emotion, development, environment, and the functioning of the central nervous system.

From this perspective, the convergence between neuroscience and the developmental approach contributes to a broader understanding of giftedness. Both suggest that the difference lies not only in what the individual produces, but also in the way they learn, perceive, feel, process information, and develop throughout life. This broadening of perspective represents one of the most significant advances in

contemporary literature and reinforces the need for models of identification and educational support capable of encompassing the complexity of the gifted experience.

WHY THIS DISCUSSION MATTERS FOR IDENTIFICATION AND FOR THE SCHOOL

The discussion of theoretical models of giftedness is not limited to the academic field. The conceptions adopted by researchers, professionals, and educational systems directly influence identification processes, the organization of support services, the formulation of public policies, and the developmental opportunities offered to students.

The way giftedness is defined determines who will be recognized, who will have access to specialized assessments, and which students will receive educational responses compatible with their needs. For this reason, the epistemological differences discussed throughout this work produce concrete consequences in the lives of children, adolescents, and adults.

When giftedness is understood predominantly through indicators of productivity, exceptional performance, or visible talents, identification processes tend to privilege students who have already succeeded in transforming potential into observable results. Although these students should be identified and supported, this approach presents important limitations. As discussed previously, performance and giftedness are not equivalent concepts. The manifestation of potential depends on the interaction among biological, emotional, educational, social, and environmental factors, which is why many gifted individuals remain outside formal identification processes.

This reality becomes particularly evident among twice-exceptional students, masked students, or those subjected to contexts of school understimulation. In these situations, significantly advanced cognitive abilities may coexist with learning difficulties, neurodevelopmental conditions, emotional suffering, or environmental barriers that hinder the expression of potential. As a consequence, differentiated functioning may remain invisible to assessment systems centered exclusively on observable performance.

For this reason, the choice of theoretical framework directly influences pedagogical practice. Models centered predominantly on productivity tend to identify productive students. Models centered exclusively on performance tend to recognize those who already present superior results. In contrast, developmental approaches seek to understand the student in their totality, considering aspects related to cognitive functioning, learning pace, depth of thought, emotional intensity, developmental asynchrony, and the specific educational needs resulting from these characteristics.

This change has relevant implications for teacher education. Many education professionals still associate giftedness with constant academic excellence, exemplary behavior, or generalized ease in learning. This understanding contributes to processes of underidentification and reinforces the mistaken perception that gifted students do not require specialized educational support.

Contemporary literature points precisely in the opposite direction. Gifted students may require curricular enrichment, content compacting, acceleration, pedagogical flexibility, interest-based grouping, socioemotional monitoring, and individualized educational planning. These measures do not constitute privileges, but educational responses compatible with specific needs arising from differentiated forms of development and learning.

From this perspective, identification ceases to be understood as the recognition of merit and comes to be understood as an instrument for guaranteeing educational rights. The objective is not to reward students who already demonstrate high performance, but to ensure that individuals with specific needs resulting from high abilities receive adequate opportunities for their integral development.

This understanding also has relevance for the formulation of public policies. Educational systems that adopt excessively restrictive criteria tend to produce artificial identification rates, contributing to the underreporting of the gifted population and to the limitation of specialized services. As a consequence, many students remain without institutional recognition, without adequate support, and without access to the resources necessary for the full development of their potential.

For this reason, contemporary literature advocates identification processes based on multiple sources of information, including psychological or neuropsychological assessments, pedagogical observations, developmental history, family reports, student productions, in-depth interests, and analysis of the environmental conditions that favor or hinder the expression of potential. No single instrument is capable of capturing the full complexity of the phenomenon.

The contemporary understanding of giftedness requires recognizing that different developmental trajectories may lead to different forms of manifestation. Not all students will present the same characteristics, nor will they express their abilities in the same way or at the same moment in life. This diversity requires models of identification and support broad enough to encompass the complexity of the phenomenon.

In this context, the central question ceases to be “who deserves to be recognized as gifted?” and becomes “which students present specific educational needs arising from differentiated cognitive, emotional, and developmental functioning?” This shift moves the discussion from the field of merit to the field of rights and brings the contemporary understanding of giftedness closer to the principles of inclusive education, equity, and integral human development.

PAULO FREIRE AND THE PEDAGOGY OF SINGULARITY

Although Paulo Freire did not develop a specific theory on giftedness, various elements of his work offer relevant contributions to the contemporary understanding of the educational needs of students with high abilities. His influence has crossed Brazilian borders and achieved international recognition, making him one of the most cited references in the field of critical education and humanist pedagogy.

At the center of his proposal lies the understanding that the student should not be treated as a mere passive recipient of information, but as an active subject of the educational process. In opposition to what he called banking education, Freire advocated a pedagogical practice based on dialogue, autonomy, the construction of knowledge, and the recognition of human singularity.

Although these ideas were formulated in contexts distinct from the discussion on giftedness, they dialogue directly with challenges frequently observed in the education of students with high abilities. Many of these students present an accelerated pace of learning, intense intellectual curiosity, a need for conceptual depth, and interest in topics that go beyond the limits of the traditional curriculum. When subjected to excessively standardized practices, they may experience disengagement, demotivation, and a progressive reduction of interest in learning.

From this perspective, Freire's contribution lies not in the definition of giftedness, but in the understanding that effective educational processes require the recognition of individual differences. The valuing of the student's experience, respect for their interests, the construction of meaningful formative pathways, and the rejection of excessively homogeneous models bring his proposal close to contemporary principles of inclusive education.

This approximation becomes especially relevant when considered in light of the discussions presented in this study. If the developmental literature demonstrates that giftedness may involve differentiated forms of learning, thinking, sensitivity, and development, Freirean pedagogy contributes by defending that education should begin from the concrete subject and their real needs, rather than from standardized models applied indistinctly to all students.

In this sense, Freire's reflection offers a complementary contribution to the psychological, developmental, and neuroscientific approaches discussed throughout this work. While these areas help us understand how gifted people learn, feel, and develop, Freirean pedagogy reinforces the need to construct educational practices capable of welcoming this human diversity.

The contemporary relevance of this perspective resides precisely in its defense of an education committed to singularity, equity, and integral development. From this viewpoint, recognizing gifted students does not mean assigning privileges or distinctions of merit, but ensuring that legitimate developmental differences are considered in the construction of educational opportunities compatible with their needs.

Thus, although Paulo Freire did not write about giftedness, his defense of an education centered on the student, on dialogue, and on respect for differences offers important foundations for an educational understanding that recognizes the diversity of ways of learning and developing. This perspective converges with the contemporary understanding that the purpose of identification is not to select the best, but to guarantee that each student receives adequate conditions to fully develop their potential.

CONCLUSION

The present study aimed to analyze the historical and scientific evolution of the understanding of giftedness by examining the contributions of different theoretical frameworks that have influenced the construction of knowledge in the field, with special attention to the proposals of Joseph Renzulli, Linda Silverman, authors of the developmental perspective, and contemporary research in neuroscience. It began from the understanding that the way giftedness is defined is not merely a conceptual issue, but directly influences identification processes, educational practices, and students' access to the services and resources intended to address their specific needs.

The analysis conducted demonstrated that different conceptions of giftedness did not emerge to answer the same scientific question. While Renzulli sought to understand the factors associated with the emergence of creative productivity and socially relevant achievements, Silverman and other authors of the developmental perspective directed their attention to the cognitive, emotional, and developmental functioning of gifted people. This distinction proved fundamental for understanding why apparently related models lead to distinct interpretations of the phenomenon.

The results of the review showed that the Three-Ring Conception represented an important historical advance by broadening the debate beyond measurable intelligence, incorporating creativity and task commitment into the field of high abilities. However, they also indicated that the exclusive use of models centered on the visible manifestation of potential may contribute to the invisibility of students

who present gifted functioning but do not demonstrate productivity, talent, or exceptional performance in an evident manner.

The developmental literature analyzed revealed significant convergence among different researchers in the description of characteristics such as developmental asynchrony, emotional intensity, heightened sensitivity, complex thinking, invisible suffering, difficulties with belonging, and specific educational needs. These findings broaden the understanding of giftedness beyond observable production, making it possible to recognize the existence of profiles frequently neglected by traditional identification systems, including twice-exceptional students, masked individuals, and people identified only in adulthood.

The analysis of the contributions of neuroscience demonstrated that recent research has been identifying differences related to neural efficiency, brain connectivity, cortical development, cerebral metabolism, and the organization of cognitive networks. Although such evidence does not authorize the use of neuroimaging as a diagnostic instrument for giftedness, it reinforces the understanding that high cognitive differences have observable neurobiological bases compatible with part of the phenomena previously described by the developmental literature.

Another relevant aspect evidenced by the study concerns the distinction between giftedness and talent. The results indicate that talent may constitute a possible manifestation of giftedness, but not its definition. Likewise, the existence of talent is not a sufficient condition to characterize giftedness. This differentiation proves particularly important in order to prevent identification from being restricted only to those who have already managed to transform potential into visible performance, excluding individuals who have not yet had adequate opportunities to develop their abilities.

The discussion also made it possible to show that the choice of a theoretical model produces concrete consequences for education. Educational systems that understand giftedness exclusively through productivity tend to recognize only a portion of students who present differentiated educational needs. In contrast, approaches that consider functioning, development, and diversity of manifestations broaden the

possibilities of identification and favor educational responses more compatible with the singularity of the subjects.

In this context, Paulo Freire's contributions reinforce the importance of an education committed to recognizing human diversity and valuing the singularity of each student. Although he did not develop specific studies on giftedness, his conception of education centered on the subject offers important elements for reflecting on pedagogical practices capable of welcoming different ways of learning, thinking, and developing.

It is concluded, therefore, that the scientific evolution of the understanding of giftedness should not be interpreted as the replacement of one theory by another, but as the progressive expansion of knowledge. The different models analyzed contributed to answering distinct scientific problems and, when understood within their original contexts, offer complementary contributions to the understanding of the phenomenon. Contemporary literature points toward a multidimensional conception of giftedness, involving cognitive, emotional, developmental, educational, and neurobiological aspects, incompatible with reductions based exclusively on performance, talent, or productivity.

Finally, it is suggested that future research should deepen the interfaces among neuroscience, human development, and education, especially with regard to twice-exceptionality, masking processes, and strategies for identifying students who remain invisible to traditional models. The expansion of this field of knowledge may contribute to more comprehensive identification models, fairer educational practices, and responses compatible with the complexity of the gifted experience.

This study presents limitations inherent to theoretical bibliographical research, especially due to the impossibility of empirically testing the hypotheses discussed. In addition, neuroscientific evidence related to giftedness remains under development and still does not permit definitive conclusions about specific biological mechanisms associated with the phenomenon.

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TEACHER EDUCATION FOR THE DEVELOPMENT OF COMPETENCIES AND SKILLS IN CONTEMPORARY EDUCATION

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Abstract

Contemporary education has been marked by profound social, cultural and technological transformations that directly impact teaching and learning processes. In this context, teacher education plays a fundamental role in preparing professionals capable of acting critically, reflectively and innovatively in response to the educational demands of the twenty-first century. This chapter aims to discuss teacher education for the development of competencies and skills in contemporary education, analyzing the challenges imposed by social changes, digital culture and new demands of pedagogical practice. Methodologically, this is a qualitative bibliographic study grounded in research on teacher education, professional competencies, professional development, digital competencies and educational innovation. The discussion is supported by authors such as Freire, Perrenoud, Tardif, Nóvoa, Moran, Castells and UNESCO. The findings indicate that teacher education must go beyond the mere transmission of theoretical knowledge, promoting the development of competencies related to pedagogical mediation, critical thinking, inclusion, collaboration and the ethical use of digital technologies. It is concluded that both initial and continuing teacher education are essential for building an educational system capable of responding to contemporary challenges while maintaining its commitment to human and civic development.

Keywords: Teacher education, Professional competencies, Skills, Contemporary education, Digital competencies.

INTRODUCTION

Contemporary education is situated within a context marked by profound social, cultural, technological, and communicational transformations that directly affect teaching and learning processes. The expansion of digital technologies, the speed at which information circulates, the diversity present in school spaces, and new forms of social interaction have required increasingly dynamic responses from educational systems, aligned with the demands of the twenty-first century. In this scenario, teacher

education assumes a strategic role, since the development of teaching competencies and skills becomes fundamental for education professionals to act critically, reflectively, and innovatively in the face of contemporary challenges.

The changes observed in recent decades have significantly altered the traditional role of the teacher. Whereas previously teachers' work was centered on the transmission of content, today they are expected to be able to mediate learning processes, promote the collective construction of knowledge, encourage students' autonomy, and develop contextualized pedagogical practices. For Freire (1996, p. 47), "teaching is not transferring knowledge, but creating the possibilities for its own production or construction." This understanding reinforces the need for teacher education that goes beyond the technical mastery of content and encompasses ethical, human, social, and pedagogical dimensions.

In analyzing the transformations of contemporary society, Castells (1999) emphasizes that we live in a network society, characterized by the intense circulation of information and by the reorganization of economic, cultural, and educational relations mediated by digital technologies. In this context, the school ceases to be the main source of access to knowledge and begins to share this role with multiple informational environments. Consequently, teachers need to develop competencies that allow them to act in a constantly changing scenario by selecting information, promoting critical thinking, and assisting students in constructing meaningful learning.

The discussion concerning professional competencies gained prominence especially through the studies of Perrenoud (2000), who understands competence as the ability to mobilize knowledge, skills, attitudes, and values when faced with complex situations in professional practice. For the author,

"a competence is the capacity to mobilize a set of cognitive resources (knowledge, capacities, information, etc.) to solve a series of situations with relevance and effectiveness" (Perrenoud, 2000, p. 19).

This perspective broadens the understanding of teaching, since it recognizes that professional practice is not limited to the mechanical application of knowledge acquired during initial education. On the contrary, it requires the capacity for analysis, decision-making, adaptation, and permanent reflection on educational practice.

In the same direction, Tardif (2014) argues that teachers' knowledge is constructed throughout their professional trajectory and results from the articulation of academic knowledge, practical experiences, social interactions, and institutional contexts. For the author, teaching work constitutes a complex activity that mobilizes different types of knowledge and requires constant updating in response to educational and social changes. This understanding reinforces the importance of continuing education as an indispensable element in teachers' professional development.

In addition to traditional pedagogical competencies, contemporary education also demands the strengthening of digital competencies. The incorporation of technologies into educational processes has ceased to represent a future possibility and has become a concrete necessity. Moran (2023) emphasizes that digital technologies profoundly modify ways of learning, communicating, researching, and producing knowledge, requiring teachers to develop new competencies related to technological mediation, information curation, and the construction of more participatory and collaborative learning environments.

The emergence of Artificial Intelligence further broadens this debate. Recent documents from UNESCO (2023) and studies developed by Holmes and Tuomi (2022) indicate that the ethical, critical, and pedagogical use of intelligent technologies requires continuous investment in teacher education. It is not merely a matter of learning how to use digital tools, but of understanding their potential, limitations, ethical implications, and impacts on teaching and learning processes.

In this context, teacher education for the development of competencies and skills assumes central relevance for the construction of an education capable of responding to contemporary demands without losing sight of its commitment to human formation. As Nóvoa (2022) emphasizes, there is no consistent

educational transformation without the appreciation and strengthening of the teaching profession, with education being one of the fundamental pillars of this process.

In view of these considerations, this chapter aims to discuss teacher education for the development of competencies and skills in contemporary education, analyzing the challenges imposed by social and technological transformations, the contributions of theories on professional competencies, and the importance of continuing education for the practice of teaching in the twenty-first century. To this end, it will address changes in the role of the teacher, the conceptual foundations of teaching competencies, emerging digital competencies, and pathways for professional development in contemporary times.

METHODOLOGY

This chapter is characterized as bibliographic research with a qualitative approach, developed through the analysis and interpretation of scientific productions related to teacher education, the development of teaching competencies and skills, and the challenges of contemporary education. According to Gil (2008), bibliographic research is prepared on the basis of materials already published, enabling the researcher to deepen knowledge about a given topic and to construct analyses grounded in consolidated theoretical frameworks.

The qualitative approach was adopted because it enables the understanding of educational phenomena in their complexity, considering the historical, social, cultural, and pedagogical aspects that permeate teacher education. According to Bogdan and Biklen (1994), qualitative investigation seeks to understand the meanings attributed by subjects and by social practices, privileging the interpretation of contexts and of the relationships established among the different elements that make up the object of study.

The bibliographic survey included books, scientific articles, official documents, and academic productions that discuss teacher education in contemporary times, professional teaching competencies, the development of pedagogical skills, digital competencies, and the challenges arising from the social

and technological transformations of the twenty-first century. Priority was given to authors recognized nationally and internationally in the fields of education, teacher education, and pedagogical innovation, including Freire (1996), Perrenoud (2000), Tardif (2014), Nóvoa (2022), Moran (2023), Castells (1999), Holmes and Tuomi (2022), as well as documents produced by UNESCO (2023) and by the National Common Curricular Base (Brazil, 2018).

The analysis of the selected material was conducted through exploratory reading, analytical reading, and critical interpretation of the texts, seeking to identify theoretical convergences, central concepts, and contributions to the understanding of the competencies and skills necessary for the exercise of teaching in contemporary education. According to Severino (2017), bibliographic research makes it possible to establish dialogues among different theoretical perspectives, favoring the construction of interpretative syntheses and grounded reflections on the phenomenon under investigation.

The organization of the discussion was structured around thematic axes that encompass the challenges of teacher education in contemporary times, the conceptual foundations of professional competencies and skills, emerging digital competencies, and pathways for teachers' professional development. This structure made it possible to analyze, in an articulated manner, the demands imposed on the twenty-first-century teacher and the contributions of initial and continuing education to the construction of critical, innovative pedagogical practices committed to students' learning.

TEACHER EDUCATION AND THE CHALLENGES OF CONTEMPORARY EDUCATION

The transformations that characterize contemporary society have brought about profound changes in educational processes and, consequently, in the demands related to teachers' education and professional practice. The expansion of digital technologies, the intensification of information flows, the cultural diversity present in classrooms, and new forms of production and circulation of knowledge challenge traditional teaching models and require the construction of new professional competencies. In this

context, teacher education is no longer understood as a process restricted to initial training and is instead conceived as a permanent path of learning, reflection, and professional development.

The emergence of the so-called knowledge society has brought new demands for educational systems. Castells (1999) argues that contemporary society is marked by the constitution of global information networks that modify forms of communication, work, learning, and social participation. According to the author, information technologies do not represent merely technical tools, but rather structuring elements of a new social organization based on the circulation of knowledge. This scenario directly affects teaching work, since the school no longer occupies the exclusive position of producing and transmitting knowledge.

From this perspective, it becomes necessary to rethink the role of the teacher. If, for a long time, the teaching function was associated mainly with the transmission of content, today educators are expected to act as mediators of learning, stimulating students' autonomy, inquiry, creativity, and critical thinking. Moran (2023) observes that contemporary teachers need to work in hybrid, dynamic, and connected environments in which knowledge is constructed collaboratively and contextually.

In discussing the educational changes arising from digital culture, Lévy (1999) emphasizes that collective intelligence emerges as one of the main challenges and opportunities of contemporary education. For the author, learning begins to occur in collaborative networks in which different subjects share experiences, knowledge, and competencies. In this context, the teacher's role shifts from the centrality of information to the mediation of processes of knowledge construction.

This change requires a profound review of teacher education processes. As Nóvoa (2022) states, contemporary educational challenges cannot be addressed solely through curricular reforms or the introduction of new technologies. It is necessary to invest in the valorization of the teaching profession and in the construction of permanent spaces for professional development. For the author, "there will be no transformation of education without the transformation of teacher education" (Nóvoa, 2022, p. 32).

This statement shows that the quality of educational processes is directly related to the quality of the education offered to education professionals. More than mastering specific content, teachers need to develop competencies that allow them to understand the complexity of school contexts and respond critically to the demands of contemporary society.

In analyzing teaching as a profession, Tardif (2014) emphasizes that teachers' knowledge is plural and results from the articulation among different sources of knowledge. According to the author, teachers mobilize disciplinary, curricular, pedagogical, and experiential knowledge constructed throughout their professional trajectory. This understanding breaks with the idea that teaching practice depends exclusively on initial academic education, recognizing the importance of lived experiences and reflection on one's own practice.

In this sense, teacher education must be understood as a continuous process of identity and professional construction. Imbernón (2011) argues that continuing education needs to go beyond models centered on the simple updating of content, promoting spaces for critical reflection on the real challenges faced by educators. According to the author,

The permanent education of teachers must be supported by the subjects' reflection on their teaching practice, in such a way as to allow them to examine their implicit theories, their operating schemes, their attitudes, and their work processes. In this way, education ceases to be merely a process of transmitting knowledge and becomes an instrument of professional and institutional transformation (Imbernón, 2011, p. 48).

The quotation reinforces the idea that teacher education must be articulated with the concrete experiences of everyday school life. It is not enough to offer isolated courses or training sessions; it is necessary to create conditions for teachers to critically analyze their practices and develop strategies capable of responding to the needs of students and the school community.

Another relevant aspect refers to the growing diversity present in educational spaces. Contemporary classrooms are marked by cultural, social, linguistic, and cognitive plurality. This reality requires teachers to possess competencies related to inclusion, equity, and respect for differences. Teacher

education, therefore, must encompass not only technical and methodological aspects, but also ethical, human, and social dimensions that favor the construction of democratic and welcoming educational environments.

Freire (1996) contributes significantly to this discussion by affirming that teaching requires respect for learners' knowledge, dialogue, ethics, and commitment to social transformation. For the author, educational practice cannot be neutral, because it involves choices, values, and positions in relation to reality. From this perspective, teacher education must prepare professionals capable of understanding education as a social practice committed to human emancipation.

Technological transformations have also expanded the challenges of the teaching profession. The advancement of artificial intelligence, digital platforms, and virtual learning environments requires teachers to develop new competencies related to the pedagogical use of technologies. Holmes and Tuomi (2022) emphasize that the integration of artificial intelligence into education demands specific education so that educators can use these tools in a critical, ethical, and pedagogically grounded manner.

In addition, recent UNESCO documents (2023) emphasize that teacher education for the digital age must address aspects related to digital citizenship, data protection, technological ethics, and the development of critical thinking. It is not merely a matter of learning how to use digital tools, but of understanding their impacts on educational processes and human relations.

In view of this scenario, it becomes evident that teacher education constitutes one of the central elements in the construction of an education capable of responding to contemporary challenges. The twenty-first-century teacher needs to develop competencies that integrate pedagogical knowledge, technological mastery, human sensitivity, reflective capacity, and ethical commitment. More than transmitting content, teachers are expected to be able to create conditions for students to learn to think, question, collaborate, and act responsibly in an increasingly complex and interconnected society.

Thus, understanding the challenges of contemporary education means recognizing that teacher education needs to keep pace with social transformations without losing sight of its humanizing

dimension. In this process, the development of professional competencies and skills emerges as a fundamental condition for strengthening teachers' work and promoting meaningful, inclusive, and socially relevant educational experiences.

COMPETENCIES AND SKILLS IN TEACHER EDUCATION

The discussion on competencies and skills has gained prominence in recent decades due to the social, economic, and technological changes that have come to require professionals capable of mobilizing knowledge in complex and dynamic contexts. In the educational field, this perspective has significantly influenced debates on teacher education, professional development, and educational quality, broadening the understanding of the knowledge necessary for the exercise of teaching.

Although often used as synonyms, the concepts of competence and skill have specific features. Skills are related to the ability to perform certain actions or procedures, while competencies involve the integrated mobilization of knowledge, skills, attitudes, and values in concrete situations. Zabala and Arnau (2010) emphasize that competence is not limited to mastery of content, but presupposes the ability to use it meaningfully in problem-solving and decision-making.

Among the main scholars of the subject, Perrenoud (2000) understands competence as the ability to mobilize different cognitive resources to face complex situations in professional practice. As the author states, "a competence is the capacity to mobilize a set of cognitive resources to solve a series of situations with relevance and effectiveness" (Perrenoud, 2000, p. 19). This definition shows that competence goes beyond the simple acquisition of theoretical knowledge, involving the ability to apply knowledge in a contextualized and reflective manner.

Within the scope of teaching, this perspective becomes especially relevant, since the teacher's work is marked by unpredictable situations, multiple demands, and constant decision-making processes. Teaching implies planning, assessing, dialoguing, mediating conflicts, promoting inclusion, using

diversified pedagogical resources, and responding to students' specific needs. Thus, teaching practice requires a broad set of competencies that develop throughout one's professional trajectory.

Perrenoud (2000) proposes ten broad families of competencies for the exercise of the teaching profession, among which the following stand out: organizing and directing learning situations; managing the progression of learning; designing and developing differentiation devices; involving students in their learning; working in teams; participating in school management; using new technologies; facing the duties and ethical dilemmas of the profession; and managing one's own continuing education.

When analyzing these competencies, it becomes clear that contemporary teaching requires far more than mastery of disciplinary content. It requires the ability to understand students in their diversity, promote meaningful learning experiences, and build inclusive and collaborative educational environments.

Tardif (2014) contributes to this discussion by affirming that teachers' knowledge is plural and results from the articulation among different sources of knowledge. For the author, "teachers' knowledge is plural knowledge, formed by the more or less coherent amalgam of knowledge arising from professional education, disciplinary knowledge, curricular knowledge, and experiential knowledge" (Tardif, 2014, p. 36).

This understanding reinforces the idea that teaching competencies are not constructed exclusively in initial education programs. They develop through experiences lived in professional practice, through interactions established in the school environment, and through continuous processes of reflection on pedagogical action.

In this context, the National Common Curricular Base (Brasil, 2018) also contributes to broadening the discussion by emphasizing the need to develop general competencies related to critical thinking, communication, digital culture, empathy, responsibility, and citizenship. Although directed toward students, such competencies presuppose teachers prepared to promote them in their pedagogical practices.

In addition to pedagogical competencies, the education of teachers capable of working in contexts marked by cultural diversity, inclusive demands, and technological transformations becomes increasingly necessary. Libâneo (2013) emphasizes that the contemporary teacher must assume an investigative, reflective stance committed to students' learning, understanding education as a social practice aimed at the integral formation of individuals.

In this way, the development of teaching competencies and skills constitutes a central element in the construction of pedagogical practices capable of responding to the challenges of contemporary education. More than transmitting knowledge, teachers need to be able to mobilize different forms of knowledge, interpret contexts, make decisions, and promote meaningful educational experiences, strengthening their professional practice and contributing to students' integral formation.

DIGITAL COMPETENCIES AND ARTIFICIAL INTELLIGENCE IN TEACHER EDUCATION

The incorporation of digital technologies into educational processes constitutes one of the main characteristics of contemporary education. The expansion of the internet, mobile devices, digital platforms, and, more recently, systems based on artificial intelligence has brought about significant changes in ways of teaching, learning, communicating, and producing knowledge. In this context, teacher education must encompass not only the technical mastery of these tools, but also the ability to use them in a critical, ethical, and pedagogically meaningful manner.

Digital culture has modified access to information and expanded the possibilities of interaction and collaboration among individuals and groups. Moran (2023) emphasizes that today's students live daily with multiple languages, media, and digital environments, requiring schools to adopt new forms of organizing teaching. According to the author, education needs to prepare individuals to act in a connected society, marked by the collaborative production of knowledge and the constant circulation of information.

In this scenario, the need emerges for the development of teachers' digital competencies. These competencies involve the ability to select appropriate technological resources, plan activities mediated by

technologies, critically evaluate information available in digital environments, and promote pedagogical practices that encourage students' active participation. It is not merely a matter of using technological tools, but of understanding how they can contribute to learning and to human development.

In discussing the challenges of digital education, UNESCO (2023) emphasizes that teacher education must address aspects related to ethics, digital security, data protection, inclusion, and the responsible use of emerging technologies. The document highlights that teachers continue to occupy a central role in educational processes, even in highly technology-rich contexts, being responsible for guiding students in the critical construction of knowledge.

The growing presence of artificial intelligence in the educational field further expands these demands. Tools capable of generating texts, images, videos, and automated analyses have been transforming pedagogical practices, assessment processes, and forms of interaction with knowledge. Holmes and Tuomi (2022) state that artificial intelligence has the potential to support the personalization of learning, expand access to education, and assist teachers in administrative and pedagogical tasks. However, they warn of the need for responsible use grounded in ethical principles.

In this sense, teacher education must prepare professionals to understand both the potential and the limits of these technologies. As Holmes and Tuomi (2022, p. 18) point out, “artificial intelligence should support educational goals and not replace them,” reinforcing that human mediation remains indispensable in teaching and learning processes.

In addition to technological knowledge, it becomes fundamental to develop competencies related to critical thinking, information curation, and the evaluation of the reliability of digital sources. In a society characterized by information overload, teachers assume an essential role in guiding students toward the critical analysis of content available in digital environments, contributing to the formation of citizens capable of using information ethically and responsibly.

Teacher education for the digital age also involves the construction of an investigative stance open to innovation. Technologies are continuously changing, requiring teachers to be willing to learn, adapt,

and update their practices. From this perspective, digital competence does not constitute a fixed set of knowledge, but rather a permanent process of professional development.

Thus, contemporary education demands teachers capable of integrating pedagogical, technological, and ethical competencies. The challenge does not consist merely of incorporating digital resources into classes, but of constructing educational practices that use technologies as instruments to promote meaningful learning, autonomy, creativity, collaboration, and civic participation in an increasingly connected society.

PATHWAYS FOR TEACHERS' PROFESSIONAL DEVELOPMENT IN CONTEMPORARY TIMES

In view of the social, cultural, and technological transformations that characterize the twenty-first century, teachers' professional development has become a permanent necessity. Initial education, although fundamental for the construction of the profession's basic knowledge, is not sufficient to respond to the constant changes that affect education. For this reason, continuing education assumes a strategic role in consolidating the competencies and skills necessary for the exercise of contemporary teaching.

Nóvoa (2022) argues that teacher education must be directly articulated with professional practice, valuing experience, reflection, and collaboration among peers. For the author, teachers learn not only through courses and training programs, but also through the sharing of experiences, the analysis of real problems, and the collective construction of solutions to the challenges faced in everyday school life. From this perspective, the school comes to be understood as a privileged space for education and professional development.

Reflection on practice constitutes another essential element in this process. Schön (2000) emphasizes the importance of the reflective professional, capable of analyzing their actions, understanding the results of their interventions, and continuously reconstructing their knowledge.

According to the author, “reflection-in-action is central to the art through which practitioners sometimes deal with the indeterminate zones of practice” (Schön, 2000, p. 39).

This reflective capacity allows teachers to develop greater professional autonomy and broaden their possibilities for action in the face of the complex situations present in the school environment.

Another relevant aspect concerns collaborative work. Contemporary teaching requires overcoming isolated practices, favoring the construction of learning communities in which teachers share experiences, knowledge, and pedagogical strategies. Imbernón (2011) states that collaboration among professionals strengthens educational innovation processes and contributes to the construction of more effective responses to the demands of the contemporary school.

In addition, research on one’s own practice constitutes an important instrument of professional development. Freire (1996, p. 32) affirms that “there is no teaching without research and no research without teaching,” emphasizing that teachers must assume an investigative stance toward educational phenomena. By researching their practice, analyzing results, and reflecting on students’ learning processes, teachers strengthen their decision-making capacity and continuously improve their professional practice.

In this context, teachers’ professional development must be understood as a continuous, reflective, collaborative process committed to improving the quality of education. Investing in the permanent education of teachers means strengthening not only individual competencies, but also the school’s capacity to respond to contemporary challenges in a critical, ethical, and socially responsible manner.

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NEURODIVERSITY IN THE AGE OF GENERATIVE AI: PEDAGOGICAL CHALLENGES, INCLUSION AND ETHICAL IMPLICATIONS

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Abstract

The growing presence of Generative Artificial Intelligence in educational contexts has intensified discussions about inclusion, personalization of learning, and the recognition of cognitive diversity. At the same time, these technological advances raise important pedagogical and ethical questions regarding accessibility, equity, data privacy, algorithmic bias, and the role of teachers in increasingly digital learning environments. This chapter aims to reflect on the relationship between neurodiversity and Generative Artificial Intelligence, analyzing both the opportunities and challenges associated with the use of intelligent technologies in educational settings. Methodologically, the study is based on a qualitative bibliographic approach, drawing on scientific literature related to neurodiversity, inclusive education, educational technologies, Artificial Intelligence, and teacher mediation. The discussion highlights that Generative AI may contribute to personalized learning experiences and support students with diverse cognitive profiles, provided that its implementation is guided by ethical principles and inclusive pedagogical practices. The findings indicate that technology alone cannot guarantee inclusion; rather, meaningful educational transformation depends on human mediation, critical reflection, and institutional commitment to diversity. The chapter concludes that the educational potential of Generative AI lies not in replacing teachers, but in strengthening pedagogical practices capable of promoting participation, belonging, and equitable learning opportunities for all students.

Keywords: Neurodiversity, Generative Artificial Intelligence, Inclusive Education, Personalized Learning, Educational Ethics.

INTRODUCTION

The twenty-first century has been marked by profound transformations in the ways knowledge is produced, circulated, and accessed. Among these transformations, the rapid development of Artificial Intelligence (AI) stands out as one of the most influential technological phenomena in contemporary education. More than a technological innovation, AI has become part of a broad digital ecosystem that has

been modifying educational practices, communication processes, and learning experiences. The emergence of Generative Artificial Intelligence has intensified these changes by enabling the production of texts, images, educational resources, and personalized responses capable of supporting different teaching and learning processes.

At the same time, educational systems in different parts of the world continue to face the challenge of building more inclusive environments capable of responding to the diversity of students present in contemporary classrooms. Discussions on inclusion have expanded their scope beyond approaches traditionally centered on disability, incorporating perspectives related to diversity, equity, participation, and the recognition of different cognitive profiles. In this context, the concept of neurodiversity has gained increasing relevance in educational research and practice.

The perspective of neurodiversity challenges deficit-based views of neurological differences and proposes that variations related to cognition, communication, attention, perception, and information processing be understood as part of human diversity, rather than merely as conditions to be corrected. From this viewpoint, educational institutions are called upon to recognize and value different ways of learning, interacting, and participating in social life. Such an understanding is aligned with the principles of inclusive education, which advocate educational environments capable of embracing diversity and promoting equitable learning opportunities for all students.

The growing recognition of neurodiversity has prompted important reflections on pedagogical practices. For a long time, educational models were structured on assumptions of homogeneity, expecting students to learn at similar paces and through similar strategies. However, advances in neuroscience and educational research demonstrate that learning processes are profoundly diverse and influenced by cognitive, emotional, and social factors. Cosenza and Guerra (2011) emphasize that understanding how the brain learns can contribute to the development of more effective pedagogical strategies, while Tokuhamma-Espinosa (2010) argues that educational practices should be grounded in scientific knowledge about cognitive diversity and learning.

Neuroscientific studies also reveal the complexity of human cognitive functioning. Diamond (2013) emphasizes that executive functions, attention, self-regulation, and cognitive flexibility play fundamental roles in learning, although these processes may manifest differently among individuals. Likewise, Damásio (1994) demonstrated that cognition and emotion are deeply interconnected, challenging simplified conceptions that understand learning as an exclusively rational activity. These contributions reinforce the need for educational systems to be prepared to embrace different cognitive profiles and learning pathways.

In this scenario, Generative Artificial Intelligence has been presented as a promising tool to support personalized learning experiences. AI-based systems are capable of adapting content, generating teaching materials, providing immediate feedback, and presenting information in different formats. Such possibilities may be particularly relevant for students with diverse cognitive profiles, including neurodivergent individuals who may benefit from differentiated pedagogical approaches.

However, the educational use of Artificial Intelligence also raises important ethical concerns. UNESCO (2021) warns that AI systems must be developed and implemented based on principles of transparency, accountability, inclusion, and respect for human rights. Similarly, Holmes and Tuomi (2022) argue that educational technologies should not be evaluated solely for their technical capabilities, but also for their social, ethical, and pedagogical implications. Issues related to algorithmic bias, privacy, surveillance, accessibility, and digital exclusion remain central in discussions about the future of AI in education.

The relationship between technology and inclusion has also been explored by authors such as Capucha (2010), who associates educational inclusion with broader principles of social justice, participation, and equal opportunities. From this perspective, technological innovation should not be limited to increasing the efficiency of educational systems, but should contribute to the construction of environments that foster human development and social participation. Similarly, Dominick and Alves (2018) emphasize that educational innovation requires more than the adoption of technologies; it requires

the transformation of pedagogical practices in order to strengthen inclusion and meaningful student participation.

In this context, the debate on Generative Artificial Intelligence and neurodiversity cannot be restricted to technical considerations. It is necessary to reflect more broadly on how educational systems can use technological resources to promote inclusion without compromising human relationships, pedagogical mediation, and ethical responsibility. The central question is not whether AI should be present in education, but how it can be used to support students with different cognitive profiles without reinforcing existing inequalities or creating new forms of exclusion.

In light of this scenario, this chapter aims to reflect on the pedagogical challenges, inclusive possibilities, and ethical implications associated with the relationship between neurodiversity and Generative Artificial Intelligence. To this end, the foundations of neurodiversity in contemporary education will first be discussed; then, the potential of generative AI for the personalization of learning will be analyzed; subsequently, the ethical and pedagogical challenges related to the use of these technologies will be examined; and, finally, the relationship between inclusion, belonging, and digital participation in educational contexts increasingly mediated by technologies will be explored.

METHODOLOGY

This chapter is characterized as a bibliographic study, with a qualitative approach and an exploratory-descriptive nature. According to Gil (2008), bibliographic research is developed from previously published materials, including books, scientific articles, dissertations, theses, institutional documents, and other academic works that contribute to the understanding and interpretation of a given phenomenon. This approach proves especially suitable for studies that seek to analyze concepts, theoretical perspectives, and contemporary debates based on existing scientific knowledge.

The adoption of a qualitative perspective is justified by the nature of the problem investigated, which involves understanding the relationships among neurodiversity, Generative Artificial Intelligence,

inclusive education, and ethical challenges in contemporary educational contexts. Rather than privileging numerical measurements or statistical correlations, qualitative research seeks to interpret meanings, identify conceptual connections, and critically analyze the contributions of different theoretical frameworks. As Bogdan and Biklen (1994) emphasize, qualitative investigations seek to understand phenomena in their social and cultural contexts, valuing interpretation and critical reflection.

The bibliographic review encompassed scientific works related to neurodiversity, inclusive education, neuroscience and learning, Artificial Intelligence applied to education, educational innovation, digital inclusion, educational ethics, and teacher mediation. Priority was given to studies that discuss the educational implications of Generative Artificial Intelligence and its contributions to students with different cognitive profiles, seeking to integrate perspectives from education, neuroscience, technology, and the social sciences.

Among the main references analyzed are the contributions of Cosenza and Guerra (2011), Tokuhamma-Espinosa (2010), Diamond (2013), and Damásio (1994), which offer important foundations for understanding cognitive diversity and learning processes. Discussions on Artificial Intelligence and education are supported by the studies of Holmes and Tuomi (2022), as well as UNESCO documents on the ethics of Artificial Intelligence and the use of generative AI in education (UNESCO, 2021; UNESCO, 2023). Complementing this theoretical framework are the contributions of Capucha (2010), Dominick and Alves (2018), Silva, Campani and Furtado (2023), and Junior and Spitz (2016), which support reflections on inclusion, social justice, digital participation, pedagogical innovation, and teacher education.

The analysis of the selected material was carried out through exploratory, analytical, and interpretative readings. Initially, the aim was to identify central concepts and theoretical contributions related to neurodiversity and educational inclusion. Subsequently, thematic categories were organized to structure the chapter's discussion: neurodiversity and contemporary education; Generative Artificial Intelligence and personalized learning; ethical and pedagogical challenges of AI; and inclusion, belonging, and digital participation.

The interpretation of the data was conducted from a critical perspective that understands technology as a social and educational phenomenon, and not merely as a technical resource. Thus, the chapter seeks to articulate discussions originating from neuroscience, education, digital technologies, and ethics, emphasizing the need for pedagogical practices that reconcile technological innovation, human mediation, social justice, and respect for cognitive diversity. Through this approach, the study seeks to contribute to contemporary debates on the responsible and inclusive use of Generative Artificial Intelligence in educational environments.

NEURODIVERSITY AND CONTEMPORARY EDUCATION: FROM THE DEFICIT PERSPECTIVE TO THE RECOGNITION OF COGNITIVE DIVERSITY

The concept of neurodiversity has gained increasing prominence in contemporary educational debates, especially as movements in defense of inclusive education have begun to question traditional conceptions of learning, development, and difference. In contrast to approaches centered exclusively on deficits or limitations, the neurodiversity perspective proposes understanding neurological differences as legitimate expressions of human diversity. From this perspective, variations related to cognition, attention, communication, sensory processing, and social interaction should not be interpreted only as disorders or disabilities, but as distinct ways of perceiving, understanding, and interacting with the world.

Historically, educational systems were structured around models that privileged homogeneity. Students were expected to learn in a similar manner, following standardized rhythms, methodologies, and forms of assessment. Those who followed different learning pathways were frequently classified according to their difficulties and viewed through the lens of disability or inadequacy. This model influenced pedagogical practices that sought to adapt students to existing school structures, rather than promoting institutional transformations capable of embracing the diversity present in classrooms.

In recent decades, however, advances in neuroscience, psychology, and education have contributed to broadening the understanding of learning processes. Studies have demonstrated that human

cognitive functioning is marked by wide diversity and is influenced by biological, emotional, social, and cultural factors. Cosenza and Guerra (2011) state that learning results from the interaction of multiple brain systems and that there is no single path to the construction of knowledge. This understanding challenges educational models based on uniformity and reinforces the need for more flexible and inclusive pedagogical practices.

The neurodiversity perspective gained strength especially through discussions related to Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), dyslexia, and other neurodevelopmental conditions. Rather than understanding these characteristics solely as deficits, the neurodiversity movement has come to emphasize potential, alternative forms of thinking, and different modes of learning. This does not mean ignoring the challenges faced by these individuals, but recognizing that such challenges are often intensified by social, pedagogical, and institutional barriers.

In this regard, Tokuhamas-Espinosa (2010) argues that education must consider the knowledge produced by the neurosciences in order to understand the complexity of human learning. According to the author, effective pedagogical practices are those capable of recognizing that students learn in different ways and that these differences must be taken into account in educational planning.

Diamond's (2013) studies also offer relevant contributions to this discussion. By investigating executive functions such as working memory, inhibitory control, cognitive flexibility, and self-regulation, the author demonstrates that these abilities develop differently among individuals. These differences directly influence the way students organize information, solve problems, and participate in school activities. Thus, requiring everyone to learn in the same way means disregarding fundamental aspects of human development.

Another important contribution comes from Damásio's (1994) studies, which reveal the profound relationship between cognition and emotion. For the author, learning processes cannot be understood exclusively from a rational perspective, since emotions, feelings, and social experiences directly influence

the construction of knowledge. This understanding reinforces the need for educational environments that value not only cognitive aspects, but also the affective and relational dimensions of learning.

The educational implications of these reflections are significant. If students present different ways of learning, communicating, concentrating, and interacting socially, it becomes indispensable for educational institutions to develop strategies capable of responding to this diversity. Inclusion, in this context, cannot be understood only as physical access to school. It involves the construction of conditions that foster participation, belonging, learning, and development for all students.

The discussion on neurodiversity also directly engages with the principles of social justice. Capucha (2010) argues that inclusion should not be limited to compensating for inequalities, but should promote effective opportunities for social participation, autonomy, and human development. From this perspective, educational institutions are called upon to recognize differences as a constitutive part of human experience and to reorganize their practices to ensure that everyone can fully participate in school life.

This understanding challenges traditional conceptions of academic success, which are often based on uniform standards of performance. From an inclusive perspective, educational quality does not mean that all students achieve identical results, but rather that all have real opportunities to develop their potential. In this way, the recognition of neurodiversity contributes to broadening the understanding of educational equity, shifting the focus from student adaptation to the transformation of learning contexts.

These reflections become even more relevant in light of the growing presence of digital technologies in education. As tools based on Artificial Intelligence begin to be integrated into educational environments, new possibilities emerge for supporting different cognitive profiles, but so do new challenges related to inclusion, accessibility, and educational justice. Thus, understanding neurodiversity constitutes a fundamental step toward reflecting on the role that Generative Artificial Intelligence can play in the construction of more inclusive educational experiences, a topic that will be discussed in the next section.

GENERATIVE ARTIFICIAL INTELLIGENCE AND PERSONALIZED LEARNING

The advancement of Generative Artificial Intelligence has brought about significant transformations in teaching and learning processes, expanding possibilities for educational personalization and reconfiguring the way students and teachers interact with knowledge. Unlike traditional digital technologies, which operate based on previously programmed commands, generative systems are capable of producing original content, adapting information to different contexts, and responding dynamically to users' needs. These characteristics have aroused great interest in the educational field, especially in view of the growing search for strategies capable of addressing the diversity present in contemporary classrooms.

The idea of personalized learning is not new. For decades, researchers and educators have discussed the need to move beyond overly standardized educational models, recognizing that students have different rhythms, interests, abilities, and ways of learning. However, the practical implementation of this perspective has always encountered limitations related to the number of students per class, teachers' workload, and the difficulty of offering individualized pathways on a large scale. In this scenario, Generative Artificial Intelligence emerges as a tool with the potential to assist in adapting content and creating more flexible learning experiences.

For neurodivergent students, this possibility is especially relevant. Different cognitive profiles may require distinct pedagogical strategies, adapted materials, and varied forms of presenting knowledge. AI-based systems can generate explanations at different levels of complexity, produce summaries, reorganize content, create visual representations, and provide immediate feedback, expanding possibilities for access to the school curriculum.

Holmes and Tuomi (2022) emphasize that Artificial Intelligence has the potential to contribute to more adaptive educational processes capable of responding to students' individual needs. However, the authors warn that such resources should not be understood as substitutes for teacher practice, but as tools that can expand the possibilities of pedagogical mediation.

When discussing the future of AI in education, Holmes and Tuomi observe:

Artificial Intelligence in education should not be understood as a technology intended to replace teachers or fully automate teaching processes. Its potential lies in supporting educators and students, expanding opportunities for learning, personalization, and inclusion, provided that its use is guided by clear ethical and pedagogical principles. (Holmes; Tuomi, 2022, p. 18).

The authors' reflection shows that the educational value of Artificial Intelligence lies not only in its technical capacity, but in the way it is integrated into pedagogical processes. Personalized learning, therefore, does not depend exclusively on technology, but on the articulation among digital resources, teacher planning, and educational objectives.

In this context, the discussion on personalized learning converges with contributions from neuroscience. Tokuhamas-Espinosa (2010) argues that different brains learn in different ways and that effective pedagogical practices need to consider this diversity. According to the author, ignoring cognitive differences means limiting the learning possibilities of many students.

The author states:

Education based on evidence from the neurosciences does not seek to create a single model of teaching, but to understand that cognitive diversity requires multiple pedagogical strategies. No two brains are identical and, consequently, no two learning processes are exactly the same. (Tokuhamas-Espinosa, 2010, p. 57).

From this perspective, Generative Artificial Intelligence can be understood as a tool capable of expanding the possibilities of pedagogical differentiation. By enabling the creation of personalized materials and more flexible learning pathways, technology can assist teachers in constructing educational experiences compatible with different cognitive styles.

Another important aspect concerns student autonomy. AI-based tools can support task organization, time management, content review, and the development of study strategies. For students

who experience difficulties related to attention, planning, or self-regulation, such resources may represent important mechanisms of support in the learning process.

However, it is necessary to avoid overly optimistic or deterministic perspectives. The mere availability of technologies does not guarantee better educational outcomes. Dominick and Alves (2018) argue that educational innovation depends on the transformation of pedagogical practices and not merely on the incorporation of technological resources. According to the authors, technology produces significant impacts only when associated with pedagogical proposals capable of promoting participation, autonomy, and the collective construction of knowledge.

This discussion is also supported by UNESCO (2023) guidelines, which recognize the potential of Generative Artificial Intelligence to support educational processes, but emphasize the need to preserve principles related to equity, inclusion, and human rights. The document highlights that educational technologies should be used to expand learning opportunities and not to reproduce existing inequalities.

In this sense, personalization promoted by AI cannot be confused with extreme individualization or the isolation of students. Learning remains a profoundly social process, constructed through interactions, exchanges of experiences, and human relationships. Freire (1996) had already argued that knowledge is produced through dialogical and collaborative processes that cannot be fully replaced by automated systems.

Thus, although Generative Artificial Intelligence presents potential to support personalized learning and expand educational accessibility, its effectiveness depends on the presence of teachers capable of interpreting contexts, understanding individual needs, and constructing meaningful pedagogical mediation. Technology can offer valuable resources, but it remains human action that assigns educational meaning to these tools.

Based on these reflections, it becomes clear that the benefits of Artificial Intelligence for neurodiverse students should not be evaluated solely in terms of technological efficiency. It is necessary to consider its impacts on autonomy, belonging, participation, and the construction of inclusive

educational experiences. This discussion inevitably leads to the ethical issues involved in the use of AI, a topic that will be explored in greater depth in the next section.

PEDAGOGICAL CHALLENGES AND ETHICAL IMPLICATIONS OF ARTIFICIAL INTELLIGENCE IN EDUCATION

The accelerated growth of Generative Artificial Intelligence in educational environments has expanded debates about its potential, but also about the risks and challenges associated with its use. Although these technologies offer significant opportunities for personalized learning, accessibility, and support for inclusion, their implementation does not occur in a social or ethical vacuum. On the contrary, the incorporation of AI into education requires profound reflections on justice, equity, privacy, autonomy, and pedagogical responsibility.

UNESCO (2021) warns that the use of Artificial Intelligence systems must be grounded in ethical principles capable of protecting human rights and promoting collective well-being. According to the document, intelligent technologies must be developed and used in a transparent, inclusive, and responsible manner, ensuring that their benefits are distributed equitably among different social groups.

When addressing the ethical challenges of AI, UNESCO states:

Artificial Intelligence systems must be designed in such a way as to promote diversity, inclusion, and equity, avoiding the reproduction of prejudices, discrimination, or structural inequalities existing in the societies in which they are implemented. (UNESCO, 2021, p. 15).

This concern becomes especially relevant when discussing neurodivergent students. Algorithms trained on majority patterns may fail to adequately recognize diverse forms of communication, behavior, or learning, reinforcing exclusionary processes already present in many educational contexts.

INCLUSION, BELONGING, AND DIGITAL PARTICIPATION IN EDUCATIONAL CONTEXTS MEDIATED BY TECHNOLOGIES

Discussions on educational inclusion have shown that access to school, although fundamental, is not sufficient to guarantee truly inclusive experiences. Active participation in learning processes, recognition of differences, and the construction of meaningful bonds are equally essential elements for students to feel part of the school community. In this context, the concept of belonging assumes a central role, especially when discussing neurodivergent students in educational environments increasingly mediated by digital technologies.

To belong means to be recognized as a legitimate member of a group, to participate in its dynamics, and to perceive that one's presence has value and meaning. In the school environment, belonging is related to the possibility of establishing positive interpersonal relationships, expressing opinions, participating in proposed activities, and developing a sense of identification with the institution. For neurodivergent students, this dimension becomes particularly relevant, since social, communicational, and cultural barriers often hinder their full participation in educational spaces.

The literature on inclusion shows that many difficulties experienced by neurodivergent students do not arise exclusively from their individual characteristics, but from the barriers imposed by the contexts in which they are situated. This understanding is close to the reflections of Capucha (2010), who associates educational inclusion with the principles of social justice and civic participation. For the author, an inclusive society is not one that merely tolerates differences, but one that creates effective conditions for everyone to participate in different social spaces.

When discussing the relationship between inclusion and participation, Capucha states:

Inclusion implies the creation of effective opportunities for social, economic, and cultural participation, allowing individuals to develop their capacities and fully exercise their rights of citizenship. (Capucha, 2010, p. 32).

This reflection has important implications for the educational field. From an inclusive perspective, the goal is not merely to ensure that students attend school, but to guarantee that they can participate in the academic, social, and cultural activities that constitute the educational experience. Participation, therefore, becomes a fundamental indicator of the quality of inclusive processes.

In this scenario, digital technologies present the potential to expand opportunities for participation and belonging. Communication tools, virtual learning environments, collaborative platforms, and resources based on Artificial Intelligence can foster different forms of interaction and expression, helping to reduce barriers that have historically limited the participation of certain groups.

Junior and Spitz (2016), when discussing digital platforms for civic participation, argue that digital technologies can strengthen inclusion processes by expanding possibilities for access to information, communication, and social participation. Although the focus of their study is related to digital citizenship, their contributions make it possible to understand how technological environments can foster the agency of individuals frequently excluded from traditional spaces of participation.

This discussion becomes especially relevant when associated with neurodiversity. Students who face difficulties in certain conventional forms of interaction may find in digital environments new possibilities for communication and participation. Multimodal resources, accessible interfaces, and adaptive tools allow different cognitive profiles to find alternative ways to express knowledge, share experiences, and interact with peers and teachers.

However, it is necessary to recognize that technologies can also reproduce existing inequalities. Digital exclusion remains a significant challenge in many educational contexts, especially when there are limitations in internet access, inadequate infrastructure, or a lack of training for the pedagogical use of technological resources. In such cases, technology risks widening gaps rather than promoting inclusion.

Dominick and Alves (2018) warn that digital inclusion should not be understood merely as access to equipment or platforms. According to the authors, it is a process related to critical participation, the

meaningful appropriation of technologies, and the ability of individuals to use digital resources to expand their opportunities for learning and social action.

The authors emphasize:

Digital inclusion must be understood beyond access to technologies, involving processes of participation, autonomy, knowledge production, and the exercise of citizenship in digital contexts. (Dominick; Alves, 2018, p. 1347).

This perspective contributes to broadening the understanding of the role of Artificial Intelligence in education. More than making sophisticated tools available, it is necessary to ensure that these technologies are accessible to different students and that their use promotes processes of participation, autonomy, and belonging.

The construction of inclusive digital environments also depends on teacher education. Silva, Campani and Furtado (2023) argue that pedagogical innovation requires professionals capable of understanding the potential and limits of educational technologies, integrating them critically into pedagogical practices. Thus, teacher mediation continues to play a central role in promoting inclusion, even in contexts strongly marked by the presence of technological resources.

When reflecting on belonging and digital participation, it becomes evident that technology does not replace the human relationships that sustain educational processes. On the contrary, its inclusive potential depends on the capacity to strengthen bonds, expand opportunities for interaction, and promote meaningful learning experiences. When used ethically and with pedagogical guidance, digital technologies can contribute to the construction of educational environments that are more accessible, democratic, and sensitive to cognitive diversity.

Thus, the relationship among neurodiversity, inclusion, and digital participation shows that the construction of truly inclusive education requires both technological innovation and human commitment. The contemporary challenge consists of using the resources offered by Artificial Intelligence and digital

technologies to expand possibilities for learning and participation, without losing sight of the principles of social justice, equity, and respect for diversity that underpin inclusive education.

FINAL CONSIDERATIONS

The growing presence of Generative Artificial Intelligence in educational contexts has brought about significant transformations in the ways of teaching, learning, and producing knowledge. At the same time, these changes challenge educators, researchers, and institutions to reflect on how to use such technologies in an ethical, inclusive, and socially responsible manner. In this scenario, the articulation between neurodiversity and Artificial Intelligence emerges as a particularly relevant field of discussion for contemporary education.

Throughout this chapter, the aim was to show that neurodiversity represents an important paradigm shift in the ways cognitive differences are understood. Rather than focusing exclusively on deficits or limitations, this perspective proposes recognizing neurological diversity as a constitutive part of human experience. Such an understanding reinforces the need for educational systems capable of embracing different ways of learning, communicating, and participating in school life.

The analyses carried out demonstrated that Generative Artificial Intelligence has the potential to contribute to more personalized, accessible, and flexible learning processes. Tools capable of adapting content, generating differentiated materials, and supporting students with distinct cognitive profiles can expand educational opportunities and foster inclusion. However, it also became evident that such benefits do not arise automatically from technology, but from the way it is integrated into pedagogical processes.

The ethical challenges discussed throughout the text reinforce the need for a critical approach to the use of AI in education. Issues related to privacy, algorithmic bias, digital exclusion, and the preservation of individual autonomy require permanent attention from educational institutions. As UNESCO (2021) and Holmes and Tuomi (2022) emphasize, technological innovation must be subordinated to ethical principles capable of ensuring equity, transparency, and respect for human rights.

It was also shown that inclusion cannot be understood merely as access to technologies. The construction of truly inclusive educational environments depends on the promotion of participation, belonging, and recognition of differences. In this process, teachers, administrators, and other education professionals continue to play an irreplaceable role, acting as mediators capable of assigning pedagogical meaning to technological tools.

Finally, it is concluded that the transformative potential of Generative Artificial Intelligence does not lie in replacing human work, but in expanding possibilities for learning and participation for students with different cognitive profiles. When used ethically, critically, and with pedagogical guidance, AI can contribute to strengthening inclusive practices and promoting more democratic educational experiences. However, the construction of an education committed to neurodiversity will continue to depend, above all, on the human capacity to recognize, value, and respect the multiple ways of being, learning, and participating in the world.

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CLIL IN BRAZILIAN PUBLIC HIGH SCHOOLS: REFLECTIONS ON ENGLISH LANGUAGE TEACHING AND PEDAGOGICAL POSSIBILITIES

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Abstract

This article aims to analyze the situation of additional language teaching in Brazilian public High Schools, especially with regard to the English language. We will also examine current policies for language teaching in Brazil, particularly the National Common Curricular Base (BNCC). Finally, we highlight the benefits of the CLIL (Content and Language Integrated Learning) approach as a suggestion for effective pedagogical practice in High School, based on an experience carried out at the Federal Institute of Espírito Santo (IFES), Montanha campus, where students were exposed to lessons involving geography and cultural studies content in English. Research was conducted on this experience, and the data will be discussed here. This study is grounded in analyses of beliefs about additional language teaching in public schools, such as those conducted by Lima (2011) and Leffa (2011), as well as in discussions on bilingual education and CLIL by García (2009), among others.

Keywords: CLIL, High School, English language teaching.

INTRODUCTION

It is possible to say that, in globalized economies, knowledge of English seems to have been included among the basic skills, and this is bringing about profound changes in who is learning the language, their reasons for learning it, and learners' needs.

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In this scenario, the English language has come to hold considerable market value. According to Bourdieu (1998, p. 98), knowledge is a form of symbolic capital, which is an indicator of prestige that may, at a given moment, be converted into cultural or economic capital, insofar as access to these other forms of capital is enabled by the valuing effect exercised by the individual who possesses it. Thus, today, knowledge of several languages and, above all, of English, would constitute valuable symbolic capital in the contemporary linguistic market.

All these considerations invite us to reassess the reasons for learning an additional language as a subject in the school curriculum, both from the perspective of students' expectations and from that of what would be desirable for the development of a critical awareness of the role that languages play in the world (Gimenez apud Lima, 2011). According to the same author, its teaching could thus explore the hegemonic role that English plays in contemporary society, establishing connections with economic issues. If economic questions are not secondary even for other languages, in the case of English it is impossible to disconnect it from globalization, since it enables the mobility of capital and resources (Graddol, 2006, p. 49).

The acceptance of the high value of English worldwide and the recognition of the existence of attributed meanings that distinguish it from other languages allow the political and ideological aspects involved in language teaching to become more visible. The recovery of an educational dimension that is not only humanistic but also critical appears to be one of the main objectives in the education of English teachers.

Despite the importance of the language, many regular Brazilian schools experience a precarious reality in additional language teaching. Leffa (2011, p. 20) points to some of the reasons for the persistence of teachers who “pretend to teach while students pretend to learn,” such as, in public schools, lack of government investment, poor infrastructure, teachers' lack of preparation, and student indiscipline.

Especially in the context of High School, foreign language teaching in Brazil has historically been guided by approaches that frequently reduce the learning of a second language to mere grammar and vocabulary learning.

However, in the contemporary educational context, there is a growing need for methodologies that integrate the teaching of academic content with foreign language learning, and it is in this context that CLIL (Content and Language Integrated Learning) emerges as an innovative and potentially effective approach.

CLIL proposes a form of teaching that not only teaches the English language, but also uses the language as a tool for learning other academic content, offering students an opportunity to acquire knowledge and develop linguistic competencies simultaneously.

The CLIL proposal is supported by contemporary theories of language teaching and acquisition, such as those of Stephen Krashen, whose hypotheses on language acquisition (Krashen, 1982) highlight the importance of comprehensible input and constant exposure to the language in meaningful contexts.

Krashen (1982) emphasizes the need for students to be exposed to a language in situations of real use, in which interaction with content is more relevant than excessive emphasis on the formal structure of the language. In this sense, by integrating academic content and language, CLIL provides a natural learning context aligned with input theory, which favors the development of linguistic competence.

Ofélia García (2009), in her research on bilingualism and language teaching, also argues for the importance of methodologies that value the active use of language in academic and sociocultural contexts. The author emphasizes that language teaching should not be dissociated from students' sociocultural and cognitive context. In this sense, by allowing English language learning to occur in interaction with other subjects, CLIL creates a contextualized and meaningful learning environment that favors the construction of both linguistic and disciplinary knowledge.

In addition to its theoretical foundations, the use of CLIL in Brazil is supported by educational regulations that promote foreign language learning as an essential component of student education. The

Law of Guidelines and Bases of National Education (LDB)—Law No. 9,394/96—establishes, in Article 26, that High School must provide students with a broad education that includes the development of competencies in different areas of knowledge, including foreign language learning.

In addition, the National Common Curricular Base (BNCC), approved in 2017, emphasizes the importance of language teaching integrated with the development of cognitive, social, and cultural skills, reinforcing the potential of CLIL as a pedagogical model that promotes more integrated and contextualized learning.

Given this reality, and considering the importance of proficiency in an additional language in the current context, this article is justified by its discussion of possible paths for language teaching in regular Brazilian schools, as well as by its investigation of the use of CLIL in English language teaching in High School, discussing its pedagogical implications and the advantages of this approach.

THEORETICAL FRAMEWORK

With regard to elite bilingualism, that is, the teaching of a prestigious additional language, bilingual education in Brazil for children from the dominant group has been increasingly gaining ground, as demand for bilingual schools has grown considerably.

Within this scope, the proposal under consideration here would be an adaptation of the theoretical and practical contribution of the CLIL approach used in bilingual schools to classes in regular Brazilian schools, in High School, with the aim of achieving learning that is more consistent with students' daily needs, as well as more motivating for both teacher and learner.

It is worth noting that such an approach would be in line with the principles of Brazilian policies for language teaching² since it involves interdisciplinary teaching focused on students' real possibilities.

Perhaps the first CLIL-type program of which we are aware dates back approximately five thousand years, in what is now modern Iraq. The Akkadians, who conquered the Sumerians, wanted to

² Specifically, we could say that the CLIL approach would follow the principles of the PCNs (1998) and the PNLD call for proposals (2011) with regard to more interdisciplinary education.

learn the local language. To this end, Sumerian was used as a medium of instruction to teach various subjects to the Akkadians, including theology, botany, and zoology.

In Europe, in more recent times, many people came to understand the value of multilingualism. However, bilingual education seemed, above all, to be a privilege reserved for the wealthiest.³

In the 1970s, with the expansion of language immersion programs, bilingual education became more accessible to children from different social classes—at least in more developed countries.

In the 1980s, Stephen Stryker and Betty Lou Leaver began their research on Content-Based Instruction (CBI), or content-based education. Until then, the use of this methodology was a “rare phenomenon” worldwide (Stryker & Leaver, 1997, p. 281).

The studies by these authors covered a large number of centers that taught additional languages through CBI in the United States, from New York City to California.

According to the authors, the objective of the pioneering teachers using this method was to free learners from old and monotonous approaches and to develop students’ motivation, self-confidence, and personal skills. For Stryker and Leaver (1997, pp. 285–286):

This “new objective” is to “empower” students so that they become autonomous learners. This happens most effectively when we address students’ needs and motivations, help them understand their own learning process, and allow them to take control of their learning from the outset. We believe that CBI, more than any other “method,” stimulates these new roles and objectives. (our translation)

In this sense, CLIL emerged as a new proposal for bilingual education and encompasses any program that uses a second language to teach non-linguistic content. This generic term represents what already exists in different forms in different countries and, moreover, this proposal is capable of supporting language maintenance for groups that speak minority languages (García, 2009, p. 209).

³With regard to elite bilingualism, this type of education is still strongly associated with the financially privileged in Brazil, as we saw in the previous chapter.

The CLIL approach is a way of teaching language in regular schools from preschool through voluntary education for all populations. It is not a special program for some schools, as is the case with immersion bilingual education.

CLIL is providing a practical and sustainable way of leading citizens toward plurilingualism. Although this approach emerged in Europe and was originally used there, it has been gaining ground around the world in many countries that seek to educate children as bilingual individuals through the teaching of one or more school subjects in the additional language.

This approach also makes it possible to adapt it to monolingual communities and to language teaching contexts such as private language courses, since it is broad, flexible, and dynamic. CLIL has already shown favorable results in preparing its students for the bilingual world, since it is based on content learning and thus leads students to learn the second language in real teaching and learning situations.

In addition to all the reasons already mentioned for using a language teaching practice that is more flexible and consistent with the world in which we live, we can identify and present a highly relevant factor characterized by the intense immediacy that surrounds new generations.

Considering CLIL, we can clearly identify that its main characteristic is a policy aligned with this demand for immediate applicability, since this teaching approach is defined by its dual focus: what matters is not only the learning of an additional language or the reinforcement of school content in another language, but rather the integration of the two.

METHODOLOGICAL PROCEDURES

This article was based on essentially qualitative research involving the analysis and discussion of data collected through a semi-open and anonymous questionnaire⁴. However, quantitative data will also

⁴ Disponível no anexo I.

be relevant and will therefore be counted, especially those derived from the objective questions in the questionnaire administered.

In order to collect data on the experience with CLIL in English language classes, we chose to administer a questionnaire to third-year High School students at the Federal Institute of Espírito Santo, Montanha campus. These students are generally between 16 and 18 years old and come from the city of Montanha and nearby towns.

The choice of third-year High School students at the Federal Institute of Espírito Santo, Montanha campus, was due to the experience of a teacher in applying CLIL during the second year, involving topics in geography and cultural studies, such as different celebrations around the world. The culmination of this work was a Nations Fair, in which each group presented, in English and Portuguese, issues related to the geography, history, sociology, philosophy, arts, among other areas, of a particular country; this work involved the partnership and evaluation of teachers from these subjects.

The questionnaire prepared contains nine questions, eight of which are multiple-choice, and four of these ask for justification of the previous response. Only one question is entirely open-ended: “What is your conception of the English language?”

This is because our theoretical framework includes, among other themes, the concept of representation and its implications for the language teaching/learning process, in this specific case, English.

It is worth noting that the questionnaires (attached) were not intended to be English proficiency tests, but rather questions designed to assess students’ beliefs regarding their own learning and linguistic confidence after one year of study with CLIL.

One relevant variable would be individual limitations in learning an individual language, as well as motivation and the time outside of class devoted by each student to improving their linguistic knowledge. This factor is undoubtedly relevant, but it is not the focus of our research, which will use data reflecting the reality of the majority of students.

RESULTS AND DISCUSSION

Of the 65 (sixty-five) questionnaires administered, the majority, in the first question, referred to the importance of the English language, confirming Bourdieu's (1998) idea of symbolic capital. Among some responses, we have:

“Without a doubt, the most important language to be learned, mainly because it is the world language, giving people the opportunity to communicate all over the world.”

Or also:

“The English language is of utmost importance, as it allows us to have greater knowledge about the world beyond us; everywhere in the world, there are people who speak English, so it allows us to learn about cultures and places.”

And we also have:

“An extremely important language nowadays, because it is almost a language that can be used throughout the entire world for communication.”

In the second question, which sought to identify whether Elementary and Middle School took place in a public or private school, only 29.2% had studied entirely in a private school or had completed half of their schooling in a public school and half in a private school.

In the third question, regarding what English classes were like in Elementary and Middle School, among those who studied in public schools, we obtained the following results: 10.86% classified them as very poor, 15.21% as poor, 45.6% as average, 19.56% as good, and only 6.5% as excellent. As justification, many students wrote that they had studied only the verb “to be.”

For the same question, among those who had studied for at least some years in private schools, only 5.2% rated them as very poor, 21% as poor, 26.3% as average, 36.8% as good, and 10.4% as excellent, highlighting the existing differences between public and private schools in Brazil.

The fourth question, regarding the use of English in the classroom at IFES, following BNCC guidelines, yielded 64.17% who considered it “excellent,” 26.86% who considered it “good,” and only 4.47% who considered it “average” and “poor.”

The fifth question, which addresses the integration of English language classes with geography and cultural studies in the second year of High School (the previous year), obtained 63.07% “excellent,” 35.38% “good,” and 1.5% “average.” There were no “poor” or “very poor” responses, demonstrating interest in classes using the CLIL approach.

Among the justifications for these responses, we have:

- “It was good to learn about other cultures in English.”
- “With the Nations Fair event, our knowledge of geography and the integrated English language expanded.”
- “Excellent, because the study gave us more background knowledge about various cultures.”
- “I really liked the classes; I learned a lot about the culture of other countries.”
- “It made us learn new terms about this subject in English, as well as bringing English into everyday life.”
- “I thought it was excellent because, besides learning English, I learned about the culture and customs of other peoples.”
- “I found the integration with other subjects interesting, because we learned about other cultures in English and the Nations Fair was really cool to do.”
- “We combined the two subjects at the Nations Fair, and this helped us learn and study both subjects together.”
- “Because it became more enjoyable to learn; because of this, I can pay close attention.”
- “It was a challenge, but a challenge within our reach, and for that reason it made learning dynamic.”
- “It brought us knowledge of other cultures, broadening our view of the world.”

- “It was possible to write, read, and speak in English, learning the content and also the English language, with more specific topics and words.”

The sixth question investigates whether the student felt more motivated to study the language. Only 7.69% stated that they did not, while 92.31% emphasized that they did. In this regard, it may be said that CLIL proposes an environment in which the student is the protagonist of the learning process and becomes aware of this, while also proposing that the student's innate motivation be activated toward the understanding that the learning process can become enjoyable once they know the reasons for which they are participating.

The next question concerned the experience of giving presentations in English, contributing to students' oral practice. Regarding this item, 44.26% considered it good, nearly 30% considered it excellent, 22.95% considered it average, and 1.63% considered it very poor or poor.

Regarding the belief in “school English,” nearly 63% stated that it is possible to learn English at school. Among those who wrote that it is not possible, the main justification was the low number of class hours, which seems interesting in light of the common belief that “school English” does not work, as explained by Leffa (2009).

The final question refers to a score indicating how students evaluate their experience with English in the second year, with options ranging from 0 to 2, 3 to 5, 6 to 8, and 8 to 10. Thus, 49.12% answered from 6 to 8; 47.36% from 8 to 10; and only 3.5% from 3 to 5. Among the justifications for the score of 6 to 8, a large number wrote that they should have dedicated themselves more. Among some responses, we have:

- “Excellent approach by the teacher and very dynamic classes.”
- “It was the year in which we had the greatest depth and diversity in learning.”
- “Because I love English and I loved watching the videos about cultures.”
- “Despite my difficulty with English, I loved the methodology.”

- “I really liked the classes and the teacher’s didactics; I was able to learn several things, and I thought it was very good.”
- “The classes were well explained by the teacher, and the method helped me a lot.”
- “It was one of the best experiences in English, in which I felt most comfortable trying.”
- “I learned a lot; the experience with geography was very nice.”
- “The teacher made the content more interesting with videos, seminars, and activities, creating more motivation to learn.”
- “I found it very dynamic, and it made studying easier without that kind of tiresome content.”
- “It was a new experience and moved away from the obvious.”

It should be noted that all these data point to a very positive understanding of the experience with the CLIL approach, involving topics in geography and cultural studies in English in High School at the Federal Institute of Espírito Santo.

FINAL CONSIDERATIONS

In an increasingly globalized world, the need for an education that prepares students to interact in different contexts and cultures has never been more urgent. Within this scope, CLIL (Content and Language Integrated Learning) emerges as an innovative approach that not only enables the teaching of the English language more efficiently, but also motivates students to learn in a contextualized and meaningful way. As the studies by Krashen and Ofélia García emphasize, the acquisition of a new language becomes more effective when embedded in an authentic and relevant context, far from the dichotomy between content and language.

By integrating English with topics such as geography and cultural studies, we are not only teaching a language, but also bringing students closer to a broader world that awakens their curiosity and engagement.

The BNCC, in turn, reaffirms the importance of methodologies that develop linguistic competencies while also promoting the construction of interdisciplinary knowledge. Thus, CLIL fits perfectly within this paradigm by allowing students to appropriate the English language through content that makes sense for their reality and for their understanding of the world.

The data obtained from the questionnaires administered to students demonstrate that those who experienced classes with geography and cultural studies themes in English showed greater involvement and significant progress both in linguistic competence and in their understanding of the topics addressed.

Based on what has been discussed, it is possible to affirm that CLIL presents itself as a promising path for making English classes more meaningful and motivating in High School. By integrating content and language, this approach not only facilitates English language learning, but also contributes to the formation of critical citizens who are able to engage in dialogue in an increasingly interconnected world.

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APPENDIX

Questionnaire on second-year English language classes

1. What is your conception of the English language? Explain.

2. Did you attend Elementary and Middle School in a:

☐ Public school ☐ Private school

3. What were your English classes like in Elementary and Middle School?

- ☐ Very poor
- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

Justify.

4. At IFES, teachers use English in the classroom, following the parameters of the BNCC. What do you think about this?

- ☐ Very poor
- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

5. What was it like to have integration with geography and cultural studies?

- ☐ Very poor
- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

Explain.

6. Did you feel more motivated to study the language?

- ☐ Yes ☐ No

7. What was the experience of giving presentations in English like?

- ☐ Very poor

- ☐ Poor
- ☐ Average
- ☐ Good
- ☐ Excellent

8. Do you think it is possible to learn English at school?

☐ Yes ☐ No

Why?

9. In general, from 0 to 10, how do you evaluate your experience with English in the second year?

0 to 2

3 to 5

6 to 8

8 to 10

Briefly, why?

CLIL, BNCC, AND MOTIVATION: PERSPECTIVES FOR ENGLISH LANGUAGE TEACHING IN HIGH SCHOOL

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Abstract

This article aims to analyze the current situation of additional language teaching in Brazilian public high schools, with an emphasis on the English language. The study examines current educational policies in Brazil, particularly the National Common Curriculum Base (BNCC) and the Curriculum Guidelines for High School Education (OCeMs), and their implications for language teaching. Based on this analysis, the article discusses the CLIL approach (Content and Language Integrated Learning) as an effective methodology for increasing students' motivation by integrating the teaching of disciplinary content with the learning of a foreign language. The effectiveness of CLIL was investigated through an experience carried out at the Federal Institute of Espírito Santo (IFES), Montanha campus Federal Institute of Espírito Santo (IFES), Montanha campus, where students participated in geography and cultural studies classes taught in English. The research conducted in this context will be discussed on the basis of the data collected. The theoretical foundations that support this study include Leffa's (2011) analyses of beliefs in additional language teaching in public schools, as well as Garcia's (2009) contributions on Bilingual Education, Dörnyei's (2001) work on motivation in language teaching, and Moita Lopes's (1996) sociocultural perspectives on language teaching, among others. These discussions reveal the positive impact of CLIL on students' motivation, aligning with the principles of the BNCC and the OCeMs.

Keywords: Additional language teaching, High school, CLIL, Motivation, BNCC.

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INTRODUCTION

Foreign language teaching, especially English, in Brazil has faced significant challenges in the context of public schools. Although English language teaching has been a legal requirement since the enactment of the 1996 Law of Guidelines and Bases of National Education (LDB), the results regarding the development of linguistic and communicative skills remain unsatisfactory, particularly in public schools. This scenario appears to reflect pedagogical practices that still privilege traditional, grammar-centered methods, resulting in low student motivation (Brasil, 2017; IBGE, 2018).

Within this context, increasing students' motivation and searching for more effective approaches have been recurring themes in the educational literature. One promising approach is Content and Language Integrated Learning (CLIL), which integrates the teaching of disciplinary content with the learning of an additional language, providing students with a more meaningful and contextualized experience. According to Dörnyei (2001), motivation is a key factor for success in foreign language learning, and CLIL has proven effective in this regard by offering more dynamic and engaging instruction.

Moreover, CLIL aligns with the guidelines of the National Common Curriculum Base (BNCC), which emphasizes the need to promote comprehensive and contextualized learning by connecting knowledge from different areas. According to the BNCC (Brasil, 2017), language teaching should be directed toward the development of competencies involving the use of language in real communicative contexts, and CLIL emerges as a viable path toward this goal. The integration of content such as geography and cultural studies into English teaching, for example, allows students to perceive the language not merely as an isolated object of study, but as a tool for knowledge construction, which fosters their engagement and participation.

Furthermore, CLIL is also consistent with the Curriculum Guidelines for High School Education (OCEMs), which seek to encourage student agency and promote active teaching methodologies. This is because, by enabling the use of English for the construction of knowledge in specific areas, it proposes a

form of teaching more closely connected to students' interests and needs, meeting the recommendations of the OCEMs, which highlight the importance of more contextualized and meaningful teaching for learners (Brasil, 2006).

In this sense, the present study aims to analyze the motivation of third-year high school students at a Federal Institute through the application of a questionnaire on students' perceptions of English classes that use CLIL. The objective is to investigate whether the use of this approach can be an effective strategy for increasing students' motivation and improving foreign language teaching in Brazilian public schools.

THEORETICAL FRAMEWORK

Additional language teaching, especially English, in Brazil faces historical challenges related to pedagogical practices primarily centered on grammar and on the teaching of vocabulary in a decontextualized manner. This traditional model often results in demotivating learning experiences and low student performance (IBGE, 2018).

Regarding this issue, Leffa (2011) states:

The traditional approach, centered on grammatical rules and the memorization of vocabulary lists, ignores the conditions of real communication and does not provide students with an experience that allows them to effectively appropriate the language. (Leffa, 2011, p. 42).

Leffa (1999) also observes that grammar teaching, when isolated from communicative practice, often results in superficial and demotivating learning, disconnected from real language use:

Foreign language teaching, reduced to grammar and formal exercises, does not create the necessary conditions for students to engage with the language in a meaningful way, thus resulting in ineffective learning. (Leffa, 1999, p. 58).

Lima (2008) also reflects on the failure of the grammar-based approach in English teaching in public schools, arguing that it does not take into account the need for contextualization in the learning process:

The grammar-based methodology, which focuses solely on teaching rules and structures without contextualized application, not only discourages students but also limits their ability to understand and use the language in real communicative situations. (Lima, 2008, p. 52).

However, more recent pedagogical approaches, such as Content and Language Integrated Learning (CLIL), have demonstrated potential to promote learning that is more meaningful, engaging, and integrated with disciplinary content. This theoretical framework is based on the discussion of the concept of motivation for learning, the principles of CLIL, the National Common Curriculum Base (BNCC), and the Curriculum Guidelines for High School Education (OCeMs), in order to analyze the effectiveness of this approach in English language teaching in Brazilian public schools.

With regard to motivation, it plays a fundamental role in the success of foreign language learning. Dörnyei (2001) argues that motivation is one of the main factors influencing language acquisition, as it is directly related to the perception of relevance and to the learning context. By integrating the teaching of relevant content, such as geography or cultural studies, into the English language learning process, CLIL creates a more motivating environment, since it allows students to see the language as a useful tool for accessing knowledge in other areas.

In a study on motivation in language teaching, Dörnyei (2001, p. 36) states that “students tend to engage more in learning activities when they perceive that what they are learning is relevant and applicable to their lives.”

This statement is corroborated by Garcia (2009), who also emphasizes that student motivation is significantly enhanced when language learning is associated with cultural or academic content of interest to them. According to the author, “language learning should not be viewed merely as an end in itself, but as a tool for understanding different cultural and academic worlds” (Garcia, 2009, p. 83).

By integrating language and content teaching, CLIL may also help overcome the traditional demotivation associated with English classes, which are frequently limited to grammar repetition activities. As Moita Lopes (1996) aptly observes, “language teaching, when disconnected from students’ reality and focused only on grammar and formal aspects, tends to become an uninteresting and disengaged process” (Lopes, 1996, p. 47).

The CLIL proposal, by combining language learning with themes from students’ everyday lives, makes teaching more dynamic and aligned with their needs and interests.

In addition, the National Common Curriculum Base (BNCC) establishes as one of its main objectives the promotion of comprehensive education that connects different areas of knowledge and fosters students’ critical development. With regard to foreign language teaching, the BNCC emphasizes the need for teaching to be guided by communicative practices, with the use of language in real contexts of interaction. The document suggests that students should develop skills that allow them to use English in everyday situations, such as interpersonal interactions and the comprehension of multimodal texts (Brasil, 2017). In this context, CLIL offers an effective path toward such integration, as it combines the teaching of content from other areas with language learning, providing contextualized and relevant instruction.

According to the BNCC (Brasil, 2017), language teaching should “develop students’ communicative competence, aiming at effective participation in different social and cultural practices.” This principle is particularly evident in the CLIL proposal, which, by integrating English language teaching with other subjects, such as geography and science, allows students to learn the language in contextualized situations, linking language learning to relevant academic content. This promotes greater motivation, since students not only learn a language but also acquire new knowledge while practicing communication in English.

The Curriculum Guidelines for High School Education (OCeMs), in turn, also highlight the importance of active methodologies and interdisciplinarity in the learning process. According to the

OCEMs (Brasil, 2006), “it is essential for students to develop competencies and skills that prepare them to act autonomously and critically in diverse contexts, being able to apply the knowledge acquired in real-world situations.” In this sense, CLIL aligns with the objectives of the OCEMs by promoting language learning in an interdisciplinary context, encouraging students’ critical thinking and autonomy. The fact that students learn English while exploring content such as history, geography, and cultural studies makes language learning more relevant and integrated into their daily lives.

Language teaching based on interdisciplinarity also favors the construction of knowledge in a more dynamic way, as Mejía (2002) emphasizes when stating that “CLIL allows students to engage actively in language learning, since the content taught is not dissociated from real life, but contextualized in situations that make the learning process more interesting and meaningful.” This integration promotes the development of higher-order cognitive skills, as students not only learn the language but also expand their repertoire of knowledge, applying it in a context of real use.

METHODOLOGY

This article was based primarily on qualitative research involving the analysis and discussion of data collected through a semi-open and anonymous questionnaire. However, quantitative data will also be relevant and, therefore, will be considered, especially those derived from the objective questions in the questionnaire administered.

In order to collect data on the experience with CLIL in English language classes, we chose to administer a questionnaire to third-year high school students at the Federal Institute of Espírito Santo, Montanha campus. These students are generally between 16 and 18 years old and come from the city of Montanha and nearby municipalities.

The choice of third-year high school students from the Federal Institute of Espírito Santo, Montanha campus, was due to a teacher’s experience in applying CLIL during the second year, involving geography and cultural studies topics, such as different celebrations around the world. The culmination of

this work was a Nations Fair, in which each group presented, in English and Portuguese, issues related to the geography, history, sociology, philosophy, arts, among other aspects, of a given country. This activity involved the collaboration and assessment of teachers from those subject areas.

The questionnaire designed contains nine questions, eight of which are multiple-choice, and four of these ask students to justify their previous response. Only one question is entirely open-ended: “What is your conception of the English language?”

This is because our theoretical framework encompasses, among other themes, the concept of representation and its implications for the language teaching/learning process, in this specific case, English.

RESULTS AND DISCUSSION

In this article, we will analyze only some of the responses from the 65 (sixty-five) questionnaires administered that are related to the theme of the study.

In the third question, concerning what English classes were like in elementary school, among those who studied in public schools, the results were as follows: 10.86% classified them as terrible, 15.21% as poor, 45.6% as average, 19.56% as good, and only 6.5% as excellent. As justification, many students wrote that they had studied only the verb to be, which confirms the studies by Leffa (2011) and Lima (2008).

For the same question, among those who had studied at least some years in private schools, only 5.2% rated the classes as terrible, 21% as poor, 26.3% as average, 36.8% as good, and 10.4% as excellent, highlighting the existing differences between public and private schools in Brazil.

The fourth question, concerning the use of English in the classroom at IFES, in accordance with the BNCC guidelines, yielded 64.17% of responses rating it as “excellent,” 26.86% as “good,” and only 4.47% as “average” and “poor,” respectively.

The fifth question, which addresses the integration of English language classes with geography and cultural studies in the second year of high school (the previous year), resulted in 63.07% rating it as excellent, 35.38% as good, and 1.5% as average. There were no responses indicating poor or terrible, which makes evident the interest in classes using the CLIL approach.

Among the justifications for these responses, we find the following:

- “It was good to learn about other cultures in English.”
- “With the Nations Fair event, our knowledge of geography and integrated English language learning expanded.”
- “Excellent, because the study gave us more background knowledge about different cultures.”
- “I really liked the classes; I learned a lot about the culture of other countries.”
- “It made us learn new terms about this subject in English, in addition to bringing English into everyday life.”
- “I thought it was excellent, because besides learning English, I learned about the culture and customs of other peoples.”
- “I found the integration with other subjects interesting, because we learned about other cultures in English and the Nations Fair was really cool to do.”
- “We combined the two subjects in the Nations Fair, and this helped us learn and study both subjects together.”
- “Because it became more enjoyable to learn; because of that, I can pay close attention.”
- “It was a challenge, but a challenge within our reach, and for that reason, it made learning dynamic.”
- “It brought us knowledge of other cultures, broadening our worldview.”
- “It was possible to write, read, and speak in English while learning both the content and the English language, with more specific subjects and words.”

The sixth question investigates whether the student felt more motivated to study the language. Only 7.69% stated that they did not, while 92.31% emphasized that they did. In this regard, it may be said that CLIL proposes an environment in which students are protagonists of the learning process and become aware of this, while at the same time encouraging the activation of their innate motivation through the understanding that they can transform the learning process into a pleasurable one once they know the reasons for their participation.

The next question concerned the experience of giving presentations in English, contributing to students' oral practice. Regarding this item, 44.26% considered it good, almost 30% considered it excellent, 22.95% considered it average, and 1.63% considered it terrible or poor.

With regard to the belief in "school English," almost 63% stated that it is possible to learn English at school. Among those who wrote that it is not, the main justification was the low number of class hours, which seems interesting in light of the common-sense belief that "school English" does not work, as explained by Leffa (2009).

The final question refers to a score indicating how students evaluate their experience with English in the second year, with the options being 0 to 2, 3 to 5, 6 to 8, and 8 to 10. Thus, 49.12% answered 6 to 8; 47.36% answered 8 to 10; and only 3.5% answered 3 to 5. Among the justifications for the score of 6 to 8, a large number of students wrote that they should have dedicated themselves more. Among some of the responses, we find:

- "Excellent approach by the teacher and very dynamic classes."
- "It was the year in which we had the greatest depth and diversity in learning."
- "Because I love English and I loved to watch the videos about cultures."
- "Despite my difficulty with English, I loved the methodology."
- "I really liked the classes and the teacher's teaching approach; I was able to learn many things, and I thought it was very good."
- "The classes were well explained by the teacher, and the method helped me a lot."

- “It was one of the best experiences in English, when I felt most comfortable trying.”
- “I learned a lot; the experience with geography was very nice.”
- “The teacher made the content more interesting with videos, seminars, and interactive activities, creating more motivation to learn.”
- “I found it very dynamic, and it made studying easier without that kind of tedious content.”
- “It was a new experience and moved away from the obvious.”

It should be noted that all these data point to a very positive understanding of the experience with the CLIL approach, involving geography and cultural studies topics in English in high school at the Federal Institute of Espírito Santo.

CONCLUSION

The present study aimed to analyze the motivation of third-year high school students at a federal institute in relation to English teaching through the Content and Language Integrated Learning (CLIL) approach, applied to geography and cultural studies topics. The results obtained from the questionnaire administered clearly show that the vast majority of students felt more motivated and engaged in English classes when these involved the use of the language to learn meaningful and relevant content, such as geography and cultural studies, than in traditional classes focused solely on grammar and vocabulary.

These results corroborate the conclusions of several scholars in the field, such as Dörnyei (2001), who emphasize the importance of using approaches that integrate content of interest to students, making learning more meaningful and applicable to their reality. In addition, the study reinforces Garcia's (2009) assertions that motivation in foreign language learning is directly influenced by the relevance and applicability of the content, and that contextualized learning tends to promote greater student engagement.

By integrating the teaching of geography and cultural studies with English language learning, CLIL not only contributed to language proficiency but also made classes more dynamic, engaging, and aligned with students' interests and needs. This approach proved to be an effective alternative to the

traditional grammar-based methodology, which is often discouraging for students, as indicated by previous studies that point to low student motivation in classes centered exclusively on grammar (PNAD, 2018).

Therefore, it can be concluded that CLIL presents itself as an effective methodology for increasing students' motivation in additional language learning, especially in the Brazilian educational context, where the traditional approach often fails to meet students' expectations and interests. The use of English as a tool for learning content from other areas of knowledge proved to be a pedagogical strategy that promotes greater engagement, autonomy, and meaningfulness in students' learning.

In view of the positive results observed, it is possible to suggest that CLIL be adopted more widely in public schools and in other educational contexts in Brazil, as a methodological alternative that favors meaningful learning and increases students' motivation, making foreign language teaching more relevant and effective.

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**SCIENTIFIC RESEARCH AS A FORMATIVE PRINCIPLE: THE TEACHER-RESEARCHER
AND THE PRODUCTION OF KNOWLEDGE IN THE SCHOOL**

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Abstract

The complexity of contemporary educational challenges requires a new understanding of the teacher's role in the knowledge society. In this context, teachers are no longer understood merely as transmitters of previously established content; rather, they come to assume an investigative, critical, and reflective stance toward the situations experienced in everyday school life. Scientific research, therefore, constitutes an essential formative principle, capable of strengthening teachers' intellectual autonomy, expanding their capacity to problematize reality, and fostering the construction of more conscious and transformative pedagogical practices. This chapter aims to discuss scientific research as a constitutive element of teacher education, analyzing the construction of the teacher-researcher and the role of the school as a space for knowledge production. This is a qualitative study of a basic nature, with exploratory and descriptive objectives, developed through a bibliographic review of classic and contemporary works on teacher education, educational research, and reflective practice. The discussion is grounded in the studies of Demo, Freire, Nóvoa, Schön, Stenhouse, Dewey, André, Lüdke, Gatti, and Boaventura de Sousa Santos, as well as in the contributions of Oliveira and Gonzaga (2012) regarding scientific education and research-based practicum in teacher education. The results of the theoretical reflection show that the constitution of the teacher-researcher requires overcoming a teaching practice based on the reproduction of knowledge, advocating professional practice guided by investigation, critical reflection, and the capacity to produce knowledge from educational experience itself. It is concluded that research, when incorporated into teachers' professional identity, strengthens autonomy, continuing education, and teachers' commitment to democratic, critical, and socially engaged education. Thus, the school ceases to be merely a space for the application of externally produced theories and comes to be recognized as a legitimate environment for investigation, scientific production, and the transformation of reality.

Keywords: Knowledge production, Reflective practice, Scientific research, Teacher education, Teacher-researcher.

INTRODUCTION

Contemporary society, marked by the rapid circulation of information, scientific and technological advancement, and the complexity of social challenges, requires a redefinition of the teacher's role. In a context in which knowledge is continuously changing, it is no longer sufficient to understand the teacher as a mere transmitter of content produced by other individuals or institutions. Contemporary teaching requires professionals capable of investigating their own practice, problematizing situations present in everyday school life, and producing knowledge that contributes to the transformation of educational reality.

Historically, scientific production has been associated with university settings and with researchers linked to formal research centers. However, studies on teacher education have shown that the school is also a legitimate space for knowledge production, since everyday school life presents challenges, experiences, and problems that require ongoing observation, reflection, and investigation. In this sense, the teacher-researcher emerges as a professional who goes beyond the condition of executor of externally developed pedagogical proposals and assumes an active stance toward educational processes.

In defending research as a constitutive principle of teaching practice, Freire (1996) establishes an inseparable relationship between teaching and investigating, affirming that educational activity requires curiosity, questioning, and a permanent search for knowledge. In one of his most emblematic reflections, the author states:

“There is no teaching without research and no research without teaching. These acts are found within one another. While I teach, I continue searching and researching. I teach because I search, because I asked, because I ask questions and question myself. I research in order to verify, and by verifying I intervene; by intervening I educate and educate myself. I research in order to know what I do not yet know and to communicate or announce the novelty.” (Freire, 1996, p. 29).

Freire's understanding breaks with the idea of a teaching practice based on the repetition of ready-made knowledge. From this perspective, the teacher does not occupy a passive position in relation to

historically produced knowledge, but builds his or her professionalism through epistemological curiosity, critical analysis of reality, and a permanent willingness to learn. Teaching, therefore, constitutes an investigative act, in which reflection on one's own pedagogical action becomes an essential element for the transformation of educational practices.

This same conception is deepened by Demo (1996), who understands research as the foundation of emancipatory education and the construction of intellectual autonomy. For the author, an education committed to the critical formation of individuals must overcome models based on the mere reproduction of information and promote a culture of questioning, argumentation, and the autonomous elaboration of knowledge. As he states:

“The first essential condition for education through research is that the education professional be a researcher, that is, that he or she manage research as a scientific and educational principle and adopt it as an everyday attitude. The goal is not a research professional, but an education professional formed through research.” (Demo, 1996, p. 2).

The reflection presented by Demo is particularly significant for understanding the concept of the teacher-researcher. It is not a matter of requiring all teachers to be full-time academic researchers or necessarily linked to formal university production. Rather, what is proposed is the constitution of an investigative posture in the exercise of teaching, one capable of transforming doubts, challenges, and situations experienced at school into opportunities for analysis, knowledge production, and the improvement of pedagogical practice.

In this context, research assumes a central role in the processes of initial and continuing teacher education. The construction of teaching identity is directly related to the teacher's capacity to understand his or her practice as an object of investigation, articulating theory and school reality. Oliveira and Gonzaga (2012) emphasize that the inclusion of research in the formative process enables future teachers to develop a scientific stance toward the profession, encouraging observation, problematization, and the search for grounded answers to the challenges encountered in everyday educational life.

The discussion of the teacher-researcher is also related to the understanding that teacher education does not end upon completion of an initial training course. On the contrary, it is a continuous path, built throughout professional experiences, interactions established within the school environment, and the capacity to reflect critically on one's own actions. In this sense, Nóvoa (1992) states that education is not built through the accumulation of courses or techniques, but through constant work of reflection on practices and the ongoing reconstruction of professional identity.

In addressing teacher education, Nóvoa (1992, p. 25) highlights:

“Education is not built through the accumulation of courses, knowledge, or techniques, but rather through a work of critical reflexivity on practices and the permanent (re)construction of a personal identity.”

This perspective shows that teaching is a profession marked by the continuous movement between experience, reflection, and transformation. The teacher-researcher, therefore, is one who observes school reality with an investigative gaze, recognizes the challenges present in his or her practice, and produces knowledge that contributes not only to professional development but also to the improvement of educational processes.

When considering the school as a space for investigation, it becomes necessary to overcome the view that scientific knowledge is produced exclusively outside the school environment. Teachers' everyday practice, the relationships established with students, the methodologies used, and the challenges encountered in the teaching and learning process constitute legitimate objects of study and analysis. In this sense, research developed by teachers on their own practice strengthens teacher autonomy and contributes to the construction of a more conscious, critical, and contextualized education.

In view of this scenario, this chapter aims to discuss scientific research as a formative principle in the constitution of the teacher-researcher, reflecting on the role of investigation in teacher education and on the school as a space for knowledge production. To this end, the methodological path of the research is

first presented; subsequently, research is discussed as a foundation of teaching, along with the construction of the teacher-researcher's identity, the role of the school as an environment for scientific production, and, finally, the possibilities for transforming pedagogical practice through reflection and investigation.

METHODOLOGY

The present study is characterized as qualitative research, of a basic nature, with exploratory and descriptive objectives, developed through bibliographic research. The choice of this methodological path is grounded in the need to understand the constitution of the teacher-researcher and scientific research as formative principles based on the analysis of consolidated academic productions in the field of Education.

The qualitative approach makes it possible to understand educational phenomena in their complexity, considering the meanings, experiences, and relationships established by individuals in their social contexts. According to Minayo (2008), qualitative research works with the universe of meanings, beliefs, values, and interpretations constructed in human relationships, making it especially appropriate for the investigation of formative processes and educational practices.

With regard to its objectives, the study has an exploratory character insofar as it seeks to broaden understanding of the formation of the teacher-researcher and its implications for educational practice. According to Gil (2002, p. 41), exploratory research aims to provide “greater familiarity with the problem, with a view to making it more explicit or to constructing hypotheses.” In addition, it has a descriptive character, as it analyzes characteristics, concepts, and theoretical perspectives related to scientific research within the scope of teaching.

The methodological procedure adopted consists of bibliographic research, understood as a process of critical engagement with knowledge already produced on a given topic. According to Gil (2008), this type of investigation is developed from previously published materials, such as books, scientific articles,

theses, dissertations, and academic documents, allowing the researcher to analyze different contributions concerning the object under study.

This understanding is complemented by Lakatos and Marconi (2003), who state that bibliographic research does not represent a simple reproduction of what has already been written, but enables the researcher to examine a topic from new perspectives, establish relationships among different authors, and produce new interpretations.

The selected theoretical framework includes authors who discuss research as a foundation of teacher education and educational practice. In this regard, the contributions of Demo (1996) and Freire (1996) support the understanding of research as a teacher's everyday attitude and as an inseparable dimension of the act of teaching. The discussion on professional identity and reflective practice dialogues with Nóvoa (1992; 2009) and Schön (2000), while the reflections of Stenhouse (1987), Dewey (1979), André (2001), Lüdke (2001), and Gatti (2003; 2010) contribute to understanding the school as a space for investigation and the production of teachers' knowledge.

In addition, the contributions of Oliveira and Gonzaga (2012) were considered, as they discuss scientific education and the research-based practicum as fundamental elements in initial teacher education, advocating the construction of an investigative posture capable of bringing together theory, practice, and knowledge production in the school context.

The critical analysis of the selected references made it possible to understand that scientific research should not be conceived as an activity restricted to the university or to formal spaces of academic production. On the contrary, it constitutes an intellectual and professional attitude that enables teachers to investigate their own practice, problematize school reality, and construct new knowledge capable of transforming educational processes.

RESEARCH AS A FORMATIVE PRINCIPLE IN TEACHING

Understanding research as a constitutive element of teacher education represents a significant shift in the way the teacher's role is perceived in contemporary society. For a long time, educational practice was associated with the transmission of knowledge produced by specialists external to school reality, assigning teachers the function of applying methods, content, and guidelines previously established. However, the transformations that have occurred in the educational field reveal the need to recognize the teacher as an intellectual subject, capable of questioning his or her reality, producing knowledge, and transforming practice through investigation.

In this sense, research ceases to be understood as an activity distant from the everyday life of the classroom and becomes an educational principle capable of strengthening teacher autonomy. Demo (1996) emphasizes that research-based education breaks with a passive conception of learning, as it enables teachers and students to assume an authorial stance toward knowledge. For the author, research is not limited to a methodological technique, but constitutes an attitude toward life and the construction of knowledge.

In discussing the centrality of research in education, Demo (1996) states:

“Research is a process that must appear throughout the entire educational path, as the educational principle it is, at the foundation of any emancipatory proposal. If educating is, above all, motivating the subject's creativity so that the new master may emerge, and never the disciple, research assumes a crucial role, because it is through the reconstruction of knowledge that human historical competence is formed.” (Demo, 1996, p. 2).

The reflection presented by the author allows us to understand that research has not only a scientific dimension, but also a formative one. By investigating, the teacher develops the capacity to problematize situations, analyze different perspectives, construct arguments, and elaborate grounded responses to the challenges encountered in educational practice. Thus, teaching ceases to be based on the repetition of ready-made models and becomes constituted by permanent processes of reflection, creation, and transformation.

This understanding is close to the perspective defended by John Dewey, who regards experience and investigation as essential elements of learning. For Dewey (1979), knowledge is not constructed passively, but through the interaction between the subject and the problems encountered in reality. The investigative attitude arises from doubt, curiosity, and the need to find answers to concrete situations. Thus, education should promote experiences that enable individuals to observe, question, formulate hypotheses, and construct new knowledge.

Within the scope of teacher education, this conception is fundamental, as it shows that teachers need to assume a posture of constant investigation of their own practice. Everyday school life presents complex situations, marked by student diversity, social changes, and the specific demands of each educational context. Thus, to research means to understand the classroom as a living space, in which the difficulties and possibilities of teaching become objects of analysis and knowledge production.

This perspective is also present in the contributions of Lawrence Stenhouse (1987), one of the main advocates of the idea of the teacher-researcher. For the author, the curriculum should not be understood as a rigid set of prescriptions, but as a field of permanent investigation conducted by the teacher. In this sense, Stenhouse states:

“Curriculum development must belong to teachers. If it cannot be developed by teachers, it is not a curriculum, but an instruction imposed upon teachers.” (Stenhouse, 1987, p. 142).

Although the statement emphasizes the curriculum, it reveals a broader understanding of teacher professionalism: the teacher is not a mere executor of proposals constructed by others, but an intellectual who continuously interprets, adapts, evaluates, and reconstructs educational processes.

Research as a formative principle is also supported by the Freirean perspective. For Freire (1996), teaching requires curiosity, intellectual humility, and a willingness to learn constantly. The educator who conducts research recognizes that knowledge is not finished and that pedagogical practice must be

continuously analyzed and reconstructed. Thus, the act of investigating constitutes an ethical commitment to improving education and forming critical and autonomous individuals.

Therefore, recognizing research as a foundation of teaching means assigning teachers the role of protagonists in the construction of educational knowledge. Investigation developed from the challenges of the school enables the creation of more contextualized practices, the understanding of students' needs, and the strengthening of professional autonomy. The teacher-researcher thus emerges as a subject who teaches, learns, questions, and produces knowledge from the reality in which he or she is situated.

THE TEACHER-RESEARCHER AND THE CONSTRUCTION OF PROFESSIONAL IDENTITY

The constitution of the teacher-researcher is directly related to the understanding of teaching as a profession that requires permanent education, critical reflection, and the production of knowledge about one's own practice. Teaching identity is not constructed immediately or solely through initial education, but results from a path marked by lived experiences, relationships established in the school context, and the teacher's capacity to assign new meanings to his or her pedagogical work.

In this direction, Nóvoa (1992) understands teaching identity as a process in constant construction, in which personal and professional dimensions are intertwined. Being a teacher involves a formative trajectory that is not limited to the accumulation of technical knowledge, but requires continuous reflection on one's own experiences and on the meanings attributed to the profession. As the author states:

“To be in formation implies a personal investment, a free and creative work on one's own paths and projects, with a view to constructing an identity, which is also a professional identity.” (Nóvoa, 1992, p. 25).

This perspective demonstrates that the identity of the teacher-researcher is associated with the willingness to learn continuously and to transform everyday experience into a source of knowledge. The teacher who investigates his or her practice develops a critical stance toward the difficulties encountered

at school, avoiding the automatic reproduction of methodologies and seeking to understand educational phenomena in their complexity.

In this context, the studies of Oliveira and Gonzaga (2012) contribute significantly to the debate by showing that the inclusion of research in the formative process enables future teachers to develop a scientific attitude toward educational practice. The authors argue that the practicum associated with research favors the approximation between theory and practice, allowing the teacher in training to observe, analyze, and problematize school reality, constructing knowledge from lived experiences.

This conception dialogues with Donald Schön (2000), in proposing the idea of the reflective professional. According to the author, professionals work in complex and unpredictable contexts in which technical knowledge, although necessary, is not always sufficient to solve the problems encountered. Thus, it becomes essential to develop the capacity to reflect during action and subsequently upon it, transforming professional experience into an opportunity for learning.

Reflective practice is also discussed by Marli André (2001), who emphasizes that research carried out by teachers constitutes a path for understanding the reality of the school and promoting significant changes in pedagogical work. Investigation developed in the educational context itself brings teachers closer to a more autonomous posture, allowing them to cease being merely consumers of theories produced by other researchers and to also become producers of knowledge.

The discussion proposed by Lüdke (2001) reinforces this perspective by advocating closer ties between research and teaching practice. The author highlights the need to overcome the historical separation between the academic researcher and the basic education teacher, recognizing that everyday school life produces relevant questions that can give rise to consistent and socially significant scientific investigations.

Based on these contributions, it is understood that the teacher-researcher does not correspond to an idealized model of a professional who has all the answers regarding the educational process. On the contrary, the teacher-researcher is characterized by the disposition to formulate questions, investigate

problems, engage with theoretical references, and continuously reconstruct knowledge. Research thus becomes a professional attitude, a way of looking at the school and understanding the complexity of educational relationships.

Accordingly, the construction of the teacher-researcher's identity represents a movement toward overcoming a form of teaching based solely on the application of previously defined content and methods. By assuming investigation as part of his or her practice, the teacher strengthens intellectual autonomy, expands the capacity to intervene in school reality, and contributes to the production of knowledge committed to the transformation of education.

THE SCHOOL AS A SPACE FOR KNOWLEDGE PRODUCTION

Understanding the school as a space for knowledge production represents a significant shift in relation to traditional models that assigned the university the exclusive role of producing scientific knowledge, while teachers in basic education were expected only to apply theories developed by researchers external to school reality. Although the university plays an essential role in scientific development, it is necessary to recognize that the school also produces knowledge from the experiences, human relationships, pedagogical challenges, and problems present in its everyday life.

In this sense, the teacher-researcher assumes a fundamental role by transforming educational practice into an object of investigation. The everyday life of the classroom, far from representing merely a space for the execution of previously defined methodologies, presents complex situations that require observation, interpretation, analysis, and grounded decision-making. Investigation carried out by teachers enables the construction of contextualized knowledge, directly related to the needs of students and to the specificities of each school reality.

In discussing the relationship between teachers and research, André (2001) emphasizes the need to overcome the view that separates the teacher from the researcher, understanding that investigation can constitute an integral element of the teaching profession. The approximation between research and

practice allows teachers to develop a more autonomous and critical stance toward educational challenges, ceasing to occupy only the place of consumers of theories and becoming producers of knowledge about their own work.

This perspective is reinforced by Lüdke (2001), who argues that research conducted by teachers has the potential to qualify pedagogical practices and broaden understanding of the phenomena that occur within the school. The author argues that teachers' everyday experience constitutes a rich source of questions and investigative problems, capable of generating relevant knowledge for the educational field.

The appreciation of knowledge produced in different educational contexts is also supported by the reflections of Boaventura de Sousa Santos (2007), especially in his defense of the ecology of knowledge. The author criticizes the idea that only certain forms of knowledge have scientific legitimacy, proposing a more plural perspective in which different ways of understanding the world can enter into dialogue.

In discussing this broadening of the concept of knowledge, Santos (2007, p. 85) states:

“The ecology of knowledges is a form of extension in reverse, from outside the university into the university. It consists of promoting dialogues between the scientific or humanistic knowledge produced by the university and the lay, popular, traditional, urban, peasant knowledges, originating from non-Western cultures, that circulate in society.”

Although Santos's reflection is primarily related to the relationship between university and society, it contributes significantly to understanding the school as a territory of multiple forms of knowledge. The knowledge constructed by teachers in their practice, students' experiences, knowledge originating from communities, and scientific references can establish complementary relationships, enriching educational processes.

In this direction, recognizing the school as a space for knowledge production means valuing the teacher as an intellectual who interprets reality, formulates questions, constructs investigative strategies, and produces new understandings of teaching and learning processes. As Freire (1996) states, teaching requires research, curiosity, and permanent openness to the construction of the new. Teaching practice

committed to investigation breaks with the idea of education based on repetition and begins to value questioning, creativity, and the transformation of reality.

Gatti's (2010) contributions also show that strengthening research in teacher education constitutes an essential path for teachers' professional development. The author emphasizes that the professionalization of teaching requires educators to develop analytical and reflective capacities, understanding pedagogical practice as a complex field that demands study, investigation, and the constant production of knowledge.

Thus, when the school is recognized as an investigative environment, it ceases to be seen merely as a place for the transmission of content and assumes its potential as a space for creation, reflection, and scientific production. The teacher-researcher, in this context, becomes a subject who articulates theory and practice, produces knowledge about his or her experience, and contributes to the construction of a more critical, democratic, and socially committed education.

RESEARCH, REFLECTION, AND THE TRANSFORMATION OF PEDAGOGICAL PRACTICE

Research carried out by teachers finds its greatest relevance when it goes beyond the field of observation and becomes an instrument for reflection and transformation of pedagogical practice. Investigating everyday school life means looking at experiences lived in the classroom not as isolated events, but as phenomena that can be understood, analyzed, and resignified in light of theoretical references and the concrete needs of the subjects involved in the educational process.

In this scenario, reflection on practice constitutes an indispensable element for teacher professionalization. Schön (2000) states that professionals face situations marked by uncertainty, singularity, and complexity, making it impossible to solve all problems solely through the application of previously established technical knowledge. In this way, teachers need to develop the capacity to reflect

during their action and subsequently upon it, transforming their experiences into a permanent source of learning.

The idea of the reflective teacher is close to the contributions of Paulo Freire, who understands pedagogical practice as a continuous movement between action, reflection, and transformation. The author emphasizes:

“It is by critically thinking about today’s or yesterday’s practice that one can improve the next practice. The theoretical discourse itself, necessary for critical reflection, must be so concrete that it almost merges with practice.” (Freire, 1996, p. 43).

Freire’s statement shows that reflection does not represent an abstract exercise distant from school reality. On the contrary, it arises from the encounter between theory and practice, allowing teachers to understand their challenges, review their strategies, and construct new possibilities for action.

In the same direction, Nóvoa (2009) argues that teacher education should be understood as a process constructed within the profession itself, through the sharing of experiences, dialogue among teachers, and investigation of the real problems faced in everyday school life. Professional development occurs when educators assume an active stance toward their education, recognizing themselves as subjects responsible for the construction of their knowledge.

Research, in this sense, constitutes a path toward strengthening teacher autonomy. By investigating their practice, teachers cease to depend exclusively on external models and begin to produce situated knowledge, coherent with their reality and with students’ needs. This movement does not mean rejecting the scientific knowledge produced by academia, but establishing a dialogical relationship between theory and practice, in which both fields mutually enrich each other.

Oliveira and Gonzaga (2012) reinforce this perspective by demonstrating that research-based education favors the constitution of more critical, autonomous teachers capable of understanding educational processes in their complexity. By developing an investigative posture from initial education

onward, the future teacher learns to perceive the school as a space of questions, possibilities, and the permanent construction of knowledge.

Therefore, research and teaching constitute inseparable dimensions of a pedagogical practice committed to the quality of education. The teacher-researcher is not defined solely by the conduct of formal studies, but by the capacity to maintain an investigative attitude toward reality, transforming doubts into research problems, experiences into knowledge, and everyday challenges into possibilities for innovation and change.

The appreciation of research in the school context therefore represents a path toward strengthening the teaching profession, expanding educators' autonomy, and constructing more conscious and contextualized pedagogical practices. A school that encourages its teachers to conduct research is a school that recognizes the collective production of knowledge and understands education as a permanent process of investigation, dialogue, and social transformation.

FINAL CONSIDERATIONS

Reflecting on scientific research as a formative principle implies recognizing that teaching goes beyond the dimension of content transmission, configuring itself as an intellectual, critical, and permanently investigative practice. Throughout this chapter, the aim has been to show that the teacher-researcher is not only the one who develops research linked to formal academic spaces, but the professional who assumes a posture of epistemological curiosity toward reality, questioning his or her practice, analyzing the challenges of everyday school life, and producing knowledge capable of contributing to the transformation of educational processes.

The contributions of Paulo Freire and Pedro Demo made it possible to understand research as an inseparable element of the act of teaching. While Freire defends the inseparability between teaching and investigation, Demo emphasizes research as a scientific and educational principle capable of promoting intellectual autonomy and the emancipation of subjects. From this perspective, teaching and researching

constitute complementary movements, in which the teacher learns while teaching and teaches while continuing to learn.

The discussion developed also showed that the construction of the teacher-researcher is directly related to the constitution of professional identity. The reflections of Nóvoa, Schön, André, and Lüdke demonstrate that teacher education does not end with the attainment of a diploma or the acquisition of pedagogical techniques, but is realized in a continuous process of reflection on practice, dialogue with other professionals, and the production of new knowledge from experiences lived in the school context.

In this movement, the school ceases to be understood as a space that merely reproduces externally produced knowledge and comes to be recognized as a legitimate environment for investigation and scientific production. Teachers' everyday experiences, challenges related to learning, pedagogical practices, and relationships built with students constitute relevant objects of research and contribute to broadening understanding of educational phenomena. The contributions of Boaventura de Sousa Santos, by valuing the plurality of knowledges, strengthen the understanding that knowledge is constructed through dialogue among different experiences, contexts, and subjects.

The inclusion of research in the initial and continuing education of teachers, as discussed by Oliveira and Gonzaga (2012), represents a concrete possibility for bringing theory and practice closer together, favoring the construction of more autonomous, reflective professionals committed to the reality in which they work. By developing an investigative posture from the formative process onward, teachers learn to look at the school as a space of questions, discoveries, and permanent reconstruction of knowledge.

Moreover, in light of the constant social, cultural, scientific, and technological changes that traverse contemporary education, the teacher education capable of critically interpreting reality and proposing grounded interventions becomes increasingly necessary. In this context, research assumes a strategic role, as it enables teachers to abandon the position of mere executors of prescribed practices and

to assume protagonism in the construction of educational responses more consistent with the needs of students and school communities.

It is concluded, therefore, that the consolidation of an investigative culture in the school environment represents a fundamental path for strengthening teacher professionalism and qualifying teaching and learning processes. The teacher-researcher is characterized by the permanent disposition to ask, observe, problematize, study, and transform his or her practice. In this way, scientific research ceases to occupy a peripheral place in teacher education and becomes an essential dimension of an education committed to autonomy, knowledge production, and social transformation.

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FLIPPED CLASSROOM AND GAMIFICATION IN HIGHER EDUCATION: CONTRIBUTIONS TO MEANINGFUL LEARNING, STUDENT AGENCY, AND PEDAGOGICAL INNOVATION

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Abstract

Contemporary transformations in higher education have driven the adoption of active methodologies aimed at promoting more dynamic, participatory, and student-centered pedagogical practices. In this context, the present study aimed to analyze the contributions of the flipped classroom and gamification in

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higher education, with emphasis on meaningful learning, student agency, and pedagogical innovation. This is an integrative literature review, carried out through searches for studies in the LILACS, ERIC, and DOAJ databases and OJS repositories, covering publications from 2021 to 2026 in Portuguese, English, and Spanish. Descriptors related to active methodologies, gamification, flipped classroom, and meaningful learning were used. After applying the inclusion and exclusion criteria, studies were selected to compose the final analysis. The results show that the flipped classroom reorganizes the teaching-learning process, promoting greater student autonomy and active participation. Gamification, in turn, stands out as a strategy capable of increasing students' motivation and engagement. The integration of both methodologies favors the construction of more meaningful learning and promotes pedagogical innovation in higher education. It is concluded that these strategies contribute to the transformation of educational practices, strengthening students' active role and promoting more dynamic, interactive, and collaborative learning environments. Longitudinal empirical studies are suggested to deepen the understanding of the impacts of these methodologies on academic education.

Keywords: Active methodologies, Flipped classroom, Gamification, Meaningful learning, Pedagogical innovation.

INTRODUCTION

Contemporary higher education is undergoing a continuous process of transformation, driven by the incorporation of active methodologies, the expansion of digital technologies, and the need to redefine traditional pedagogical practices. In this scenario, there is a progressive move beyond models centered on the transmission of content toward approaches that prioritize students' active participation, autonomy, and meaningful learning (Moran; Bacich, 2018).

The flipped classroom constitutes a pedagogical approach that reorganizes the time and space of learning, shifting theoretical exposition to moments prior to the face-to-face meeting, while classroom time is devoted to practical, collaborative, and in-depth activities. This methodology has been recognized

as a strategy that favors student agency and the active construction of knowledge (Bergmann; Sams, 2016). Accordingly, studies indicate that its application in higher education contributes to greater student engagement and better use of classroom time (Bueno; Da Rosa Rodrigues; Moreira, 2021).

Within the scope of educational transformations, blended learning emerges as an important foundation for practices such as the flipped classroom, as it integrates face-to-face and digital learning experiences. This perspective favors the personalization of teaching and expands the student's role as an active subject in the educational process (Bacich; Tanzi Neto; Trevisani, 2015).

Gamification, in turn, has become consolidated as an innovative pedagogical strategy by incorporating game elements, such as challenges, rewards, and goals, into the educational context. This approach contributes to increasing students' motivation, engagement, and participation in the learning process (Baldo; Da Conceição, 2024). In addition, its application in educational environments has been associated with pedagogical innovation and the transformation of teaching practices (Rodrigues; Neto; Da Silva, 2025).

The integration of the flipped classroom and gamification has been widely discussed as a promising possibility for higher education, especially because it enhances active learning and the development of cognitive and socio-emotional competencies. Evidence indicates that the combination of these strategies can improve academic performance and foster more dynamic and interactive learning (Chang; Kim; Kim, 2024). In this sense, such methodologies contribute to the construction of more meaningful educational experiences.

The meaningful learning proposed by Ausubel constitutes an essential theoretical framework for understanding the impacts of these methodologies on the educational process. According to this perspective, learning occurs more effectively when new knowledge is related to existing cognitive structures, assigning meaning to the content learned (Ausubel, 1982). Thus, active pedagogical practices, such as the flipped classroom and gamification, favor the consolidation of this type of learning by promoting the articulation between theory and practice.

Pedagogical innovation has also been widely discussed as a central element in improving the quality of higher education. Studies indicate that innovative strategies contribute significantly to academic performance and to students' critical education (Suárez et al., 2025). Furthermore, the adoption of approaches based on active pedagogical design favors the collaborative construction of knowledge and reflective learning (Zhao; He; Su, 2021).

Despite advances, there are still significant challenges related to the implementation of these methodologies, such as the need for continuous teacher training, adequate technological infrastructure, and cultural changes in the educational process. Research indicates that the effectiveness of the flipped classroom depends directly on structured pedagogical planning and student engagement (Baig; Yadegaridehkordi, 2023). In this sense, the articulation between theory and practice becomes fundamental to the success of these strategies.

Given this scenario, it can be observed that active methodologies represent a significant advance in higher education by promoting greater student participation, pedagogical innovation, and meaningful learning. The integration of the flipped classroom and gamification strengthens this movement by creating more dynamic, interactive, and student-centered educational environments (Moran; Bacich, 2018). These approaches reinforce the need to rethink the traditional teaching model.

Therefore, this study is justified by the relevance of analyzing the contributions of the flipped classroom and gamification in higher education, especially with regard to the promotion of meaningful learning, student agency, and pedagogical innovation. This is a current and relevant theme that dialogues with contemporary educational demands and with the need to train professionals who are more critical, autonomous, and prepared for complex contexts.

METHODOLOGY

This study is characterized as an integrative literature review, a method that enables the synthesis, critical analysis, and integration of scientific evidence on a given topic, allowing a broad understanding of

the phenomenon under investigation and the identification of gaps in knowledge. This type of review is widely used in the field of education because it enables the systematization of results from different methodological approaches.

The guiding question that oriented this study was: *what are the contributions of the flipped classroom and gamification to meaningful learning, student agency, and pedagogical innovation in higher education?*

The survey of studies was carried out in the LILACS, ERIC, and DOAJ databases and in scientific repositories linked to the OJS system (Open Journal Systems), as these are relevant sources for national and international scientific production in the areas of education, pedagogical innovation, and educational technologies. These databases were selected for their scope, reliability, and indexing quality.

For the article search, controlled and uncontrolled descriptors in Portuguese, English, and Spanish were used, including: “sala de aula invertida,” “flipped classroom,” “gamification,” “*gamificação*,” “*aprendizagem significativa*,” “meaningful learning,” “*enseñanza invertida*,” “*innovación pedagógica*,” and “active learning.” The descriptors were combined with the Boolean operators AND and OR in order to broaden or refine the results according to the needs of the investigation.

Studies published between 2021 and 2026, available in Portuguese, English, and Spanish, and directly addressing the themes of flipped classroom, gamification, and their contributions to higher education were included. Original articles, systematic reviews, integrative reviews, and empirical studies available in full were considered.

Duplicate studies, editorials, letters to the editor, simple abstracts, incomplete works, as well as publications that did not directly address the proposed theme or that were outside the established time frame, were excluded.

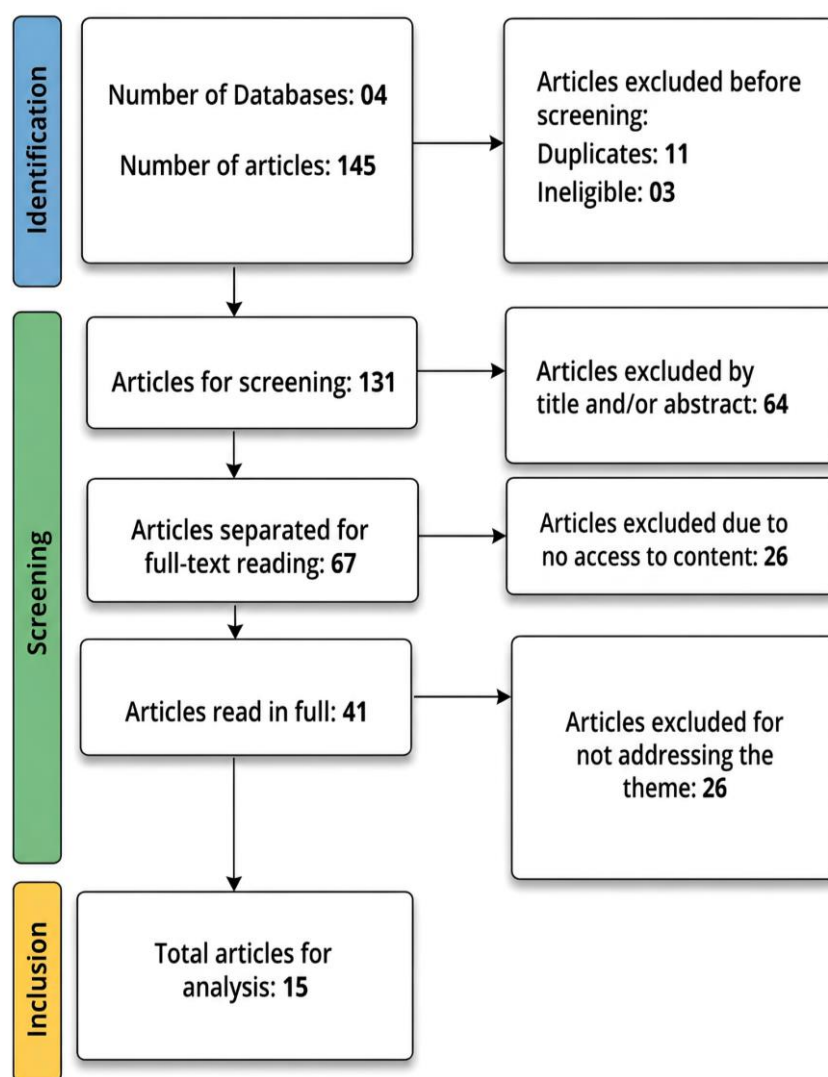
The study selection process occurred in sequential stages, comprising identification in the databases, screening by titles and abstracts, full-text reading, and application of the eligibility criteria. This process ensured methodological rigor, transparency, and reproducibility of the integrative review.

Data organization and analysis were carried out through thematic categorization, allowing the identification of convergences, divergences, and gaps in the scientific productions analyzed. This stage enabled the synthesis of evidence related to the contributions of active methodologies in higher education.

The methodological process for selecting the studies is represented in Figure 1, which visually summarizes all stages followed from the initial search to the definition of the final sample included in the review.

Figure 1

Flowchart of the study selection process



Source: Authors (2026).

Figure 1 systematically presents the methodological pathway adopted, allowing greater transparency, organization, and traceability of the selection process of the studies included.

Finally, it should be emphasized that the integrative review enables an in-depth and comprehensive understanding of the topic investigated, contributing to the consolidation of scientific knowledge and to the strengthening of innovative pedagogical practices in higher education.

RESULTS AND DISCUSSION

The bibliographic search was carried out in the Latindex, ERIC, DOAJ, SpringerLink, and Miguilim databases, covering national and international scientific productions related to emerging technologies, knowledge production in the digital society, epistemological transformations, and the implications of these changes for education and pedagogical innovation. These databases were selected for their academic relevance, breadth of indexing, and contribution to the dissemination of qualified scientific studies.

After the rigorous application of the previously established inclusion and exclusion criteria, as well as the removal of duplicate publications, the reading of titles and abstracts, and the careful analysis of the full texts, 15 scientific articles were selected to compose the final sample of this integrative review. This process ensured greater methodological rigor, reliability, and consistency in the selection of studies.

The included studies were published between 2021 and 2026 and presented different theoretical and empirical approaches to the influence of emerging technologies on the processes of constructing, sharing, and validating knowledge. The evidence analyzed reveals relevant contributions to the understanding of contemporary educational transformations and their implications for innovative pedagogical practices.

The characterization of the selected articles enabled a systematic and comparative analysis of the scientific productions. This organization makes it possible to identify trends, convergences, and gaps in

the knowledge produced.

Table 1

Synthesis of the studies included in the integrative review

Author/Year	Objective of the Study	Axis of the Study	Main Contributions
Ng; Lo (2022)	To assess the impact of the flipped classroom associated with gamification on academic performance and student engagement in sustainable learning contexts	Flipped classroom and gamification in higher education	Shows that the articulation between flipped classroom and gamification enhances academic performance, strengthens student engagement, and promotes greater academic commitment, contributing to more active, sustainable, and student-centered learning
Lopes et al. (2022)	To analyze students' perceptions of the flipped classroom approach in an educational innovation project	Student perception and pedagogical innovation	Demonstrates high acceptance of the methodology by students, highlighting increased autonomy, greater involvement in the learning process, and a positive perception of the reorganization of pedagogical time
Guerrero-Quiñonez et al. (2023)	To investigate the gamified flipped classroom as a pedagogical strategy in higher education from a systematic perspective	Gamification and flipped classroom	Shows that the integration of gamification and the flipped classroom intensifies intrinsic motivation, promotes continuous engagement, and favors the construction of active, dynamic, and meaningful learning
Huesca et al. (2023)	To implement and analyze a combined strategy of gamification and flipped classroom in basic programming courses	Application of active methodologies in higher education	Indicates that the combined strategy favors the development of higher-order cognitive competencies, improves academic performance, and strengthens problem-solving capacity in practical contexts
Priyaadharshini; Maiti (2023)	To investigate the use of learning analytics associated with gamification in the flipped classroom in higher education	Data-based learning and gamification	Highlights that the analysis of educational data enables continuous monitoring of learning, favoring the personalization of teaching and more precise and efficient pedagogical interventions
Parreira et al. (2023)	To analyze the relationship between active methodologies, meaningful learning, and the flipped classroom	Meaningful learning and active methodologies	Reinforces that learning becomes more meaningful when students relate prior knowledge to new content, assuming an active, reflective, and protagonist role in the educational process
Lopes et al. (2024)	To evaluate students' perceptions of the flipped classroom in higher education contexts	Student experience and blended learning	Shows a positive perception of the methodology, with emphasis on greater autonomy, engagement, and better understanding of the content addressed

Kelly; Wu; Liebe (2024)	To investigate the use of generative artificial intelligence to enhance gamification in the flipped classroom in higher education	Artificial intelligence, gamification, and pedagogical innovation	Demonstrates that the use of AI enhances the personalization of learning, increases student engagement, and favors more interactive, adaptive, and dynamic educational experiences
Niyazova; Nelidova (2024)	To explore innovative teaching and learning approaches in higher education aimed at student empowerment	Pedagogical innovation and student agency	Shows that innovative pedagogical practices strengthen student autonomy, expand critical competencies, and promote greater agency in the learning process
Lopes et al. (2024)	To investigate the optimization of the flipped classroom associated with gamification and team-based learning	Integrated active methodologies	Indicates that the combination of active strategies promotes greater engagement, peer collaboration, and improved academic performance
Majini; Bella (2025)	To analyze the impact of innovative pedagogical practices on student engagement in higher education	Student engagement and pedagogical innovation	Demonstrates that innovative methodologies significantly increase students' engagement, motivation, and active participation in dynamic educational environments
Carreço et al. (2025)	To analyze the application of active methodologies in basic and higher education, focusing on flipped classroom and gamification	Active methodologies and educational innovation	Shows that such methodologies contribute to the development of cognitive, social, and collaborative competencies, promoting more meaningful learning
Ribeiro et al. (2025)	To discuss the flipped classroom as a new paradigm for contemporary teaching and learning	Pedagogical transformation and flipped classroom	Reinforces the centrality of students in the learning process and the redefinition of the teacher's role as a mediator of knowledge
Da Rocha Nobre et al. (2025)	To analyze peer instruction as a strategy within active methodologies	Collaborative learning	Highlights that peer learning strengthens the collective construction of knowledge, promoting greater interaction, cooperation, and conceptual consolidation
Rúdio et al. (2025)	To propose the integration of active, agile, immersive, and analytical methodologies in contemporary education	Educational innovation and methodological integration	Presents an innovative educational model based on the convergence of methodologies and emerging technologies, promoting the transformation of teaching and learning processes
Severino et al. (2026)	To analyze flipped classroom strategies in contemporary education	Flipped classroom in higher education	Shows that the flipped classroom strengthens student autonomy, improves prior study, and improves the dynamics of classroom interactions

Source: Authors (2026).

The integrated analysis of the studies shows that the adoption of active methodologies, especially the flipped classroom associated with gamification, represents a significant transformation in the teaching-learning process in higher education. The findings demonstrate convergence among different authors regarding the strengthening of student agency, the expansion of academic engagement, and the promotion of more dynamic, interactive, and student-centered pedagogical practices.

In this context, the discussion was organized into two main thematic axes: (1) the flipped classroom as a strategy for pedagogical reorganization and strengthening of active learning; (2) gamification and emerging technologies as catalysts for engagement and educational innovation.

THE FLIPPED CLASSROOM AS A STRATEGY FOR PEDAGOGICAL REORGANIZATION AND STRENGTHENING OF ACTIVE LEARNING

The studies analyzed demonstrate consensus that the flipped classroom constitutes a pedagogical strategy capable of significantly reorganizing the dynamics of higher education, shifting the focus from the transmission of content to the active construction of knowledge. For Ng and Lo (2022), the inversion of the traditional logic favors greater academic commitment and improved performance by allowing students to assume a more active role in the educational process. In the same direction, Lopes et al. (2022) reinforce that students' perception of the model is widely positive, especially with regard to autonomy and involvement in learning activities.

In a complementary manner, Guerrero-Quíñonez et al. (2023) highlight that the flipped classroom, when systematically structured, enhances students' continuous engagement and favors active learning, especially when associated with interactive strategies. Huesca et al. (2023) corroborate this perspective by showing that the practical application of the methodology in complex subjects contributes to the development of higher-order cognitive skills, such as logical reasoning and problem solving.

The centrality of students in the educational process is also emphasized by Parreira et al. (2023), who highlight that meaningful learning occurs when students establish relationships between prior

knowledge and new content in active contexts. This understanding is reinforced by Ribeiro et al. (2025), who defend the flipped classroom as a new educational paradigm in which the teacher assumes the role of mediator and the student becomes the main agent of learning.

Furthermore, Severino et al. (2026) show that the strategy contributes to better organization of prior study and improves classroom interaction dynamics, strengthening student autonomy. Lopes et al. (2024) also point out that the methodology favors greater conceptual understanding and engagement, reinforcing its effectiveness in higher education. Accordingly, Da Rocha Nobre et al. (2025) add that strategies associated with peer learning further enhance the collaborative construction of knowledge within this model.

Thus, broad agreement can be observed among the authors in recognizing that the flipped classroom promotes a significant reorganization of the pedagogical process, favoring active learning, student autonomy, and the strengthening of cognitive and collaborative competencies, consolidating itself as a relevant strategy for contemporary educational innovation.

GAMIFICATION AND EMERGING TECHNOLOGIES AS CATALYSTS FOR ENGAGEMENT AND EDUCATIONAL INNOVATION

The studies analyzed indicate that gamification, when integrated with the flipped classroom, acts as a catalytic element for student engagement and pedagogical innovation. Ng and Lo (2022) highlight that gamification contributes directly to increasing students' involvement and improving academic performance, especially when associated with active learning strategies. Similarly, Guerrero-Quíñonez et al. (2023) show that gamification intensifies intrinsic motivation and promotes greater continuous participation in the educational process.

Huesca et al. (2023) reinforce this perspective by demonstrating that the combination of gamification and the flipped classroom in practical contexts, such as programming, favors not only academic performance but also the development of complex competencies. Priyaadharshini and Maiti

(2023) broaden this discussion by highlighting the role of learning analytics in gamification, emphasizing that the use of educational data enables the personalization of teaching and more precise pedagogical interventions, based on continuous monitoring of student performance.

In this scenario, Kelly, Wu, and Liebe (2024) add a relevant technological dimension by showing that the integration of generative artificial intelligence with gamification enhances the personalization of learning and significantly expands interactivity in the educational environment. This perspective dialogues with Majini and Bella (2025), who emphasize the positive impact of innovative pedagogical practices on student engagement, evidencing greater motivation and active participation.

In addition, Lopes et al. (2024) demonstrate that the combination of flipped classroom, gamification, and team-based learning strengthens collaboration among students and improves academic performance. Accordingly, Carreço et al. (2025) highlight that gamification, when integrated with other active methodologies, contributes to the development of social and cognitive competencies that are fundamental to contemporary education.

Pedagogical innovation is also emphasized by Niyazova and Nelidova (2024), who point out that student-centered approaches strengthen student agency and expand critical skills essential for the twenty-first century. Complementarily, Rúdio et al. (2025) highlight that the integration of active, immersive, and analytical methodologies represents a significant advance in contemporary education, promoting structural transformations in the teaching-learning process.

Finally, Da Rocha Nobre et al. (2025) reinforce the importance of collaborative learning as an element that enhances active methodologies, showing that peer interaction contributes to the consolidation of knowledge. Thus, there is consensus among the authors that gamification, combined with emerging technologies and active methodologies, constitutes a central axis for educational innovation, promoting greater engagement, personalization of learning, and transformation of pedagogical practices in higher education.

CONCLUSION

Taken together, the evidence analyzed in this integrative review enabled an in-depth understanding of the contributions of the flipped classroom and gamification in the context of higher education, especially with regard to the promotion of meaningful learning, the strengthening of student agency, and the innovation of pedagogical practices.

In light of the guiding question, the results show that the integration between flipped classroom and gamification exerts a positive and consistent influence on the learning process by favoring the active construction of knowledge, the articulation between prior knowledge and new content, and the increase of academic engagement. In this sense, such methodologies expand student autonomy and qualify students' participation in the educational process.

Regarding the proposed objective, which consisted of analyzing the contributions of the flipped classroom and gamification in higher education, the findings demonstrate that both strategies promote significant changes in the organization of the teaching-learning process. It is observed that the flipped classroom reconfigures the teacher's role, while gamification acts as a dynamic element of learning, intensifying students' motivation and interest.

With regard to the main findings of the investigation, the convergence among the studies analyzed stands out in relation to the strengthening of student agency, evidenced by increased autonomy, active participation, and collaborative learning. Furthermore, gamification appeared recurrently as a strategy capable of enhancing engagement, especially when associated with active methodologies and emerging technological resources.

From the perspective of pedagogical innovation, the results indicate that the adoption of these methodologies contributes to the reconfiguration of educational practices in higher education, making them more flexible, interactive, and aligned with contemporary demands. In addition, it is observed that the use of digital technologies, such as artificial intelligence and educational data analysis, expands the possibilities for personalizing teaching and qualifying the educational process.

Thus, it can be inferred that the flipped classroom and gamification constitute complementary and effective strategies capable of promoting more active, meaningful, and student-centered learning. Their integration favors the overcoming of traditional teaching models, contributing to the construction of more participatory, dynamic, and innovative educational environments.

Finally, as a recommendation for future research, it is suggested that longitudinal empirical studies be conducted to investigate the effectiveness of the integrated application of these methodologies in different higher education contexts, with emphasis on the analysis of variables such as academic performance, levels of engagement, development of competencies, and impact on students' professional education.

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EMERGING TECHNOLOGIES AND KNOWLEDGE PRODUCTION IN THE DIGITAL SOCIETY: EPISTEMOLOGICAL TRANSFORMATIONS, CONTEMPORARY CHALLENGES, AND PERSPECTIVES FOR EDUCATION AND INNOVATION

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Abstract

Emerging technologies have driven profound transformations in the digital society, directly impacting knowledge production processes, education, and innovation. This study aims to analyze the contributions of these technologies to the construction of knowledge in contemporary times, as well as their

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epistemological and educational implications. This is an integrative literature review conducted in the Latindex, ERIC, DOAJ, SpringerLink, and Miguilim databases, covering the period from 2021 to 2026 and including texts in Portuguese and English. Fourteen studies were selected after the application of inclusion and exclusion criteria. The results show that emerging technologies foster collaborative environments, expand access to information, and strengthen innovative educational practices, contributing to the reconfiguration of learning processes. However, challenges related to digital inclusion, teacher training, and the need to develop critical literacy were observed. It is concluded that knowledge production in the digital society assumes a dynamic, collaborative, and technology-mediated character, requiring new competencies and educational approaches.

Keywords: Digital education, Digital society, Emerging technologies, Innovation, Knowledge production.

INTRODUCTION

The advancement of digital technologies has promoted profound transformations in the ways society produces, shares, and uses knowledge. The expansion of the internet, artificial intelligence, cloud computing, data analysis, and other emerging technologies has significantly altered communication, learning, research, and innovation processes, contributing to the consolidation of a society that is increasingly connected and dependent on digital flows of information (Lévy, 2010; Criollo-C et al., 2023). In this context, the digital society is characterized by permanent connectivity, the accelerated circulation of information, and the expansion of possibilities for interaction among individuals, institutions, and technological systems, redefining the foundations of contemporary knowledge production (Mena-Guacas et al., 2025).

The changes associated with digital transformation are directly related to the development of cyberculture, understood as a social and cultural phenomenon resulting from the expansion of cyberspace and digital communication networks (Lévy, 2010). The growing integration between people and

technologies has fostered new forms of social participation and collective construction of knowledge, enabling knowledge to be produced in a more dynamic, decentralized, and collaborative manner.

In this scenario, collective intelligence stands out as one of the main elements of the digital society. The ability to connect individuals in collaborative networks expands opportunities for sharing experiences, solving problems, and producing innovative knowledge (Lévy, 2014). Knowledge comes to be constructed through interaction among different subjects and contexts, strengthening collaborative processes that transcend geographical, institutional, and disciplinary boundaries.

At the same time, contemporary technological transformations have brought about significant changes in the epistemological foundations of knowledge production. The increasing complexity of social, scientific, and technological phenomena requires approaches capable of overcoming fragmented models for understanding reality and promoting an integrated view of contemporary problems (Morin, 2005).

The need to rethink educational processes becomes particularly relevant in this context. Contemporary education is challenged to form individuals capable of dealing with the complexity, uncertainty, and constant transformations of the digital world. To this end, it is essential to develop competencies that foster critical reflection, intellectual autonomy, and the capacity to learn continuously throughout life (Morin, 2015).

Several recent studies have demonstrated the potential of emerging technologies to transform teaching and learning processes. Tools such as artificial intelligence, augmented reality, virtual reality, adaptive learning, and digital platforms have contributed to the creation of more interactive and personalized educational experiences, fostering student engagement and expanding learning opportunities (Criollo-C et al., 2023).

The growing integration between technology and education is also related to the demands of Society 5.0, a model that seeks to balance technological development, innovation, and human well-being. In this context, technological innovation assumes a strategic role in the construction of more flexible and

inclusive educational systems aligned with the needs of contemporary society (Legi, Damanik and Giban, 2023).

However, despite the numerous opportunities offered by emerging technologies, challenges persist that hinder their effective implementation in educational systems. Problems related to technological infrastructure, digital inclusion, teacher training, and inequalities in access continue to limit the full use of digital resources in various educational contexts (Alenezi, Wardat and Akour, 2023). These limitations highlight the need for policies and strategies that promote greater equity and democratization of access to knowledge.

In addition to structural challenges, the digital society faces issues related to the quality, reliability, and validation of information available in virtual environments. The growing volume of content produced and shared daily requires the development of competencies capable of fostering critical analysis of information and the construction of scientifically grounded knowledge. In this context, epistemic literacy emerges as an essential competence for the formation of reflective individuals who are aware of their role in knowledge construction (Nascimento et al., 2026).

Emerging technologies also play a relevant role in promoting innovation, entrepreneurship, and economic development. The integration between digital technology, innovation, and education has contributed to strengthening entrepreneurial competencies, stimulating creativity, problem-solving capacity, and the generation of innovative solutions to contemporary challenges (Udekwe and Iwu, 2024). Thus, knowledge becomes a strategic resource for sustainable development and for the competitiveness of organizations and societies.

Future perspectives point to an even greater expansion of the presence of emerging technologies in educational and scientific environments. Recent evidence indicates that these technologies will continue to significantly influence teaching, learning, and knowledge production processes, requiring constant adaptations on the part of educational institutions and professionals (Mena-Guacas et al., 2025). At the

same time, pedagogical innovations associated with digital transformation tend to foster the construction of more participatory, collaborative educational models centered on students' needs (Fuente, 2025).

Despite the advances observed, there are still gaps related to understanding the epistemological impacts arising from the incorporation of emerging technologies into knowledge production processes. The speed of digital transformations, combined with the growing technological dependence of educational and scientific institutions, requires deeper reflection on the opportunities and challenges involved in this phenomenon.

Given this scenario, this study is justified by the relevance of emerging technologies in reconfiguring the processes of knowledge construction and dissemination, as well as by the need to understand their impacts on education, innovation, and the epistemological dynamics of the digital society. Understanding these transformations can contribute to the development of more effective strategies aimed at the critical, ethical, and innovative use of technologies in different educational and scientific contexts.

Thus, this study aims to analyze the contributions of emerging technologies to knowledge production in the digital society, discussing the epistemological transformations resulting from this process, the contemporary challenges related to education and innovation, and future perspectives for the construction of knowledge in increasingly digital and interconnected contexts.

METHODOLOGY

This is an integrative literature review, a method that enables the synthesis and critical analysis of scientific knowledge produced on a given topic, allowing evidence from different studies to be brought together and contributing to a broader understanding of the phenomenon under investigation. The choice of this approach is justified by the need to identify, analyze, and integrate scientific findings related to emerging technologies and knowledge production in the digital society, considering their epistemological, educational, and innovative implications.

To guide the development of the research, the following guiding question was formulated: *how have emerging technologies influenced knowledge production in the digital society, and what are their implications for epistemological transformations, education, and innovation in the contemporary period?*

The search for studies was carried out in the scientific databases and libraries Latindex (Sistema Regional de Información en Línea para Revistas Científicas de América Latina, el Caribe, España y Portugal), ERIC (Education Resources Information Center), DOAJ (Directory of Open Access Journals), SpringerLink, and Miguilim, selected for their relevance in indexing national and international publications related to the fields of education, technology, innovation, and knowledge production.

To construct the search strategy, descriptors in Portuguese and English were used, combined through the Boolean operators AND and OR. The main descriptors employed were: “tecnologias emergentes”, “sociedade digital”, “produção do conhecimento”, “transformação digital”, “educação digital”, “inovação educacional”, “emerging technologies”, “digital society”, “knowledge production”, “digital transformation”, “digital education” and “educational innovation.” The combinations of descriptors were adapted to the specificities of each database in order to broaden the sensitivity and scope of the search.

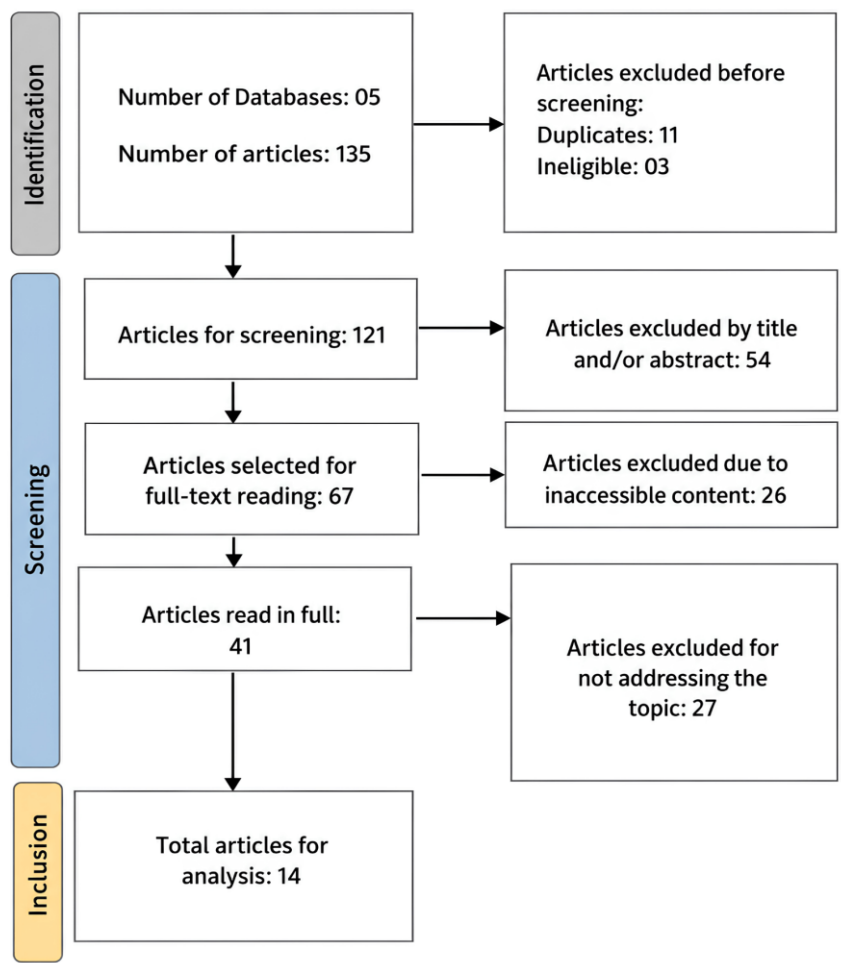
Inclusion and exclusion criteria were established to ensure the methodological quality and relevance of the selected studies. The inclusion criteria considered were: full-text scientific articles; published between 2021 and 2026; written in Portuguese or English; related to the theme of emerging technologies, knowledge production, digital education, innovation, or epistemological transformations; and presenting results relevant to answering the research guiding question.

As exclusion criteria, duplicate studies across databases were discarded; simple abstracts, editorials, letters to the editor, undergraduate final papers, dissertations, theses, book chapters, and conference proceedings; publications without access to the full text; studies published in languages other than those previously defined; and articles that, after reading the title, abstract, and full text, did not present a direct relationship with the proposed objectives.

The study selection process occurred in successive stages. Initially, electronic searches were conducted in the selected databases. Next, titles and abstracts were read to identify potentially eligible studies. Subsequently, the selected articles were read in full to verify their adequacy according to the established criteria. At the end of this process, the included studies composed the final sample of the integrative review.

The organization of the methodological stages of the research is presented in Figure 1, prepared based on recommendations for integrative literature reviews. The flowchart demonstrates the path adopted from the identification of studies to the definition of the final sample analyzed.

Figure 1
Flowchart of the study selection process for the integrative review



Source: Authors (2026).

After the articles were selected, the information was extracted and organized using an instrument developed by the researchers, containing variables such as author, year of publication, country of origin, study objective, methodology employed, and main results related to emerging technologies, knowledge production, education, and innovation. The data obtained were organized into synoptic tables to facilitate comparison and interpretation of the findings.

The studies were analyzed using thematic analysis, making it possible to identify convergences, divergences, and trends present in the scientific literature. The results were grouped into thematic categories constructed from the research objectives and the evidence found, enabling a critical discussion of the epistemological transformations associated with the use of emerging technologies in the digital society, as well as their impacts on educational and innovative processes.

Because this research was developed exclusively with secondary data available in publicly accessible scientific databases, without direct involvement of human beings, there was no need for submission to a Research Ethics Committee, in accordance with the current guidelines for literature review studies.

RESULTS AND DISCUSSION

The bibliographic search carried out in the Latindex, ERIC, DOAJ, SpringerLink, and Miguilim databases resulted in the identification of studies related to emerging technologies, knowledge production in the digital society, epistemological transformations, and implications for education and innovation. After applying the previously established inclusion and exclusion criteria, as well as removing duplicate publications and carefully reading the full texts, 14 scientific articles were selected to compose the final sample of this integrative review.

The studies analyzed were published between 2021 and 2026 and presented different approaches to the influence of emerging technologies on the processes of constructing, sharing, and validating

knowledge. The characterization of the included articles, encompassing authorship, year of publication, objective, and main contributions to the topic investigated, is presented in Table 1.

Table 1

Characterization of the studies included in the integrative review

Author/Year	Study objective	Study axis	Main contributions
Tan <i>et al.</i> (2021)	To analyze the Knowledge Building model as a strategy for aligning education with the demands of the digital age.	Knowledge production and collaborative learning.	Demonstrated that collaborative digital environments foster the collective creation of knowledge, the development of critical thinking, and the active participation of students in processes of inquiry and innovation.
Ciarli <i>et al.</i> (2021)	To investigate the relationship among digital technologies, innovation, and the development of competencies for the knowledge economy.	Digital transformation and competency development.	Showed that technological innovation requires new cognitive and professional skills, reinforcing the need for educational systems to adapt to the demands of the digital economy.
Akour and Alenezi (2022)	To discuss the future of higher education in the face of digital transformation.	Higher education and digital transformation.	Identified that the digitalization of educational institutions promotes structural changes in academic management, pedagogical methodologies, and knowledge production processes.
Haleem <i>et al.</i> (2022)	To review the role of digital technologies in contemporary education.	Digital technologies applied to education.	Highlighted that digital tools expand access to knowledge, foster personalized learning, and strengthen more flexible and interactive educational processes.
Almufarreh and Arshad (2023)	To examine promising emerging technologies for teaching and learning.	Emerging technologies and educational innovation.	Identified the potential of artificial intelligence, virtual reality, augmented reality, and data analysis to improve the educational experience and promote greater student engagement.
Farias-Gaytan, Aguaded and Ramírez-Montoya (2023)	To analyze digital transformation and digital literacy in higher education institutions.	Digital literacy and higher education.	Demonstrated that digital transformation requires strengthening digital, informational, and critical competencies to ensure effective participation in the knowledge society.
Shenkoya and Kim (2023)	To investigate the impacts of the digital transformation of the Fourth Industrial Revolution on open knowledge.	Open knowledge and sustainability.	Demonstrated that digitalization favors the democratization of knowledge and expands access to scientific production, strengthening open science practices and global collaboration.

Zhang, Chen and Wang (2023)	To evaluate how technology drives innovation in university teaching from the perspective of knowledge creation.	Pedagogical innovation and knowledge creation.	Found that technological integration fosters educational innovation and strengthens environments focused on knowledge production and sharing.
Deák and Kumar (2024)	To review the role of STEAM education in developing digital competencies for sustainable innovations.	Digital competencies and sustainable innovation.	Found that interdisciplinary approaches contribute to the development of digital skills, creativity, and complex problem-solving.
Ghanbaripour <i>et al.</i> (2024)	To analyze the impacts of emerging technologies on students' learning, engagement, and employability.	Emerging technologies and academic performance.	Identified significant improvements in engagement, active learning, and the development of professional competencies aligned with the demands of the contemporary labor market.
Ajani (2025)	To examine challenges and opportunities for knowledge production through the management of technology and innovation in higher education.	Innovation management and knowledge production.	Demonstrated that the strategic management of technology strengthens research, stimulates institutional innovation, and enhances scientific production.
Fitzpatrick <i>et al.</i> (2025)	To propose recommendations for higher education institutions to move from digital transformation toward new organizational models.	Digital governance and institutional innovation.	Highlighted the need for institutional policies aimed at digital sustainability, technological ethics, and organizational adaptation in scenarios of continuous transformation.
Stanciu (2025)	To discuss the integration of new technologies into teaching and learning processes.	Technological integration in teaching.	Showed that the adoption of innovative technologies enhances the quality of learning and fosters more participatory, student-centered methodologies.
Zou <i>et al.</i> (2025)	To analyze trends, challenges, and innovations related to digital learning in the twenty-first century.	Digital learning and educational innovation.	Demonstrated that technological integration will continue to reshape educational processes, requiring new competencies, methodologies, and knowledge management models.

Source: Authors (2026).

The integrated interpretation of the studies analyzed shows that the articulation among emerging technologies, knowledge production, and educational transformation constitutes a systemic process marked by epistemological, pedagogical, and institutional reconfigurations. The findings point to

theoretical convergence among the authors regarding the structuring role of digital technologies in reorganizing contemporary forms of learning, innovation, and knowledge construction.

The discussion was organized into two analytical axes: (1) the reconfiguration of knowledge production mediated by emerging technologies; and (2) the challenges and perspectives of digital transformation in the contemporary educational context.

EMERGING TECHNOLOGIES AND THE RECONFIGURATION OF KNOWLEDGE PRODUCTION

With regard to transformations in knowledge production, it is observed that emerging technologies have been redefining the epistemological foundations of learning and scientific inquiry processes. Tan et al. (2021) show that knowledge, in the digital age, shifts from transmissive models to collaborative dynamics of collective construction, in which subjects assume an active role in the production of knowledge. Similarly, Zhang et al. (2023) emphasize that innovation in higher education emerges from interactive knowledge-creation environments, in which learning is constituted as a shared and continuous process.

From the perspective of contemporary competencies and demands, Ciarli et al. (2021) highlight that the expansion of digital technologies redefines innovation trajectories and requires more complex cognitive skills, especially those related to critical analysis and problem-solving. In a complementary manner, Ajani (2025) argues that the strategic management of technology and innovation in higher education strengthens the institutional capacity for producing scientific and technological knowledge.

Regarding the democratization and circulation of knowledge, Shenkoya and Kim (2023) point out that digital transformation has driven the consolidation of open science practices, expanding access to knowledge and promoting greater collaboration among researchers on a global scale. Along the same lines, Haleem et al. (2022) reinforce that digital technologies broaden educational accessibility and foster more flexible, personalized, and inclusive learning processes.

In the field of pedagogical practices, Tan et al. (2021) argue that digital environments structured for collective knowledge enhance students' active participation in the construction of knowledge. Similarly, Ghanbaripour et al. (2024) show that the use of emerging technologies positively affects student engagement and academic performance, especially in educational contexts that value active methodologies.

As for competency development, Ciarli et al. (2021) and Deák and Kumar (2024) converge in affirming that knowledge production in the digital society depends on the integration of digital skills, critical thinking, and innovation capacity. These authors emphasize that contemporary education needs to incorporate such competencies as a structuring axis of academic formation.

In the field of educational trends, Zou et al. (2025) highlight that twenty-first-century digital learning is characterized by the strong integration of intelligent technologies and innovative pedagogical practices, resulting in new models of knowledge production. In a complementary manner, Stanciu (2025) reinforces that the incorporation of technologies into teaching increases interactivity and promotes more dynamic, student-centered educational environments.

Thus, the studies analyzed indicate that knowledge production in the digital society is structured as a distributed, collaborative, and technology-mediated process, in which learning is continuously reconstructed through interaction among subjects, data, and digital environments.

CHALLENGES AND PERSPECTIVES OF DIGITAL TRANSFORMATION IN CONTEMPORARY EDUCATION

With regard to structural changes in education, it is observed that digital transformation has brought about profound reconfigurations in educational institutions, requiring organizational and pedagogical adaptations. Akour and Alenezi (2022) highlight that higher education is undergoing a transition process marked by the digitalization of academic systems, which implies new forms of management, teaching, and assessment.

From the perspective of digital competencies, Farias-Gaytan, Aguaded and Ramírez-Montoya (2023) emphasize that the advancement of digital transformation requires strengthening digital and informational literacy as an essential condition for critical participation in the knowledge society. Similarly, Alenezi et al. (2023) point out that challenges such as inequality of access, infrastructure limitations, and gaps in teacher training still compromise the full integration of technologies into education.

Regarding institutional governance, Fitzpatrick et al. (2025) argue that higher education institutions need to move toward more complex models of digital transformation, incorporating ethical, structural, and strategic dimensions into their management processes. This perspective shows that isolated digitalization is not sufficient; rather, a systemic restructuring of educational organizations is necessary.

In the field of technological implementation, Almufarreh and Arshad (2023) highlight that, although emerging technologies present high educational potential, their effectiveness depends on teacher training and methodological adequacy. Similarly, Haleem et al. (2022) reinforce that technological integration must be aligned with clear pedagogical objectives, avoiding merely instrumental approaches.

With regard to pedagogical practices, Stanciu (2025) emphasizes that the use of technologies in teaching must be accompanied by active methodologies that promote autonomy, participation, and meaningful learning. In a complementary manner, Zou et al. (2025) point out that the increased availability of information in the digital environment requires the development of critical competencies for selecting, analyzing, and validating knowledge.

Regarding future perspectives, Shenkoya and Kim (2023) indicate that the expansion of open knowledge tends to strengthen the democratization of access to information and expand global scientific collaboration. Deák and Kumar (2024) complement this view by highlighting that interdisciplinary approaches such as STEAM contribute to the development of competencies oriented toward sustainable innovation.

In the context of innovation management, Ajani (2025) emphasizes that effective institutional policies are fundamental to enhancing knowledge production and strengthening the innovative capacity of educational institutions. Similarly, Ghanbaripour et al. (2024) show that the incorporation of emerging technologies can positively affect students' academic performance and employability.

Finally, Zhang et al. (2023) reinforce that technological innovation in teaching must be understood as a continuous process of knowledge construction, requiring the permanent adaptation of pedagogical and institutional practices. Thus, digital transformation in contemporary education presents itself as a complex phenomenon that simultaneously promotes innovative opportunities and generates structural and epistemological challenges, requiring articulated and integrated responses.

CONCLUSION

Based on the critical analysis of the studies, it is observed that emerging technologies exert a significant and multifaceted influence on knowledge production processes in the digital society. The evidence gathered demonstrates that such technologies not only expand forms of access to information but also reconfigure the epistemological, pedagogical, and social foundations that sustain contemporary knowledge construction.

In response to the guiding question, it was found that emerging technologies directly influence knowledge production by promoting collaborative, dynamic, and interactive digital environments. These environments foster the collective construction of knowledge, the expansion of access to information, and the strengthening of more flexible and innovative educational practices. However, such transformations also reveal challenges related to digital inclusion, the critical formation of individuals, and the need for scientific validation of the information available.

With regard to the objective of the study, which consisted of analyzing the contributions of emerging technologies to knowledge production in the digital society, it was observed that this objective was achieved. The findings demonstrated that these technologies significantly impact educational and

scientific processes while also driving new forms of interaction among subjects, knowledge, and technology, promoting important epistemological reconfigurations.

Among the main findings, it is noteworthy that knowledge production in the digital society assumes a collaborative, distributed, and technology-mediated character, breaking with traditional models centered on the unidirectional transmission of information. In addition, it was shown that the integration of emerging technologies into education enhances pedagogical innovation, expands student engagement, and contributes to the development of digital and critical competencies essential to the contemporary context.

Another relevant aspect identified concerns the persistent challenges in implementing these technologies, especially with respect to inequalities in access, the need for continuous teacher training, and the construction of epistemic literacy. These factors indicate that the mere adoption of digital tools is not sufficient to guarantee effective changes in the production and use of knowledge, making a more structured and critical pedagogical and institutional approach necessary.

In view of this, future research should conduct empirical studies in specific educational contexts, focusing on the analysis of the effectiveness of emerging technologies in learning, the development of critical competencies, and knowledge production. It is also recommended that investigations explore the impact of generative artificial intelligence and adaptive systems on academic formation, as well as comparative studies among different levels of education and socioeducational realities, with the aim of deepening the understanding of the effects of digital transformation on contemporary education.

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ASSESSMENT IN THE AGE OF ARTIFICIAL INTELLIGENCE: CHALLENGES, POSSIBILITIES, AND ETHICS

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Abstract

The widespread adoption of generative artificial intelligence has brought about profound changes in educational practices, particularly in assessment processes traditionally based on content reproduction and the individual verification of learning. As students and teachers increasingly use these technologies, questions have arisen concerning authorship, originality, academic integrity, and the very purposes of school assessment. This study aims to discuss the challenges, possibilities, and ethical implications of assessment in educational contexts permeated by artificial intelligence, reflecting on the need to redefine assessment practices in basic education. Methodologically, this is a bibliographic and documentary study grounded in research on learning assessment, educational technologies, and artificial intelligence applied to education. The findings indicate that AI, when used critically and with appropriate pedagogical guidance, can contribute to more formative, personalized, and process-oriented assessment practices without replacing teacher mediation and professional judgment. It is concluded that the challenges posed by artificial intelligence do not point to a weakening of assessment but rather to the need to reconstruct its objectives, methods, and criteria in light of new forms of knowledge production within digital culture.

Keywords: Artificial intelligence, Basic education, Digital ethics, Learning assessment, Teacher education.

INTRODUCTION

Few topics have caused as much concern in contemporary school life as the relationship between artificial intelligence and learning assessment. Since the widespread adoption of generative tools capable of producing texts, solving mathematical problems, writing computer code, and answering complex questions in natural language, teachers and educational institutions have begun to question the validity of the instruments traditionally used to assess student learning. Take-home assignments, essays, exercise lists, and school research projects now coexist with the possibility that intelligent systems may produce

them in whole or in part, shifting the pedagogical debate from the mere verification of authorship to the very purpose of school assessment.

Although concerns about the misuse of technology are not new, artificial intelligence introduces a new element into this landscape: the ability to produce original, coherent, and contextualized responses within seconds, approximating tasks historically associated with human intellectual work. The ease of access to these tools means that the debate over prohibiting or permitting their use has become increasingly insufficient, requiring broader reflection on the competencies we seek to develop and the criteria used to recognize them in assessment processes.

In this context, learning assessment ceases to function merely as a mechanism for measuring assimilated content and assumes an even more important role in understanding cognitive processes, the strategies employed by students, and the progressive construction of knowledge. As Jussara Hoffmann observes, assessment does not mean classifying or selecting individuals, but understanding their learning pathways and providing the conditions necessary for learning to continue.

According to Hoffmann (2018, p. 17): “Assessment means monitoring the process of knowledge construction, providing learners with opportunities to reflect on the world and the reality in which they are situated.”

This understanding is particularly relevant in view of the challenges posed by artificial intelligence, as it shifts the focus of assessment from the final product to the pathways, strategies, and processes mobilized by students during learning.

Cipriano Carlos Luckesi’s contributions follow the same direction in advocating the transcendence of what the author calls classificatory or punitive assessment. According to Luckesi (2011, p. 28): “School learning assessment must be a loving, welcoming, inclusive, and dynamic act.”

Although formulated before the emergence of artificial intelligence, the author’s statement remains relevant because it reinforces the need for assessment practices committed to student development rather than merely to the certification of performance.

At the same time, the expansion of AI requires schools to revisit conceptions historically associated with authorship, originality, and intellectual production. In a context in which students can use intelligent systems to draft texts, organize arguments, or synthesize information, the mere reproduction of content is likely to lose its value progressively as an indicator of learning. Issues involving critical analysis, argumentation, creativity, problem-solving, and the ability to mobilize knowledge in complex situations are becoming increasingly significant in assessment processes.

This discussion is closely aligned with Philippe Perrenoud's reflections on competency-based assessment. For the author, assessment entails determining a student's ability to mobilize knowledge in concrete situations, rather than merely reproduce information previously committed to memory. According to Perrenoud (1999, p. 53): "Assessing competencies means observing students as they engage in complex tasks that require decision-making, interpretation, and the mobilization of diverse resources."

This perspective appears to engage directly with the challenges that artificial intelligence poses to contemporary education.

At the same time, international organizations have emphasized the need to establish ethical guidelines capable of directing the use of artificial intelligence in education systems. The United Nations Educational, Scientific and Cultural Organization (UNESCO) stresses that the use of these technologies must be grounded in principles of transparency, accountability, inclusion, and human oversight, preventing algorithms from reproducing inequalities or undermining the autonomy of those involved in educational processes.

Rather than debating whether artificial intelligence should be present in schools, it appears necessary to understand how it can contribute to more formative and reflective assessment practices aligned with the competencies required by contemporary society. After all, if machines can reproduce previously known answers, education may need to focus its efforts on what remains essentially human: interpreting, arguing, creating, problematizing, and assigning meaning to available information.

Given this context, the present study aims to discuss the challenges, possibilities, and ethical implications of learning assessment in the age of artificial intelligence, reflecting on the need to redefine assessment practices in basic education. Specifically, it seeks to analyze the transformations brought about by AI in assessment processes, discuss the pedagogical potential of these tools, and critically examine the ethical challenges arising from their incorporation into everyday school life.

Methodologically, this is a qualitative, exploratory bibliographic and documentary study grounded in national and international scientific publications concerning learning assessment, digital technologies, and artificial intelligence applied to education. Classical works in educational assessment, documents produced by international organizations, and recent studies on artificial intelligence and education were analyzed in order to identify convergences, tensions, and emerging possibilities for contemporary assessment processes.

To this end, the text is organized into four sections, in addition to this introduction and the final considerations. First, it discusses the relationship between artificial intelligence and the transformation of assessment practices. It then analyzes the pedagogical potential of AI for learning assessment. Next, it critically examines the ethical challenges associated with authorship, plagiarism, algorithmic bias, and the transparency of assessment processes mediated by intelligent technologies. Finally, it presents reflections on the possibilities for developing more formative, critical, and humanized assessment practices in the context of digital culture.

ARTIFICIAL INTELLIGENCE AND THE TRANSFORMATION OF ASSESSMENT PRACTICES

Historically, education systems have structured their assessment processes around determining students' ability to recall, reproduce, and apply previously taught content. For decades, written examinations, individual exercises, and written assignments occupied a central position in the certification of learning, serving as instruments for measuring academic performance and classifying

students according to different levels of proficiency. Strongly influenced by the demands of mass schooling and the administrative needs of education systems, this model favored assessment practices centered on the final product and the production of answers considered either correct or incorrect.

However, the expansion of digital technologies and, more recently, generative artificial intelligence has called into question some of the assumptions underpinning these assessment models throughout the twentieth century. When computer systems can produce essays, solve exercises, write code, and answer complex questions within seconds, merely examining the final product no longer provides sufficient evidence of the learning students have actually achieved. The contemporary challenge is no longer simply to determine whether an answer is correct; it now involves understanding the cognitive, argumentative, and creative processes mobilized in producing it.

This transformation does not, however, mean the disappearance of assessment, but rather the need to redefine it. As Jussara Hoffmann argues, assessment must be understood as an ongoing process of pedagogical inquiry capable of providing relevant information to guide teachers' interventions and foster student development. According to the author, assessment must move beyond a classificatory logic and assume an investigative, process-oriented, and formative character.

In this regard, Hoffmann states:

Assessment entails monitoring, understanding, and interpreting students' manifestations throughout the educational process. Teachers who assess through mediation seek to understand the strategies used by students, their hypotheses, their progress, and their difficulties, using this information to reorganize teaching and create new learning opportunities. (Hoffmann, 2014, p. 24).

The emphasis placed on processes rather than solely on outcomes becomes even more relevant in view of the challenges introduced by artificial intelligence. In a context in which algorithmic systems can produce technically correct answers, limiting assessment to the verification of the final answer is insufficient. Greater attention must therefore be paid to the pathways followed by students, the strategies they employ, and the competencies they effectively mobilize while completing activities.

Similarly, Cipriano Carlos Luckesi argues that assessment must assume a diagnostic and formative character, guiding pedagogical decisions and contributing to improved learning. From this perspective, error is no longer understood as failure or inability, but instead becomes an important indicator of the cognitive pathways followed by students.

In discussing the pedagogical function of assessment, Luckesi states:

Learning assessment is not intended to approve or fail students, but to diagnose their learning situation in order to determine the pedagogical decisions required for them to progress in their development. Assessment entails welcoming learners in their current situation and helping them move toward the objectives proposed by the educational process. (Luckesi, 2011, p. 172).

Understanding assessment as an instrument for monitoring and pedagogical intervention takes on new meaning in light of the possibilities offered by generative artificial intelligence. Paradoxically, the presence of these technologies may help move beyond models excessively centered on memorization and content reproduction, shifting attention toward competencies related to interpretation, creativity, argumentation, and the resolution of complex problems.

In this context, issues such as authorship, critical thinking, and argumentative ability are becoming increasingly important in assessment processes. Rather than asking only “What was the answer?,” assessment is progressively becoming concerned with “How did the student arrive at it?,” “What strategies were used?,” “How did the student select and validate the available information?,” and “How were different forms of knowledge articulated to solve a particular problem?”

This shift is closely aligned with Philippe Perrenoud’s discussions of competency-based assessment. According to the author, contemporary assessment processes should focus less on the mere reproduction of content and more on the ability to mobilize knowledge in complex, contextualized situations.

According to Perrenoud:

Assessing competencies means observing students as they engage in complex tasks requiring the mobilization of knowledge, decision-making, analytical ability, and the transfer of knowledge to new situations. It is no longer a matter of determining what students can repeat, but what they can do with what they have learned. (Perrenoud, 1999, p. 53).

The presence of artificial intelligence makes this reflection even more pertinent. If machines are already capable of locating information and producing standardized responses with a high degree of efficiency, schools appear to be called upon to invest in distinctly human dimensions of learning, such as creativity, ethics, sensitivity, argumentation, and the capacity to assign meaning to available information.

In discussing the impact of artificial intelligence on education, UNESCO warns that education systems will need to revise not only their curricula but also their assessment models so that they encompass competencies compatible with new technological and social contexts.

In this regard, the organization emphasizes:

Education systems will need to adapt their assessment methods to encompass competencies such as critical thinking, creativity, collaboration, and problem-solving, which remain essentially human and complementary to the capabilities of artificial intelligence systems. (UNESCO, 2023, p. 12).

Thus, the emergence of generative artificial intelligence does not represent the end of school assessment; rather, it constitutes an important opportunity to review practices historically centered on reproduction and memorization. Instead of merely measuring what students can recall, assessment in the age of artificial intelligence appears to be called upon to understand what they can interpret, construct, problematize, and transform based on the knowledge available to them.

PEDAGOGICAL POSSIBILITIES OF ARTIFICIAL INTELLIGENCE IN ASSESSMENT PROCESSES

Although much of the discussion surrounding artificial intelligence and education is associated with risks involving plagiarism or authorship, generative technologies also offer significant possibilities

for developing assessment practices that are more formative, personalized, and centered on learning processes. When used critically and with appropriate pedagogical guidance, these tools can help expand the capacity to monitor students and facilitate more timely and contextualized interventions.

One of the most evident contributions concerns the production of personalized feedback. In education systems characterized by large classes and heavy administrative demands, teachers do not always have sufficient time to provide detailed, individualized feedback to every student. Artificial intelligence can assist in preparing initial feedback, allowing teachers to concentrate their efforts on pedagogical mediation and the interpretation of learning pathways.

This perspective is closely aligned with Jussara Hoffmann's conceptions of mediating assessment, according to which feedback constitutes a central element of assessment processes. According to the author: "Mediating assessment presupposes dialogue, reflection, and ongoing pedagogical intervention" (Hoffmann, 2018, p. 36).

From this standpoint, technology does not replace teachers' pedagogical judgment; rather, it expands their capacity for monitoring and intervention.

Another important possibility concerns the development of clearer and more transparent rubrics and assessment criteria. Using appropriately structured prompts, AI systems can assist in constructing assessment frameworks, performance descriptors, and criteria related to the competencies and skills established in school curricula.

This resource is particularly relevant in view of contemporary discussions surrounding competency-based assessment. As Philippe Perrenoud argues: "A competency is not limited to an isolated body of knowledge, but consists of the ability to mobilize different resources in complex situations" (Perrenoud, 1999, p. 30).

Developing assessment instruments aligned with this perspective requires more sophisticated criteria than those traditionally used in assessments centered on memorization and content reproduction.

Artificial intelligence also has considerable potential to personalize assessment pathways. Students with different learning paces, styles, and needs can benefit from differentiated activities, gradually increasing levels of complexity, and tasks adapted to their particular characteristics. This possibility is especially relevant in inclusive contexts and in classes characterized by heterogeneity.

In this respect, the use of AI is closely aligned with José Moran's discussions of personalized learning and the need for more flexible, student-centered educational pathways. According to Moran (2018, p. 9): "Each student learns at a different pace, at different times, and in different ways, requiring more diverse and personalized pedagogical approaches."

Artificial intelligence can make a significant contribution to this diversification, provided that it remains subordinate to pedagogical decisions and to the educational objectives established by the teacher.

Another promising aspect concerns the development of metacognition and self-assessment. Generative tools can help students review written work, identify argumentative inconsistencies, reflect on their learning processes, and establish goals for improvement. Assessment thus ceases to be exclusively an external act performed by the teacher and begins to incorporate processes of self-regulation and reflection undertaken by the students themselves.

This perspective is supported by Cipriano Carlos Luckesi's propositions, according to which assessment should contribute to individuals' intellectual autonomy and awareness of their own learning processes.

Rather than providing ready-made answers, artificial intelligence can be used to encourage questions, hypotheses, comparisons, and revisions, thereby fostering students' intellectual autonomy and investigative disposition.

All these possibilities, however, depend directly on the quality of the pedagogical mediation provided by the teacher. The educational value of artificial intelligence does not lie in automating assessment processes, but in its capacity to free time and energy for what remains essentially human:

listening, interpreting, engaging in dialogue, and constructing shared meanings throughout the educational process.

ETHICAL CHALLENGES AND IMPLICATIONS FOR CONTEMPORARY ASSESSMENT

While the pedagogical possibilities offered by artificial intelligence are numerous, the ethical challenges arising from its use in school contexts are equally complex. Issues involving authorship, academic integrity, data privacy, and algorithmic bias have assumed a central position in contemporary educational debates and require increasingly consistent institutional and pedagogical responses.

One of the most recurrent concerns is the difficulty of defining the boundaries between human authorship and production assisted by artificial intelligence. School assignments, essays, and research projects produced with the support of generative systems challenge traditional conceptions of originality and require a review of the criteria used to assess learning.

However, the central problem may not lie in the use of technology itself, but rather in the persistence of assessment models excessively centered on the final product and content reproduction. If an activity can be completed in its entirety by an artificial intelligence system without undermining its assessment criteria, it may be necessary to question not only the technology, but also the pedagogical design of the task itself.

This discussion is closely aligned with Neil Selwyn's reflections, according to which educational technologies should not be analyzed in isolation, but in conjunction with the social, political, and pedagogical contexts in which they are introduced. According to the author: "Educational technology is always shaped by values, interests, and power relations" (Selwyn, 2017, p. 21).

From this perspective, artificial intelligence does not create the problems of contemporary assessment; rather, it makes weaknesses already present in traditional assessment models more visible.

Another important challenge involves the biases embedded in artificial intelligence systems. Generative models are trained on vast quantities of data produced within specific cultural and linguistic

contexts and may therefore reproduce stereotypes, render certain social groups invisible, and reinforce historically constituted inequalities.

The contributions of Emily M. Bender are particularly relevant to this debate. In discussing the risks associated with large language models, the authors warn of these systems' tendency to reproduce prejudices and discriminatory patterns contained in the datasets used during their training.

Likewise, international organizations have drawn attention to the need for continuous human oversight in decision-making processes supported by artificial intelligence. UNESCO emphasizes that “ultimate responsibility for educational decisions must remain under human control” (UNESCO, 2023, p. 9).

This guidance has particularly significant implications for assessment processes, since decisions concerning performance, progression, and educational trajectories cannot be delegated exclusively to algorithmic systems.

Issues involving privacy and data protection also warrant particular attention. Many artificial intelligence tools operate by collecting and processing large quantities of personal information, requiring safeguards consistent with current legislation and institutional data-protection policies.

In the Brazilian context, these concerns are directly related to the principles established by the Brazilian General Data Protection Law (Lei Geral de Proteção de Dados—LGPD), reinforcing the need for the responsible and transparent use of educational technologies.

More than a technical or legal challenge, this is an ethical matter involving the rights to privacy, autonomy, and protection of the individuals participating in educational processes.

FINAL CONSIDERATIONS

The expansion of generative artificial intelligence has had significant effects on the ways in which teaching, learning, and assessment take place in contemporary education. While assessment systems were strongly associated for decades with content reproduction and the individual verification of learning, the

emergence of tools capable of producing texts, solving problems, and generating complex answers requires a review of some of the assumptions that have historically underpinned these practices.

Throughout this study, an attempt was made to discuss the challenges, possibilities, and ethical implications of assessment in educational contexts permeated by artificial intelligence. The analyses indicate that the presence of these technologies does not make assessment processes unviable; rather, it highlights the need to shift the focus of assessment from the final product to the pathways, strategies, and competencies mobilized by students during learning.

In this context, assessment practices centered exclusively on memorization or the reproduction of information are likely to progressively lose their capacity to demonstrate meaningful learning. Conversely, approaches concerned with problem-solving, argumentation, creativity, critical reflection, and the mobilization of knowledge in complex, contextualized situations are becoming increasingly relevant.

Likewise, it was found that artificial intelligence can contribute to the development of more formative, personalized, and inclusive assessments by facilitating more frequent feedback, differentiated pathways, and closer monitoring of learning processes. These possibilities, however, depend directly on pedagogical intentionality and teacher mediation.

The literature analyzed also demonstrates that the most significant challenges associated with artificial intelligence are not exclusively technological, but ethical and pedagogical. Issues involving authorship, academic integrity, algorithmic transparency, and data protection require clear institutional positions and appropriate training for education professionals.

Finally, it is understood that assessment in the age of artificial intelligence does not require fewer teachers, but teachers who are even better prepared to interpret contexts, problematize information, construct criteria, and assign meaning to learning. In a world in which machines are becoming increasingly efficient at producing answers, perhaps the school's principal contribution will continue to be the education of individuals who are capable of formulating relevant questions, exercising critical thinking, and using technology in an ethical, responsible, and humanized manner.

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LITERATURE REVIEW ON GENERATIVE ARTIFICIAL INTELLIGENCE IN PHYSICS AND SCIENCE: CHALLENGES, POTENTIAL, AND IMPACTS ON THE LEARNING PROCESS¹

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Abstract

Generative Artificial Intelligence (GenAI) has become established as an emerging technology in education, particularly in physics and science education since 2022, prompting debate about its pedagogical potential and limitations. The relevance of this topic stems from the sensitive and complex nature of incorporating GenAI into fields that require conceptual rigor, critical thinking, and strong teacher mediation. The general objective of this study is to analyze how the academic literature addresses the use of GenAI in the physics and science teaching and learning process between 2022 and 2025, considering its impacts, challenges, and possibilities. Methodologically, a Systematic Literature Review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. A search of the Scopus database resulted in the analysis of seven studies. The findings indicate that GenAI has the potential to support active learning, problem-solving, and methodological innovation, although it continues to face conceptual limitations, risks of superficial use, and technological dependence. The study concludes that the integration of GenAI requires critical pedagogical strategies, appropriate teacher training, and ethical use in order to enhance learning without compromising the quality of education.

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Keywords: Active Learning, Generative Artificial Intelligence, Physics Education, Science Education, Systematic Literature Review.

INTRODUCTION

The rise of Generative Artificial Intelligence (GenAI), driven by innovations that have emerged since 2022, has brought about significant changes across several sectors, particularly education. Its ability to generate texts, figures, images, sounds, voices, films, and animations has attracted growing interest in physics and science education, highlighting its potential to support innovative pedagogical practices, improve assessment processes, and strengthen human-machine collaboration. However, this integration also reveals important limitations, including conceptual errors, inadequate interpretations of visual representations, and the need for teachers and students to acquire new competencies. Accordingly, this study focuses on a critical analysis of the application of GenAI in physics and science education, considering the challenges associated with its adoption in a field characterized by traditional methodologies.

The relevance of this debate becomes even more evident when one considers that physics education remains largely grounded in transmission-based practices, which contribute to students' lack of interest and to limited methodological renewal in the teaching and learning process. The introduction of GenAI into this context is a complex matter involving technical, ethical, epistemological, and pedagogical issues. Recent studies indicate that, despite its potential, GenAI may foster superficial understanding, technological dependence, and difficulties in developing critical thinking. Discussing its incorporation into science and physics education is therefore essential to understanding both its contributions and its limitations.

In light of these considerations, the general objective of this study is to analyze how the academic literature has addressed the use of GenAI in the physics and science teaching process between 2022 and 2025, taking into account its impacts, limitations, and potential. To achieve this objective, the study seeks

to identify the main conceptual and operational challenges associated with GenAI; analyze how the studies describe its use by students and teachers; examine its pedagogical potential; discuss its limitations and risks; and identify gaps and trends in recent scientific research.

METHODOLOGY

This study adopted a Systematic Literature Review (SLR), with clearly defined methodological stages and procedures, to analyze and synthesize the findings of existing research on Generative Artificial Intelligence in the teaching and learning of physics and science. This methodological rigor was intended to ensure the validity, reliability, and reproducibility of the SLR, as noted by Vilelas (2022). The review entails the development of a planned research method that enables a comprehensive and transparent analysis of the existing literature, as proposed by Wang, Jing, and Shen (2025).

The research was conducted according to predefined stages⁴, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), as established by Moher et al. (2009) and Page et al. (2021). The Scopus database was searched for relevant studies because, in addition to being one of the largest databases of abstracts and citations in the literature, with broad global and regional coverage of scientific journals, Scopus returned results for the search terms used. By contrast, the Web of Science and ERIC databases returned no records when the same search strategy was applied, as the topic remains highly restricted. Furthermore, because of the current limitations and narrow thematic scope of the literature, this research was not restricted exclusively to journal articles; it also included other relevant academic publications, such as conference papers, provided that they were aligned with the subject under investigation.

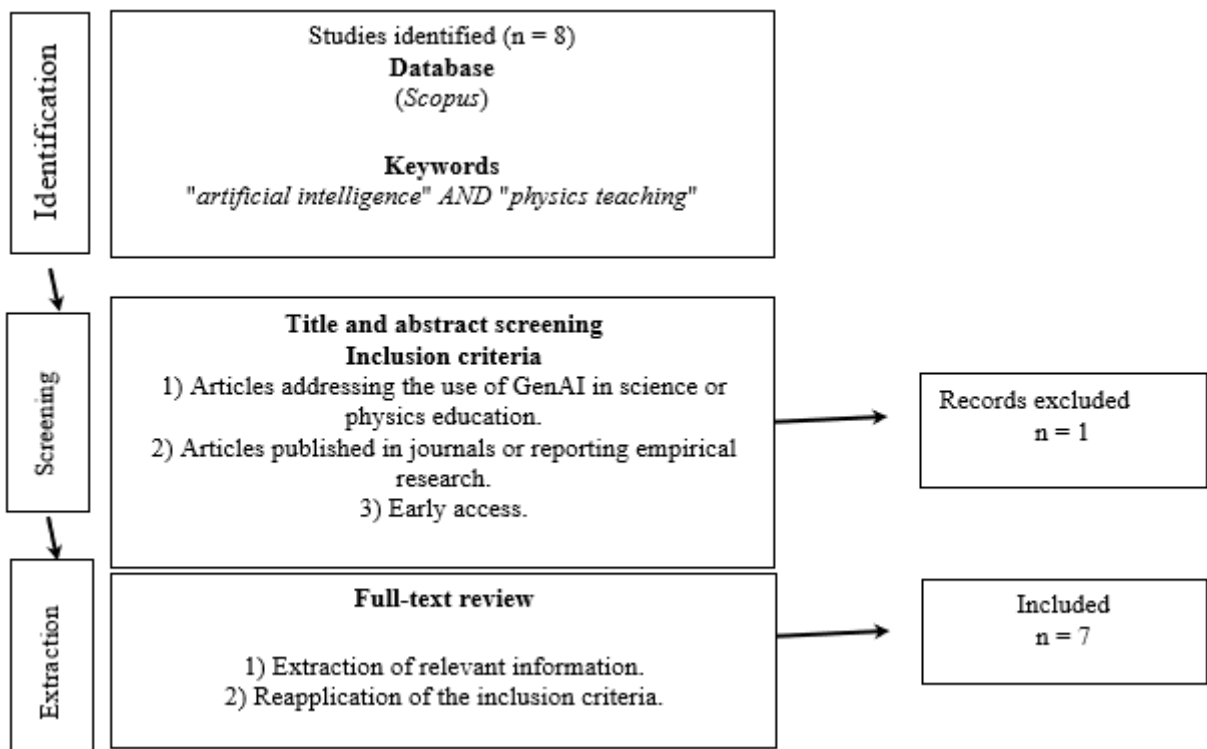
⁴ The stages defined for this study according to the checklist were eligibility criteria, information sources, search strategy, selection process, data-collection process, data items, assessment of risk of bias in the studies, effect measures, synthesis methods, assessment of reporting bias, and assessment of certainty. These stages followed the PRISMA 2020 statement (Page et al., 2021; Abreu et al., 2024).

The search, conducted on November 5, 2025, used the following search string: TITLE-ABS-KEY (“artificial intelligence” AND “physics teaching”). It initially identified 18 documents in the Scopus database.

The search was not refined by document type and therefore included not only published journal articles but also conference papers. No language restrictions were imposed, and studies in both English and Portuguese were considered. No filters were applied for keywords, country, source type, source title, author name, publication stage, affiliation, funding sponsor, or open-access status. The only refinement concerned the period from 2022 to 2025, because 2022 marked the emergence of GenAI, particularly with the popularization of models such as ChatGPT. Thus, only publications from the preceding three years were considered, filtered by subject area to include Physics and Astronomy. After these criteria were applied, the search was narrowed to eight documents identified in the database.

Subsequently, the inclusion criteria encompassed only studies specifically addressing the application of GenAI to the teaching and learning of science and physics, articles published in journals or based on empirical research, and early-access articles. The following were excluded: reviews, editorials, or other theoretical articles; and articles that mentioned the terms “AI” or “GenAI” but in fact addressed either the application of GenAI to education in general or participants’ attitudes, intentions, or perceptions regarding GenAI education, without providing details about the implementation of educational practices in science and physics classrooms. At the end of the selection process, seven articles were chosen for inclusion in the analysis conducted in this systematic review, as shown in Figure 1, the systematic flow diagram.

Figure 1
Systematic Literature Review Flow Diagram



Source: Prepared by the authors, 2025.

BIBLIOMETRIC ANALYSIS

In this section, the publications are examined through a bibliometric analysis, which enables a better understanding of the studies according to year of publication, authorship, and the distribution of documents across countries and territories. This approach provides a clearer overview of the distribution of the research conducted over these three years, contributing to the replicability and greater rigor of the systematic review.

PUBLICATIONS BY YEAR

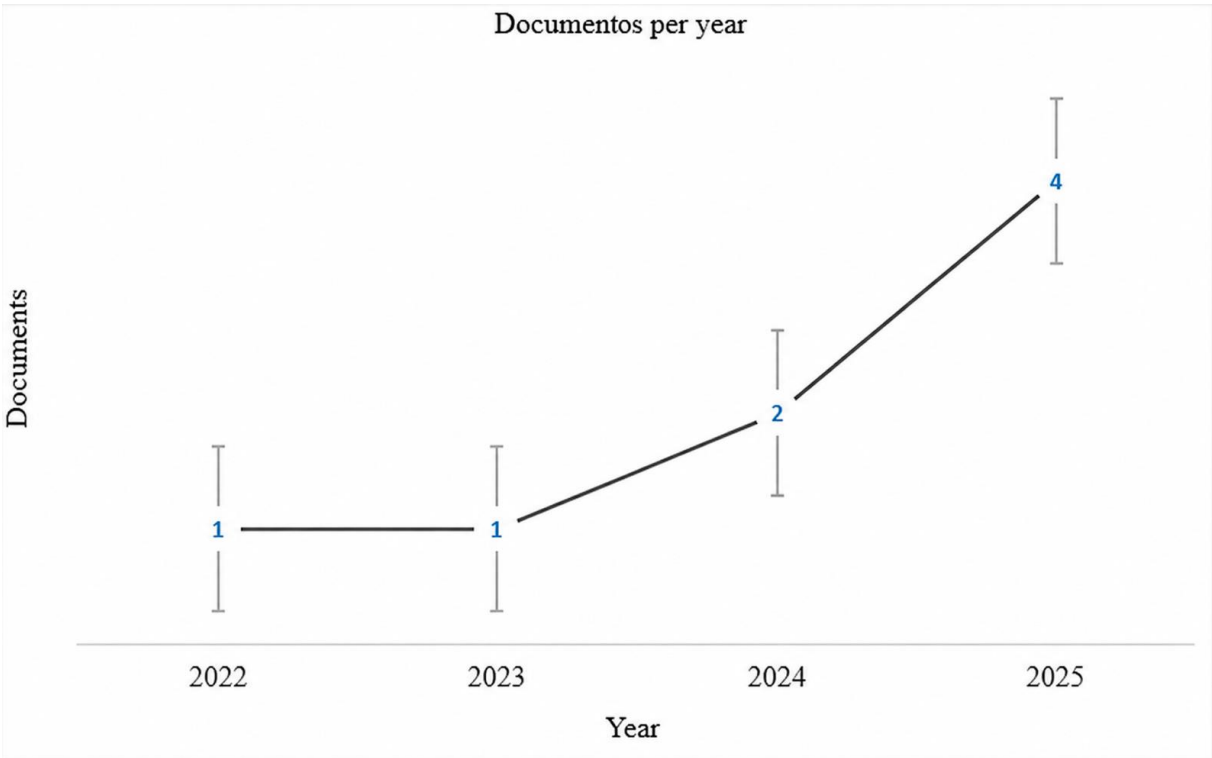
The first step consisted of categorizing the publications according to year of publication to provide a better understanding of the development of the research, as presented in Chart 1. The number of publications increased over the years, from one article in 2022 and one in 2023 to two in 2024 and four in

2025, indicating growing academic interest in the application of GenAI to physics education during this period.

Thus, although the topic has not yet been widely explored in the context of physics education, interest has steadily increased over time, contributing to greater visibility for the implementation of GenAI in this field.

Chart 1

Distribution of Documents by Year



Source: Prepared by the authors based on Scopus data, 2025.

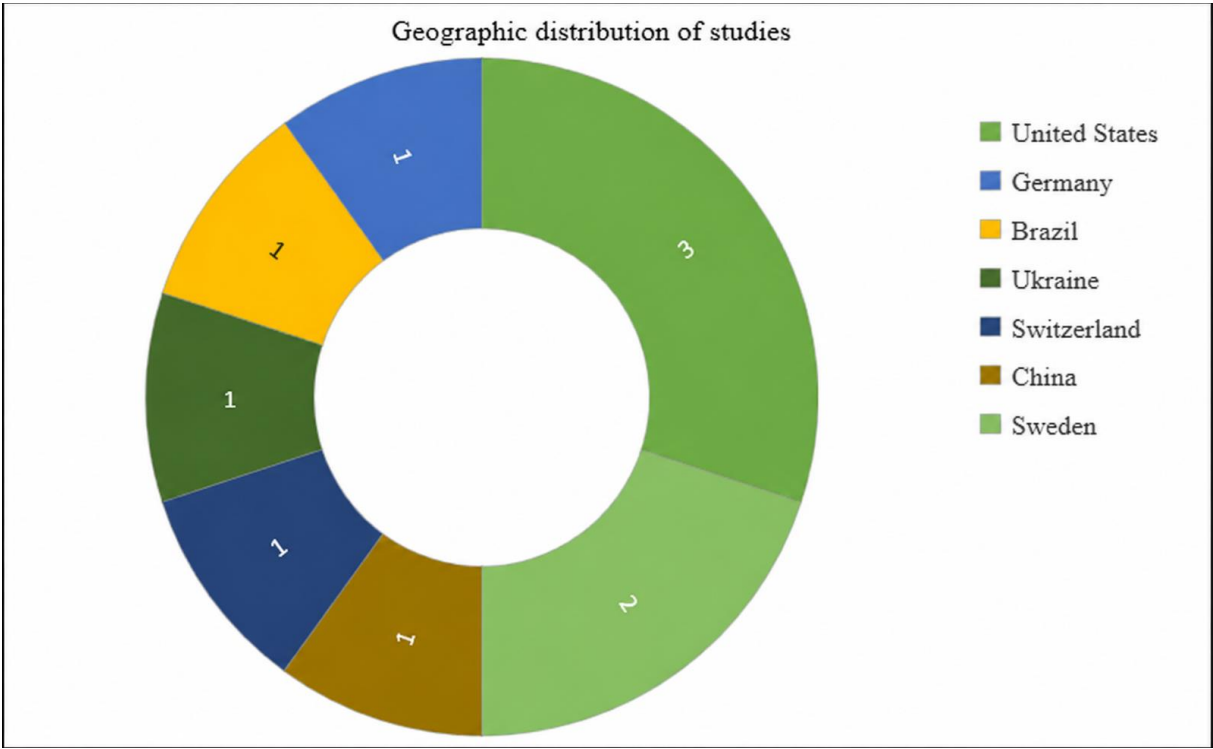
GEOGRAPHICAL DISTRIBUTION

In addition to the development of publications over time, the analysis also considered the geographical distribution of the studies, as illustrated in Chart 2. The highest concentration of publications was found in the United States, with three publications identified during the period analyzed, followed by Sweden, with two. The remaining countries—Brazil, China, Germany, Switzerland, and Ukraine—had one publication each.

The findings therefore indicate that the United States has shown greater interest in implementing GenAI in physics education and stands out as one of the leading centers for research development on the topic.

Chart 2

Geographical distribution of the studies



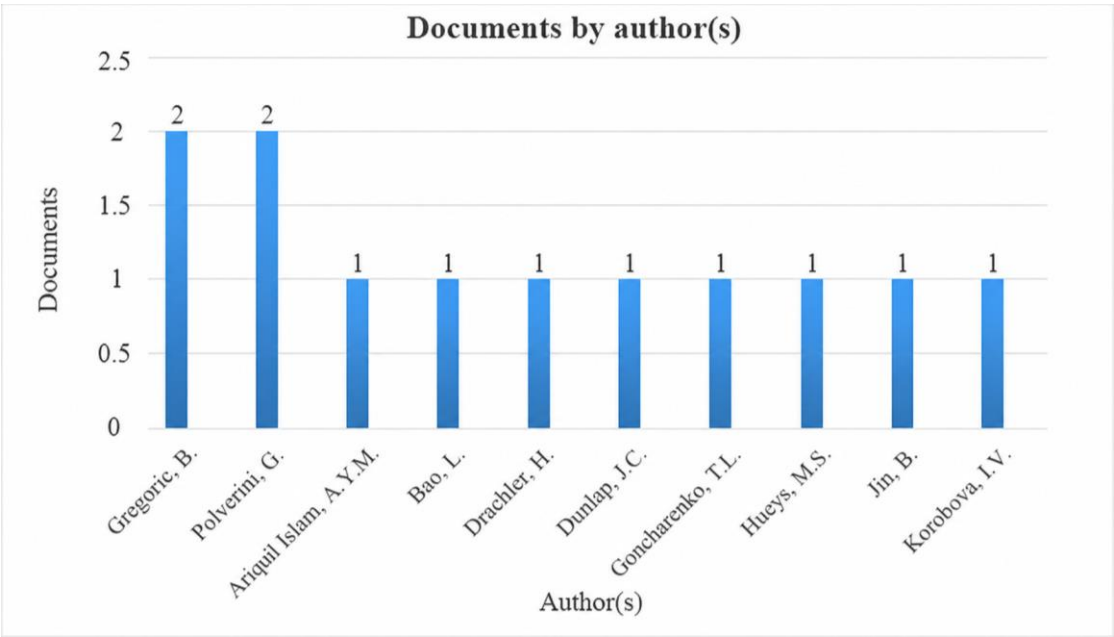
Source: Prepared by the authors based on *Scopus* data, 2025.

AUTHOR(S)

Finally, the documents were analyzed in terms of authorship, as presented in Chart 3. The authors with the highest number of publications were B. Gregorcic and G. Polverini, each with two publications. Their studies investigate the performance and limitations of GenAI in physics education, highlighting its potential as an educational tool despite its continuing conceptual and interpretive errors.

Chart 3

Distribution of documents by author(s)



Source: Prepared by the authors based on Scopus data, 2025.

RESULTS AND DISCUSSION

The findings support a more in-depth analysis of how the academic literature addresses the topic, revealing recurring patterns, knowledge gaps, and emerging trends identified through the systematic review.

A table was then prepared to present the distribution of the publications analyzed, including information such as title, authorship, journal, and number of citations, according to the data provided by the Scopus database, as illustrated in Table 1.

Table 1*Detailed distribution of each scientific publication*

NO.	TITLE	AUTHOR(S)	JOURNAL NAME	NUMBER OF CITATIONS (SCOPUS)
1st	<i>Descendo um plano inclinado com um modelo de linguagem grande</i> [Descending an Inclined Plane with a Large Language Model]	Dunlap, Justin; Sissons Ryan; Widenhorn, Ralf.	Journals.aps.org.	0
2nd	<i>Desempenho do ChatGPT em tarefas envolvendo representações visuais de física: O caso da breve avaliação de eletricidade e magnetismo.</i> [Performance of ChatGPT on Physics Tasks Involving Visual Representations: The Case of the Brief Electricity and Magnetism Assessment]	Polverini, Giulia; Melin, Jakob; Önerud, Elias; Gregórcico, Bor.	Journals.aps.org.	4
3rd	<i>Explorando o papel da colaboração entre humanos e IA na resolução de problemas científicos.</i> [Exploring the Role of Human–AI Collaboration in Scientific Problem-Solving]	Tong, Dazhenum; Jin, Bangjianb; Tao, Yangc; Ren, Hong Meium; Atiquil Islam AYMd; Bao, Leif.	Journals.aps.org.	1
4th	<i>Auxílio na correção de uma prova de termodinâmica manuscrita utilizando inteligência artificial: um estudo exploratório.</i> [Assisting the Grading of a Handwritten Thermodynamics Exam Using Artificial Intelligence: An Exploratory Study]	Kortemeyer, Gerda d; Nöhl, Julianb; Onishchuk, Dariac.	Journals.aps.org.	9
5th	<i>Como a compreensão de grandes modelos de linguagem pode orientar o uso do ChatGPT no ensino de física.</i> [How Understanding Large Language Models Can Inform the Use of ChatGPT in Physics Education]	Polverini, Giulia; Gregórcico, Bor.	Iopscience.	66
6th	<i>Ensino de física mediado por aprendizado de máquina: o caso do pêndulo simples.</i> [Machine-Learning-Mediated Physics Education: The Case of the Simple Pendulum]	Prates, José Humberto de Souza da Costa; Camila Schneider Loureiro Pessoa; Elisa Fernanda Gurriti Mattedi; Guilherme do Prado Monteiro; Henrique Baleeiro de Jesus; José Victor Brito Namiok; Luiz Fernando Yano Huoya; Marçal Santos Matui; Yumi Alves.	Scielo.	1
7th	<i>Experiência no desenvolvimento e implementação de um sistema de casos de ensino visualizados em Física utilizando um sistema de medição digital computadorizado Einstein.</i> [Experience in Developing and Implementing a System of Visualized Teaching Cases in Physics Using the Einstein Computerized Digital Measurement System]	Yu Golovko N; Goncharenko TL; Korobova IV.	Iopscience.	3

Source: Prepared by the authors based on Scopus data, 2025.

The studies analyzed in Table 1 focus on the impacts of GenAI on the teaching and learning of physics and science, with an emphasis on identifying barriers through a systematic approach.

Accordingly, the selected studies are summarized below to ensure greater clarity, transparency, and replicability of the research.

In their article, Dunlap, Sissons, and Widenhorn (2025) seek to analyze how different permutations of the object, action verb, and properties of an inclined plane affect the model's responses. The research examines how different types of prompts can influence GenAI's final response, showing that minor variations in the wording of a problem can significantly alter how the model interprets and solves it. The authors emphasize that these variations reveal important shortcomings of GenAI in physics education, particularly its failure to make assumptions explicit and its difficulty in handling conflicting information.

Polverini et al. (2025) investigate ChatGPT-4's performance in solving visual physics problems, analyzing how the model interprets diagrams, vector fields, and other conceptual representations. The authors identify significant difficulties encountered by the chatbot, including incorrect interpretations, problems applying fundamental laws of physics, and limitations in spatial reasoning. Although they acknowledge that the implementation of GenAI has substantial potential and added value for education, particularly in supporting learning and accessibility, the study emphasizes that numerous barriers to its effective integration remain, including persistent errors in visual interpretation and conceptual inconsistencies that compromise the system's reliability.

Tong et al. (2025) analyze the solving of scientific problems by comparing human–AI collaboration with human–human collaboration. The findings show that many students used ChatGPT-4 only to obtain ready-made answers, without demonstrating an interest in developing critical thinking or engaging more deeply in the learning process. By contrast, human–human interactions produced more meaningful learning, as students discussed, argued, and reflected critically on the problems. The study also demonstrates that GenAI's limitations, such as inconsistencies in its responses and failures of visual and conceptual interpretation, represent a significant barrier to its effective implementation in physics and

science education. Furthermore, it reinforces the need to instruct students on how to collaborate more productively with AI tools and avoid using these systems superficially and passively.

Kortemeyer, Onishchuk, and Nöhl (2024) evaluate four workflows for AI-assisted grading of thermodynamics examinations containing handwritten answers. The primary obstacle is converting handwriting into text that AI can read. Highly detailed rubrics produce grading errors because the model cannot process multiple criteria simultaneously; grading answers in separate parts is more reliable but loses nuances. Hand-drawn diagrams and graphs also increase the error rate. AI accurately identifies passing examinations, but failed examinations still require human verification.

Polverini and Gregorcic (2024) seek to explain how prompt engineering can improve the performance of GenAI in physics research and tasks, showing that how users formulate prompts directly influences the quality of the responses. In addition, the article provides a clear introduction to how large language models function and discusses their strengths and limitations in the context of conceptual problem-solving. Using practical examples, the authors demonstrate how specific prompt-engineering techniques can provide GenAI with better guidance, making its responses more accurate and useful for physics education. The study thus shows that understanding and applying effective prompting strategies are essential to fully harnessing the potential of these models in educational settings.

Prates et al. (2023) propose a new pedagogical approach that integrates machine-learning techniques into the study of the simple pendulum. The authors collect experimental data on the pendulum's motion and use a regression algorithm to model the system with a high degree of accuracy. The proposal demonstrates how machine-learning methods can complement traditional physics education, introducing students to data science and emerging technologies. The study emphasizes that the education of future physicists should include computational and data-analysis competencies.

Golovko et al. (2022) discuss the need to modernize the educational system, emphasizing the role of digital technologies, AI, and science, technology, engineering, and mathematics (STEM) education. They propose the development of a system of “visualized teaching cases” for physics using Google tools

and the Einstein digital measurement system. The study reports the practical experience of implementing this approach at Kherson State University, showing how visualized cases integrated into real-world contexts can improve physics learning and increase students' interest in STEM fields.

Broadly speaking, the studies seek to investigate how GenAI can contribute to students' conceptual development, support assessment processes, foster active learning, and promote more meaningful interaction between humans and machines in educational settings.

Although the studies explore different aspects—including model performance on physics problems, human–AI collaboration, automated exam grading, the use of machine-learning algorithms, and the development of interactive digital resources—they all share a common focus on the relationship between technology and education, particularly the limitations and potential that these tools may bring to the physics teaching and learning process.

Although varied, the methodologies share a similar purpose: to evaluate the effectiveness and challenges of using GenAI as a pedagogical instrument. Whether through qualitative analyses of chatbot-generated responses, comparative experiments involving humans and AI, or practical applications of digital systems in the classroom, all the studies seek to understand how these tools influence scientific reasoning, the interpretation of visual representations, problem-solving, and student autonomy.

Furthermore, the studies share a concern with preparing teachers and students to meet the new demands of the digital age, as illustrated in Table 2. The authors indicate that integrating advanced technologies into education is not intended to replace traditional methods but rather to promote critical, reflective, and collaborative learning. In summary, these studies converge on the idea that GenAI can transform physics education, provided that its limitations are recognized and its use is accompanied by appropriate pedagogical strategies capable of enhancing the teaching and learning process.

Table 2
Aspects and Requirements of the Digital Age Identified in the Scientific Literature

	Aspects	Digital-Age Requirements and Transformations Identified in the Studies
1	Development of new competencies	Integrating artificial intelligence and digital technologies into physics education requires the development of new pedagogical, cognitive, and technological competencies. Teachers and students must understand how these tools function, recognize their conceptual limitations, and use them critically and meaningfully.
2	Teacher training focused on the pedagogical use of AI	Educators must receive specific training on the use of AI in the classroom, learning to formulate effective prompts, interpret model responses, and promote scientific inquiry activities that stimulate reasoning and reflection rather than merely encourage the search for automated answers.
3	Student preparation	Students must be prepared to interact with AI tools collaboratively, ethically, and critically, developing scientific thinking, intellectual autonomy, and the ability to validate information.
4	Digital and scientific literacy	The importance of digital and scientific literacy is emphasized. Such literacy entails understanding the foundations of artificial intelligence, machine learning, and data analysis and applying this knowledge to the study of physical phenomena.
5	Integrated teaching strategies	Pedagogical strategies combining practical experimentation, computational analysis, and interactive visual resources must be adopted to make the teaching and learning process more dynamic, contextualized, and meaningful.
6	Redefinition of the roles of teachers and students	Meeting these requirements entails reconsidering the teacher's role. Rather than merely transmitting content, teachers must act as mediators and guides in technology-mediated learning processes. Students, in turn, must adopt a more active, investigative, and collaborative approach.
7	Science education for the twenty-first century	These transformations are essential to preparing teachers and students for science education that meets the cognitive and technological demands of the twenty-first century, promoting critical and reflective learning integrated into the digital context.

Source: Prepared by the authors based on the studies reviewed, 2025.

As indicated in Table 2, the requirements of the digital age demonstrate that integrating GenAI into physics education requires both teachers and students to develop new pedagogical, cognitive, and technological competencies. To use GenAI effectively, teachers must be proficient in formulating prompts, understand the technology's limitations and educational potential, critically interpret the responses it generates, and propose activities that stimulate investigative interest and go beyond merely querying the model.

Furthermore, students must be prepared to interact with AI ethically and critically while developing scientific thinking, logical reasoning, and the ability to evaluate information. Another relevant aspect is digital and scientific literacy, which enables students to understand and interpret fundamental concepts in both AI and physics.

The studies therefore indicate that this transformation is essential in the context of the twenty-first century, demonstrating that teacher education plays a central role in enabling teachers to mediate technology-enhanced learning and foster students who are more active, investigative, and capable of taking a leading role in their own knowledge-construction process.

FINAL CONSIDERATIONS

The analysis of the selected studies indicates that the use of Generative Artificial Intelligence in physics and science education constitutes an emerging and rapidly expanding field characterized by growing academic interest. The findings indicate that GenAI has significant potential to support learning, particularly by fostering conceptual development, problem-solving, personalized instruction, and the adoption of more active and innovative pedagogical practices.

However, the findings also reveal relevant limitations that cannot be overlooked. Conceptual errors, the superficial nature of certain responses, and the tendency to use the tool uncritically are challenges that require conscious teacher intervention and mediation. In this context, integrating GenAI does not diminish the importance of pedagogical mediation. On the contrary, it requires the development of new competencies, such as proficiency in prompt engineering, the ability to critically evaluate generated responses, and the capacity to guide students toward an active, reflective, and investigative approach.

Furthermore, the studies analyzed indicate that the responsible and strategic adoption of GenAI can contribute to the development of more dynamic and inclusive learning environments aligned with contemporary demands. Its implementation must therefore be understood as a complement to existing methodologies rather than as a replacement for teachers' work or traditional practices. A balance between innovation and critical awareness is thus essential to ensuring that technology enhances rather than compromises the quality of education.

In summary, GenAI is a promising tool for physics and science education, provided that it is used ethically, critically, and with appropriate pedagogical guidance. Progress in this field will depend on continuing teacher education, the development of responsible educational practices, and the consolidation of a pedagogical culture that understands technology as a means of enhancing learning and strengthening students' agency in the educational process.

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SCHOOL INCLUSION OF INDIGENOUS CHILDREN WITH AUTISM SPECTRUM DISORDER: CHALLENGES AND POSSIBILITIES FROM THE PERSPECTIVE OF INTERCULTURAL EDUCATION

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Abstract

This chapter discusses the school inclusion of Indigenous children with Autism Spectrum Disorder (ASD), considering the challenges and possibilities involved in connecting special education, Indigenous school education, and interculturality. It begins by recognizing that, although Brazilian legislation guarantees the right to inclusive education and acknowledges the cultural specificities of Indigenous peoples, studies addressing this interface remain scarce. The objective is to reflect on the main challenges involved in implementing inclusive and intercultural pedagogical practices, highlighting theoretical contributions capable of supporting the development of an education committed to human and cultural diversity. The discussion is grounded in qualitative bibliographic research, drawing on academic publications, legal documents, and authors such as Maria Teresa Eglér Mantoan, Lev Vygotsky, Paulo Freire, Vera Maria Candau, Gersem José dos Santos Luciano (Baniwa), Daniel Munduruku, and Ailton Krenak. The reflections indicate that the inclusion of Indigenous children with ASD continues to face challenges related to teacher education, access to specialized services, the production of pedagogically contextualized materials, and the limited body of scientific literature on the subject. Conversely, important possibilities include strengthening continuing education, encouraging the participation of Indigenous families and communities, valuing traditional knowledge, and adopting pedagogical practices based on Universal Design for Learning and interculturality. It is concluded that the development of an

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inclusive intercultural education depends on coordination among schools, communities, and public policies, ensuring the right to learning and respect for cultural identities.

Keywords: Autism Spectrum Disorder, Indigenous Peoples, Indigenous School Education, Interculturality, Special Education.

INTRODUCTION

Inclusive education has become established as a fundamental right and a commitment of Brazilian educational policies, particularly in view of the need to guarantee all students access, retention, participation, and learning. Nevertheless, the realization of this right remains challenging when it concerns groups that experience different forms of social, cultural, and educational exclusion. Among these groups are Indigenous children with Autism Spectrum Disorder (ASD), whose schooling requires dialogue between the principles of special education and the specific characteristics of Indigenous school education.

The 1988 Federal Constitution recognized Indigenous peoples' right to a specific, differentiated, bilingual, community-based, and intercultural education, ensuring respect for their languages, cultures, forms of social organization, and distinctive learning processes. Subsequently, policies such as the National Policy on Special Education from the Perspective of Inclusive Education (BRAZIL, 2008), Law No. 12,764/2012, which established the National Policy for the Protection of the Rights of Persons with Autism Spectrum Disorder, and the Brazilian Inclusion Law (Law No. 13,146/2015) strengthened the guarantee of the educational rights of persons with disabilities. Despite these legal advances, challenges persist in effectively guaranteeing these rights to Indigenous children with ASD, particularly in communities historically marked by invisibility and social inequality.

In this context, Indigenous school education occupies a strategic position in valuing the identities, traditional knowledge, and distinctive forms of organization of Indigenous peoples. More than a space devoted to the transmission of academic knowledge, the Indigenous school constitutes an environment for

strengthening culture, preserving collective memory, and affirming the rights of these peoples. Thus, discussing the inclusion of Indigenous students with ASD entails recognizing that their educational needs cannot be understood solely from a clinical perspective, but must also be considered in relation to the cultural, linguistic, and community contexts in which they live.

The contemporary understanding of Autism Spectrum Disorder (ASD) moves beyond exclusively biomedical approaches by recognizing that development and learning are influenced by social, cultural, and educational factors. In this regard, the school inclusion of Indigenous children requires pedagogical practices that consider both their educational needs and the cultural specificities of each Indigenous people, understanding that different forms of communication, learning, and participation cannot be interpreted solely through the lens of the disorder.

Accordingly, interculturality provides an important framework for understanding the interface between special education and Indigenous school education. By fostering dialogue among different knowledge systems, interculturality contributes to the development of pedagogical practices that value cultural diversity, respect traditional knowledge, and strengthen an education committed to equity and social justice. From this perspective, including Indigenous children with ASD means simultaneously recognizing their status as rights-bearing subjects and as members of peoples with their own histories, identities, and ways of understanding the world.

Despite legal advances, research connecting special education, Indigenous school education, and interculturality remains scarce, limiting both knowledge production and the development of pedagogical practices intended for Indigenous children with ASD.

In this context, it is essential to recognize that Indigenous children with ASD require accessible pedagogical strategies that do not disregard their cultural identity. School inclusion must therefore go beyond guaranteeing enrollment and ensure educational practices that value their language, culture, ancestry, and community belonging, regardless of the educational setting in which they are enrolled.

In this context, interculturality emerges as a principle capable of bringing together different ways of understanding human development and learning processes. As Candau (2012) emphasizes, intercultural education presupposes dialogue among cultures, the confrontation of inequalities, and the recognition of diversity as a constitutive principle of society. From this perspective, differences cease to be understood as obstacles and instead become opportunities for enriching educational practices.

This discussion is especially relevant in contexts such as the Dourados Indigenous Reserve, in the state of Mato Grosso do Sul, where Guarani, Kaiowá, and Terena students live alongside one another and where different forms of social organization, educational practices, and conceptions of child development require culturally contextualized pedagogical approaches. This situation is compounded by the difficulty many families face in accessing diagnoses, specialized services, and information about ASD, reinforcing the need for dialogue between scientific knowledge and traditional ways of knowing.

Given this context, the following research question emerges: **“What are the challenges and possibilities for the school inclusion of Indigenous children with Autism Spectrum Disorder (ASD), considering the contributions of special education, Indigenous school education, and interculturality?”**

To answer this question, the general objective of this study is to reflect on the challenges and possibilities involved in the school inclusion of Indigenous children with Autism Spectrum Disorder in light of the contributions of special education, Indigenous school education, and interculturality. Its specific objectives are to understand the theoretical foundations of inclusive education and ASD; discuss the specific characteristics of Indigenous school education; analyze the main challenges identified in the scientific literature; reflect on inclusive and intercultural pedagogical practices; and highlight the importance of dialogue between special education and Indigenous school education in developing educational processes committed to valuing diversity.

This study is justified by the need to broaden discussions concerning the school inclusion of Indigenous children with ASD, a subject that remains underexplored in Brazilian scientific literature. Its academic and social relevance lies in its potential to support pedagogical practices, strengthen dialogue among schools, families, and communities, and contribute to the formulation of public policies committed to inclusive and intercultural education.

In addition to its academic contribution, this study has social relevance, particularly for professionals working in Indigenous schools, multifunctional resource rooms, and special education support services. The reflections presented are expected to support more inclusive pedagogical practices, promote dialogue among schools, families, and communities, and contribute to the development of public policies that take the cultural specificities of Indigenous peoples into account.

Methodologically, this is a qualitative study of a bibliographic nature, developed through the analysis of books, scientific articles, master's dissertations, doctoral theses, legal documents, and academic publications related to special education, Indigenous school education, interculturality, and Autism Spectrum Disorder. The investigation is grounded in an interpretive and reflective approach and seeks to understand how the scientific literature has discussed the challenges and possibilities involved in the school inclusion of Indigenous children with ASD, as well as the contributions these studies offer to the development of culturally contextualized pedagogical practices.

To support this analysis, the study engages with authors who discuss inclusive education, including Maria Teresa Eglér Mantoan, Lev Vygotsky, and Sadao Omote, as well as researchers addressing Indigenous school education and interculturality, such as Vera Maria Candau, Gersem José dos Santos Luciano (Baniwa), Daniel Munduruku, Ailton Krenak, Neusa Maria Mendes de Gusmão, and Paulo Freire. Bringing these theoretical frameworks together makes it possible to understand that school inclusion becomes a reality only when human and cultural diversity is recognized as a structuring principle of educational processes.

This study is organized into six chapters. Following this introduction, the theoretical framework is presented, discussing the principles of inclusive education, the specific characteristics of Indigenous school education, and the intersections among culture, Indigenous identity, and Autism Spectrum Disorder. The methodological procedures adopted in the study are then described, followed by the presentation of the results and discussions developed from the literature analyzed. Finally, the concluding considerations revisit the main findings of the investigation and identify possibilities for future research.

This study is expected to contribute to broadening discussions on the school inclusion of Indigenous children with ASD, strengthening inclusive and intercultural pedagogical practices, and reaffirming diversity as a fundamental principle of education. In this way, it seeks to contribute to the development of educational processes committed to human rights, equity, and recognition of the cultural identities of Indigenous peoples.

THEORETICAL FRAMEWORK

INCLUSION AND AUTISM FROM THE PERSPECTIVE OF BASIC EDUCATION

Inclusive education constitutes one of the principal advances in contemporary educational policies by recognizing everyone's right to education, regardless of physical, intellectual, sensory, social, cultural, or linguistic characteristics. From this perspective, schools are responsible for reorganizing their spaces, curricula, methodologies, and pedagogical practices to guarantee the participation and learning of all students.

In the Brazilian context, the consolidation of inclusive education results from significant legal advances, such as the 1988 Federal Constitution, the Law of Guidelines and Foundations of National Education (Law No. 9,394/1996), and the National Policy on Special Education from the Perspective of Inclusive Education (Brazil, 2008). These instruments reaffirm the right of students who are the target population of special education to access, remain in, participate in, and learn within mainstream schools, while ensuring *Atendimento Educacional Especializado*—AEE [Specialized Educational Services (SES)]

as a complementary service. These transformations consolidated an understanding of diversity as a constitutive element of the educational process, requiring pedagogical practices capable of addressing different ways of learning.

These changes represent a significant transformation in the understanding of disability and human diversity. Inclusive education no longer regards difference as an obstacle to teaching but recognizes it as an inherent feature of educational environments. From this perspective, diversity becomes a structuring element of the pedagogical process, requiring practices that respect different ways of learning, participating, and constructing knowledge.

Maria Teresa Eglér Mantoan (2015) emphasizes that school inclusion does not consist merely of physically placing students in mainstream classrooms; rather, it requires the transformation of the school itself, encompassing the curriculum, assessment, pedagogical organization, and conceptions of difference. This perspective breaks with the integrationist logic according to which students were expected to adapt to the school, recognizing instead that barriers to learning are also embedded in the physical, pedagogical, attitudinal, and institutional structures of the school environment.

Along these lines, Mantoan (2003) argues that inclusive schools must recognize classroom heterogeneity and organize teaching in consideration of different learning rates, styles, and forms, thereby promoting more democratic pedagogical practices for all students.

The defense of an inclusive school is grounded in human rights principles and understands education as an instrument of social participation and citizenship. In the case of children with Autism Spectrum Disorder (ASD), this entails recognizing different forms of communication, social interaction, and learning, while considering that each student has specific needs and potential.

The understanding of autism has also undergone significant changes over recent decades. Whereas an approach focused exclusively on clinical and diagnostic aspects previously predominated, a biopsychosocial perspective now prevails, according to which the development of persons with ASD results from the interaction of biological, social, cultural, and educational factors. This shift expands the

school's responsibility: rather than functioning solely as a place of schooling, it assumes a fundamental role in promoting participation, learning, and social inclusion.

In this context, Law No. 12,764/2012, known as the Berenice Piana Law, represented an important advance by recognizing persons with Autism Spectrum Disorder as persons with disabilities for all legal purposes, thereby guaranteeing their access to education, health care, employment, and other fundamental rights. Subsequently, the Brazilian Inclusion Law (Law No. 13,146/2015) reaffirmed these rights and strengthened the responsibility of educational systems to remove barriers that hinder the participation of students with disabilities.

Despite legal advances, the realization of these rights continues to face challenges related to teacher education, accessible pedagogical resources, specialized services, and attitudinal barriers within the school environment. In this context, children with ASD may require strategies addressing communication, social interaction, routine organization, and sensory processing—needs that can be met through curricular adaptations, accessibility resources, and appropriate pedagogical mediation.

Understanding autism from an educational perspective means recognizing each student as a rights-bearing subject capable of learning and participating in school life when provided with pedagogical conditions compatible with their needs and potential.

School inclusion entails a fundamental change and break with the school's organizational structure. The traditional school is laden with formalities and divided into teaching modalities, types of services, curricular levels, and various bureaucratic procedures. [...] Inclusion requires the elimination of exclusionary categorizations and oppositions, seeking coordination, flexibility, and interdependence among conflicting parts. (Mantoan, 2003, pp. 16–24)

Thus, discussing school inclusion entails recognizing that teachers' work extends beyond the transmission of content and involves a commitment to promoting equity, respecting differences, and valuing the potential of each student.

INDIGENOUS SCHOOL EDUCATION AND ITS CULTURAL SPECIFICITIES

Indigenous school education constitutes an important achievement of Brazil's Indigenous peoples, resulting from a long struggle for recognition of their cultural, linguistic, territorial, and educational rights. Unlike the school model introduced during the colonial period, which sought cultural assimilation, contemporary Indigenous school education is grounded in respect for the specific characteristics of each people and recognizes diversity as the guiding principle of educational practices. The 1988 Federal Constitution consolidated this process by guaranteeing Indigenous peoples the right to a specific, differentiated, bilingual, intercultural, and community-based education. This right was subsequently strengthened by Brazilian educational legislation, which came to recognize Indigenous schools as spaces for valuing Indigenous languages, traditional knowledge, distinctive forms of social organization, and the strengthening of Indigenous identities.

In this context, interculturality constitutes one of the principal foundations of Indigenous school education. More than simply facilitating encounters among different cultures, it presupposes relationships based on dialogue, mutual respect, and appreciation for diverse ways of producing knowledge. According to Candau (2012), critical interculturality seeks to overcome historically unequal relationships by recognizing that cultural differences are not obstacles to the educational process, but opportunities to build a more democratic and socially committed form of education.

These principles are especially relevant in the Dourados Indigenous Reserve, located in the state of Mato Grosso do Sul, where the Guarani, Kaiowá, and Terena peoples live alongside one another. Although they share the same territory, these communities preserve their own histories, languages, traditions, and ways of understanding the world, all of which must be considered when planning pedagogical practices in Indigenous schools. In this setting, the school performs a role that extends beyond the transmission of systematized knowledge, becoming a space for strengthening cultural identity, collective memory, and community participation.

Nevertheless, the social transformations of recent decades have also produced significant changes in the realities of these communities. In many Indigenous families, the everyday use of Indigenous languages has declined, particularly among younger generations, leading to increased use of Portuguese in school and community settings. Although this reality may facilitate certain communication processes between students and teachers, it also highlights challenges related to preserving the linguistic and cultural heritage of Indigenous peoples, reinforcing the need for pedagogical practices committed to valuing Indigenous languages.

Teachers from the Guarani, Kaiowá, and Terena peoples work in Indigenous schools in the Dourados Reserve, alongside non-Indigenous teachers, particularly in Specialized Educational Services (SES) and pedagogical support. The presence of Indigenous teachers strengthens intercultural education by bringing academic knowledge into closer dialogue with the communities' traditional knowledge. At the same time, it highlights the need to expand preservice and continuing teacher education policies, particularly in special and inclusive education.

In this regard, particular attention should be given to the competitive civil-service recruitment examination conducted by the municipality of Dourados through Public Notice No. 01/2023/PMD, administered by SELECON, which included vacancies for Pedagogical Support Teachers that were also open to Indigenous professionals. The requirement of the Administrative Registry of Indigenous Birth (*Registro Administrativo de Nascimento Indígena—RANI*) as proof of ethnic belonging demonstrates recognition of the importance of Indigenous teachers' participation in developing culturally contextualized pedagogical practices. In addition to increasing the representation of these professionals in schools, this initiative contributes to strengthening educational policies committed to the specific characteristics of Indigenous communities and to implementing inclusive education in intercultural contexts.

In discussing Indigenous school education, Gersem José dos Santos Luciano (Baniwa, 2020) argues that schools must be committed to the communities' life projects, strengthening their political,

cultural, and educational autonomy. From this perspective, education serves as an instrument for valuing traditional knowledge and strengthening Indigenous citizenship through curricula developed with community participation and recognition of their distinctive teaching and learning processes. Likewise, learning in Indigenous communities occurs beyond the school and is constructed through social interaction, oral traditions, observation, participation in collective activities, and the transmission of knowledge by elders. As Daniel Munduruku (2012) emphasizes, this knowledge is produced through experience and relationships with the community and territory, reaffirming the need for schools to foster dialogue between scientific knowledge and ancestral knowledge without establishing relations of superiority between them.

From this perspective, interculturality goes beyond the mere coexistence of cultures and entails a commitment to recognizing diversity and valuing different ways of producing knowledge, as advocated by Candau (2012). In this context, teacher education is essential to consolidating intercultural and inclusive pedagogical practices, requiring professionals who are capable of understanding the cultural specificities of Indigenous communities and connecting the principles of special education with the particular characteristics of Indigenous school education, thereby promoting educational practices committed to respect for diversity and the learning of all students.

In this context, Specialized Educational Services (SES) must be developed in coordination with the Indigenous school's pedagogical proposal, taking students' sociocultural specificities into account and avoiding the reproduction of decontextualized models. To this end, pedagogical planning must involve mainstream classroom teachers, SES professionals, families, community leaders, and other participants in school life. Although special education and Indigenous school education have advanced in guaranteeing rights, research and practical experiences discussing the inclusion of Indigenous students with disabilities from an intercultural perspective remain scarce. In the case of Indigenous children with Autism Spectrum Disorder (ASD), it is essential to consider such aspects as their heritage language, forms of communication, traditional knowledge, family participation, and the community's cultural values. The

development of an inclusive school therefore depends on recognizing diversity as an educational principle and coordinating special education, Indigenous school education, and interculturality, thereby ensuring pedagogical practices that respect these students' potential, cultural identities, and right to learn.

Accordingly, defending the school inclusion of Indigenous children with ASD means reaffirming these students' right to learn in a school that recognizes their potential, respects their cultural identities, and promotes pedagogical practices committed to equity, social justice, and the appreciation of diversity. From this perspective, Indigenous school education is strengthened as a space for producing knowledge, preserving culture, and guaranteeing rights, contributing to the development of individuals capable of moving between different cultural worlds without relinquishing their identity or collective belonging.

INTERSECTIONS AMONG CULTURE, INCLUSION, AND INDIGENOUS IDENTITY FROM THE PERSPECTIVE OF AUTISM

Developing a genuinely inclusive education requires recognition that human differences are not obstacles to the educational process but elements that enrich learning and strengthen democratic coexistence. In the context of Indigenous schools, this challenge becomes even more complex because school inclusion must simultaneously consider disability-related specificities and the cultural, linguistic, and historical particularities of each Indigenous people. It is therefore essential to establish dialogue among the principles of special education, Indigenous school education, and interculturality, understanding that these fields are not mutually exclusive but complementary in guaranteeing the right to education.

Developing an inclusive education requires recognition that human differences enrich the educational process and strengthen democratic coexistence. In Indigenous schools, this challenge is broadened by the need to connect special education, Indigenous school education, and interculturality. Historically, both Indigenous peoples and persons with disabilities have experienced processes of

exclusion and denial of rights. Consequently, both fields share a commitment to ensuring an education that recognizes cultural identities, respects differences, and promotes the participation of all students.

In discussing school inclusion, Mantoan (2003) argues that schools must overcome homogenizing practices and recognize diversity as an organizing principle of the educational process. This perspective aligns with the contributions of Gersem José dos Santos Luciano (Baniwa, 2020), who argues that Indigenous school education should strengthen communities' life projects and engage with their traditional knowledge. The inclusion of Indigenous children with disabilities therefore requires both the removal of pedagogical barriers and the recognition of the cultural identities present in the school environment.

Nevertheless, when this discussion is situated within Indigenous contexts, it becomes clear that school inclusion must broaden its perspective. It is not enough to consider only disability-related adaptations; it is equally necessary to recognize that students belong to communities with their own histories, values, languages, and knowledge. In this regard, Gersem José dos Santos Luciano (Baniwa, 2020) emphasizes that Indigenous school education must strengthen Indigenous peoples' life projects by promoting an education committed to autonomy, cultural preservation, and community agency.

Although they begin from different theoretical frameworks, Mantoan and Baniwa converge in advocating an education that respects differences and recognizes students as rights-bearing subjects. Whereas Mantoan challenges the traditional organization of schools and proposes an education designed for everyone, Baniwa demonstrates that this principle becomes a reality only when educational practices engage with the knowledge produced by Indigenous communities themselves. Thus, considering the school inclusion of Indigenous children with disabilities entails connecting these two perspectives and understanding that transforming schools depends both on removing pedagogical barriers and on recognizing the cultural identities present in educational settings.

This understanding also engages with Paulo Freire (1996), who advocates an education grounded in dialogue, respect for different forms of knowledge, and the collective construction of knowledge. From

this perspective, interculturality, as discussed by Candau (2012), extends beyond valuing cultural diversity and seeks to promote relationships based on recognition of difference and the overcoming of inequalities, thereby strengthening the connection between special education and Indigenous school education.

Vygotsky's (1997) cultural-historical theory understands human development as the result of social and cultural interactions, making it possible to recognize that the potential of Indigenous children with ASD is directly related to the experiences they have within their families, communities, and schools. In Indigenous communities, learning occurs through oral traditions, social interaction, and participation in cultural practices, aspects that must guide the planning of inclusive pedagogical practices.

This understanding reinforces the need for flexible pedagogical practices developed through dialogue among teachers, families, community leaders, and special education professionals, simultaneously respecting students' educational needs and the knowledge produced by Indigenous communities. Accordingly, connecting special education, Indigenous school education, and interculturality strengthens an education committed to social justice, equity, and recognition of diversity as a fundamental principle of the educational process.

CHALLENGES AND POSSIBILITIES FOR THE INCLUSION OF INDIGENOUS CHILDREN WITH ASD IN SCHOOL

The school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) represents one of the principal challenges of contemporary education because it requires coordination among special education, Indigenous school education, and interculturality. Despite advances in public policies, research on this subject remains scarce, hindering the development of pedagogical practices and educational strategies appropriate to the cultural specificities of Indigenous communities.

Another challenge concerns teacher education, which must connect knowledge of inclusive education, Autism Spectrum Disorder, interculturality, and Indigenous school education. As Mantoan

(2003) and Candau (2012) emphasize, developing an inclusive school requires recognition of diversity and dialogue among different forms of knowledge, with differences being understood as constitutive elements of pedagogical practice.

Within Indigenous school education, the challenges also include access to specialized services, early diagnosis, and Specialized Educational Services (SES), particularly in communities located far from urban centers. In addition, different cultural conceptions of child development must be understood, thereby strengthening dialogue between scientific knowledge and traditional ways of knowing.

In discussing Indigenous education, Gersem José dos Santos Luciano (Baniwa, 2020) emphasizes that strengthening the autonomy of Indigenous peoples depends on recognition of their knowledge and distinctive forms of organization, as well as on the effective participation of communities in the development of educational policies. This understanding must also guide initiatives related to school inclusion, given that no pedagogical proposal can be genuinely inclusive if it disregards the participation of families, leaders, and the other individuals who constitute community life.

In this context, the teacher's work assumes a fundamental role. More than adapting activities or using differentiated resources, teachers must develop pedagogical practices that value students' potential, respect their learning pace, and promote opportunities for effective participation in everyday school life. This work requires planning, dialogue among school professionals, and a willingness to learn continually from the community in which the school is situated.

Possibilities for strengthening school inclusion include expanding preservice and continuing teacher education, strengthening Specialized Educational Services, producing culturally contextualized pedagogical materials, encouraging research, and consolidating public policies connecting special education and Indigenous school education. The agency of Indigenous communities should also be highlighted, since their participation supports the development of pedagogical practices committed to cultural diversity, equity, and guaranteeing the right of Indigenous children with ASD to learn.

Accordingly, the inclusion of Indigenous children with Autism Spectrum Disorder must be understood as a collective commitment grounded in the defense of human rights, appreciation of cultural diversity, and recognition of each student's potential. Developing an intercultural and inclusive school requires overcoming standardized practices, strengthening dialogue among different forms of knowledge, and recognizing that learning occurs when differences cease to be viewed as limitations and instead become opportunities for growth for the entire educational community.

Thus, connecting special education, Indigenous school education, and interculturality represents a concrete opportunity to develop a more democratic, humanizing school committed to social justice—one that recognizes Indigenous children with ASD as rights-bearing subjects capable of learning, participating, and contributing to their communities.

Universal Design for Learning as a possibility for the inclusion of indigenous children with Autism Spectrum Disorder

Reflecting on the school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) entails developing pedagogical practices designed from the outset to address student diversity. In this context, Universal Design for Learning (UDL) constitutes an important approach because it proposes flexible, accessible curricula and recognizes both that students learn in different ways and that teaching should be organized from the planning stage to accommodate this diversity.

According to Zerbato and Mendes (2021), UDL expands learning opportunities by making objectives, methods, resources, and forms of assessment more flexible. It is grounded in the CAST principles of providing multiple means of engagement, representation, and action and expression. These principles engage directly with Indigenous school education and interculturality by recognizing different ways of producing knowledge, communicating experiences, and learning.

For Indigenous children with ASD, UDL facilitates the planning of varied activities involving visual resources, concrete materials, oral narratives, elements of local culture, games, and assistive

technologies. These resources broaden students' opportunities for participation and respect their different forms of communication and learning. UDL also encourages student agency by allowing students to express their knowledge through different means, in accordance with the principles of inclusive education advocated by Mantoan (2003).

Despite its potential, implementing UDL in Indigenous schools continues to face challenges related to teacher education, the production of contextualized pedagogical materials, and the strengthening of public policies directed toward inclusive education in intercultural contexts. More than a set of methodological strategies, UDL represents a pedagogical conception committed to equity and contributes to developing school environments that are accessible, inclusive, and responsive to human and cultural diversity.

Continuing teacher education for inclusive and intercultural education

The effective school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) depends on educating teachers who are capable of connecting the principles of inclusive education, Indigenous school education, and interculturality. Beyond technical knowledge of ASD and inclusive methodologies, this education must encompass the history, culture, languages, forms of social organization, and traditional knowledge of Indigenous peoples, thereby promoting pedagogical practices committed to equity and respect for diversity.

Freire (1996) argues that teaching requires research, dialogue, respect for students' knowledge, and an ongoing commitment to learning. This perspective aligns with Mantoan's (2003) contributions by recognizing that all students have the potential to learn when provided with opportunities suited to their needs and characteristics—a principle that becomes even more relevant in the context of Indigenous school education.

Despite advances in public policies, many teachers continue to report uncertainty when serving students with ASD, particularly in Indigenous schools, due to the scarcity of educational programs

connecting special education, interculturality, and Indigenous school education. It is therefore essential to expand continuing education policies developed in partnership with Indigenous communities, while valuing the agency of Indigenous teachers, community leaders, and higher education institutions.

Continuing education must also strengthen collaborative work among mainstream classroom teachers, Specialized Educational Services professionals, school leadership teams, families, and the community, recognizing school inclusion as a shared responsibility. In addition to broadening technical knowledge, this process promotes critical reflection on pedagogical practice and the development of inclusive, culturally contextualized strategies committed to every student's right to learn.

Investing in teachers' continuing education therefore means strengthening an education committed to social transformation. More than broadening technical knowledge, educational processes contribute to developing inclusive, culturally contextualized pedagogical practices grounded in respect for the rights of Indigenous peoples and persons with disabilities. Teacher education is thus consolidated as one of the principal pathways toward developing a school capable of welcoming diversity, promoting learning, and ensuring that Indigenous children with ASD have access to high-quality education developed in dialogue with their culture, community, and identity.

Participation of indigenous families and communities in the inclusion process

The school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) does not depend exclusively on teachers' work or public education policies. It is a collective process involving the participation of families, Indigenous communities, traditional leaders, and the different professionals working in schools. When these stakeholders establish relationships based on dialogue and shared responsibility, the possibilities expand for developing pedagogical practices that are more responsive to students' needs and to the cultural specificities of each Indigenous people.

In Indigenous communities, education extends beyond the boundaries of the school. Learning occurs through everyday social interaction, family relationships, oral traditions, participation in collective

activities, and the transmission of knowledge by elders. Elders play a fundamental role in preserving the memory, language, cultural values, and traditions that strengthen the identity of Indigenous peoples. In this context, the school does not replace community educational processes but engages in dialogue with them, recognizing that children's education occurs in different settings and through multiple experiences.

In this context, families play a fundamental role by sharing knowledge about children's development, interests, and forms of communication, thereby contributing to the development of more meaningful pedagogical strategies. According to Freire (1996), dialogue constitutes an essential principle of educational practice, strengthening families' participation not only in monitoring school progress but also in developing culturally contextualized pedagogical proposals.

In discussing Indigenous school education, Gersem José dos Santos Luciano (Baniwa, 2020) emphasizes that community participation is indispensable to developing a school committed to the life projects of Indigenous peoples. From this perspective, education is strengthened when it respects distinctive forms of social organization and recognizes that communities are key agents in defining educational pathways. This understanding must also guide inclusive education initiatives, preventing pedagogical decisions from being made without considering the knowledge produced by families and local leaders.

Nevertheless, challenges continue to hinder closer relationships. In some circumstances, families have difficulty accessing information about Autism Spectrum Disorder, educational rights guaranteed by legislation, or available specialized services. In other cases, schools are unable to establish lasting channels of dialogue with the community, limiting families' participation to occasional meetings or the resolution of administrative matters. These situations demonstrate the need to strengthen practices that facilitate effective community participation in school life.

It is also essential to recognize that different ways of understanding child development form part of the cultural universe of Indigenous communities and must be respected by schools. Strengthening relationships among schools, families, and communities promotes the development of more humane and

culturally contextualized pedagogical practices, making it possible to understand each child in their uniqueness and broaden their opportunities for learning and participation.

Accordingly, the school inclusion of Indigenous children with ASD must be understood as a shared responsibility. Schools play a fundamental role in this process, but their work becomes more meaningful when they establish partnerships with families and recognize the community as an active participant in developing educational practices. Only through this collective effort will it be possible to consolidate an inclusive education that respects cultural diversity, strengthens the identity of Indigenous peoples, and ensures children with ASD the right to learn, participate, and fully develop their potential.

Inclusive pedagogical practices in indigenous schools

Developing inclusive pedagogical practices for Indigenous children with Autism Spectrum Disorder (ASD) requires the planning of strategies that connect the principles of special education, Indigenous school education, and interculturality. In Indigenous schools, these practices must take the cultural specificities of communities into account by valuing Indigenous languages, traditional knowledge, and students' different forms of learning and participation.

In Indigenous schools, this flexibility must be developed through dialogue with the knowledge produced by communities. The use of Indigenous languages, traditional narratives, oral traditions, elements of nature, cultural expressions, collective activities, and experiences rooted in the territory strengthens learning and helps children recognize the school as a space that values their cultural identity. Consequently, educational content ceases to be presented in a decontextualized manner and begins to engage with students' everyday realities.

In discussing human development, Vygotsky (1997) emphasizes that learning occurs through social interactions and mediation by other people. This understanding contributes to conceptualizing the school inclusion of Indigenous children with ASD because it highlights the importance of the relationships established among teachers, peers, families, and communities in the construction of

knowledge. Students cease to be viewed solely in terms of their limitations and instead come to be recognized as individuals capable of learning when they participate in environments that promote interaction and development.

From this perspective, teachers assume the role of mediators in the educational process, organizing learning situations that respect students' different rates of learning and potential. To this end, they may employ varied strategies, such as visual resources, concrete materials, educational games, illustrated stories, image sequences, structured routines, small-group activities, assistive technologies, and practical experiences related to the everyday life of the Indigenous community. These strategies broaden opportunities for children with ASD to participate and promote learning throughout the class.

Another relevant aspect concerns the organization of the school environment. Children with ASD frequently benefit from structured spaces, predictable routines, and reduced exposure to stimuli that may hinder concentration. Nevertheless, these adaptations must be planned with sensitivity to the Indigenous school context, avoiding the reproduction of standardized models and taking the distinctive characteristics of each community into account. Pedagogical planning must therefore balance accessibility, curricular flexibility, and appreciation of local cultural practices.

Collaborative activities are also important. Group work, discussion circles, shared experiences, interdisciplinary projects, and collectively developed practices strengthen relationships among students and foster a school culture founded on respect for differences. Everyday interaction enables children to learn to recognize diversity as part of community life, contributing to the development of cooperation, empathy, and solidarity.

In addition to strategies developed in the classroom, pedagogical planning must be undertaken collectively by mainstream classroom teachers, Specialized Educational Services professionals, school leadership teams, families, and Indigenous leaders. This coordination expands the possibilities for identifying potential, overcoming barriers, and developing more meaningful interventions for each

student. School inclusion thus ceases to be the exclusive responsibility of one professional and becomes a commitment shared by the entire school community.

According to Mantoan (2003), teaching from an inclusive perspective entails abandoning practices based on homogenizing students and recognizing that diversity constitutes one of the school's greatest assets. This understanding aligns with the interculturality advocated by Candau (2012), which recognizes that different ways of learning, teaching, and producing knowledge enrich educational processes. When these frameworks engage with the principles of Indigenous school education, the possibilities for developing genuinely inclusive and culturally contextualized pedagogical practices are expanded.

Inclusive pedagogical practices developed in Indigenous schools must therefore be grounded in valuing students' potential, community participation, curricular flexibility, and respect for cultural identities, ensuring that Indigenous children with ASD have effective conditions for participation, learning, and development.

Pathways toward strengthening inclusive intercultural education

The reflections developed throughout this chapter demonstrate that the school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) constitutes a complex process requiring coordination among special education, Indigenous school education, and interculturality. Although Brazilian legislation has expanded recognition of the rights of persons with disabilities and Indigenous peoples, challenges remain concerning the implementation of those rights in everyday school life. In this context, particular emphasis should be placed on strengthening public policies for preservice and continuing teacher education, thereby promoting pedagogical practices grounded in both scientific knowledge and the traditional knowledge of Indigenous communities. Investing in teacher education means investing in educational quality and in guaranteeing all students' right to learn.

Another fundamental aspect concerns strengthening Specialized Educational Services (SES), which must be integrated into the school's institutional pedagogical plan and aligned with the cultural

specificities of Indigenous communities, thereby helping to remove barriers to students' learning and participation. Similarly, scientific research on Indigenous children with ASD must be expanded in order to support the development of more contextualized public policies, pedagogical materials, and educational proposals committed to the realities of these communities.

It is also essential to recognize Indigenous communities' agency in developing educational policies and practices. The participation of families, Indigenous teachers, traditional leaders, and other community members strengthens the development of culturally contextualized pedagogical strategies. In this process, Universal Design for Learning (UDL) constitutes an important possibility for transforming the principles of inclusive education into concrete practices by proposing flexible curricula, diversified methodologies, and different forms of student participation consistent with the principles of interculturality.

Nevertheless, no pedagogical proposal will produce meaningful results if it remains confined to official documents. Inclusion is realized through relationships among teachers, students, families, and communities—relationships grounded in dialogue, respect for differences, and appreciation of each child's potential. As discussed throughout this study, and in light of the contributions of Mantoan (2003), Candau (2012), Freire (1996), Vygotsky (1997), and Baniwa (2020), the development of a genuinely inclusive school depends on recognizing diversity as a constitutive element of education and as an opportunity for learning and strengthening human relationships.

Strengthening the school inclusion of Indigenous children with Autism Spectrum Disorder therefore means reaffirming a commitment to an education that recognizes the plurality of cultures, forms of knowledge, and ways of learning. More than guaranteeing access to school, it entails ensuring conditions for participation, learning, the development of students' potential, and respect for their cultural identity, reaffirming inclusive education and Indigenous school education as pathways toward building a more just, democratic society committed to equity.

CULTURE, INDIGENOUS IDENTITY, AND THE INCLUSION OF CHILDREN WITH AUTISM SPECTRUM DISORDER

The school inclusion of Indigenous children with Autism Spectrum Disorder (ASD) requires an understanding that moves beyond exclusively clinical or pedagogical perspectives, recognizing that human development is influenced by the social, cultural, and historical relationships experienced by individuals. Among Indigenous peoples, the construction of identity is deeply connected to language, territory, ancestry, distinctive forms of community organization, and traditional processes for producing and transmitting knowledge. Discussing these children's inclusion therefore entails simultaneously recognizing their status as persons with disabilities and their ethnic and cultural belonging.

Indigenous school education, guaranteed by the 1988 Constitution of the Federative Republic of Brazil and the Law of Guidelines and Foundations of National Education, is grounded in Indigenous peoples' right to a specific, differentiated, bilingual, community-based, and intercultural education. More than guaranteeing access to schooling, this educational model seeks to strengthen cultural identities, preserve Indigenous languages, and value the knowledge produced by communities, understanding the school as a space for dialogue between traditional knowledge and scientific knowledge.

In this context, interculturality constitutes a guiding principle of educational practices because it promotes recognition of diversity as a constitutive element of society and education. As Candau (2012) argues, intercultural education presupposes relationships grounded in dialogue, respect for differences, and confrontation of historically constructed inequalities. Differences therefore cease to be understood as obstacles and instead come to represent opportunities for enriching educational processes.

In discussing Indigenous school education, Gersem José dos Santos Luciano (Baniwa, 2020) emphasizes that schools must be committed to communities' life projects by strengthening their political, cultural, and educational autonomy. From this perspective, learning extends beyond the classroom and is constructed through social interaction, oral traditions, observation, collective participation, and the intergenerational transmission of knowledge. Daniel Munduruku (2012) reinforces this understanding by

demonstrating that Indigenous knowledge is produced through relationships with the community and territory, reaffirming the need for schools to promote dialogue among different ways of producing knowledge without establishing hierarchies between them.

Although legal advances have expanded recognition of the rights of persons with disabilities and Indigenous peoples, the literature indicates that Indigenous children with ASD remain largely invisible in research, public policies, and educational practices. In many contexts, access to diagnosis, specialized services, and Specialized Educational Services (SES) remains limited, particularly in communities located far from urban centers. This situation is compounded by the scarcity of studies connecting special education, Indigenous school education, and interculturality, which hinders the development of pedagogical proposals capable of simultaneously addressing the specific characteristics of ASD and Indigenous cultural contexts.

Making these children visible is not limited to identifying them as members of special education's target population; it also entails recognizing their rights, cultural identity, and potential for learning. In light of Mantoan's (2015) contributions, school inclusion becomes a reality only when schools reorganize their practices to guarantee the participation of all students, removing barriers that hinder their learning and promoting effective conditions for access, retention, and participation.

From this perspective, it is essential to strengthen intercultural pedagogical practices that respect Indigenous languages, forms of communication, traditional knowledge, and family and community participation in the educational process. Connecting special education, Indigenous school education, and interculturality broadens the possibilities for developing a school committed to equity, respect for diversity, and realization of the right to education, recognizing Indigenous children with ASD as rights-bearing subjects capable of learning, participating, and contributing to community life.

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WELCOMING AND PEDAGOGICAL MEDIATION OF INDIGENOUS STUDENTS WITH DISABILITIES IN INDIGENOUS SCHOOLS: CHALLENGES AND POSSIBILITIES FROM THE PERSPECTIVE OF INTERCULTURALITY AND TRADITIONAL KNOWLEDGE

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Abstract

The inclusion of Indigenous students with disabilities represents one of the greatest challenges facing contemporary Brazilian education, as it requires the articulation of the principles of Special Education, Indigenous School Education, and interculturality. Although significant legal advances have secured the right to inclusive education and recognition of the cultural specificities of Indigenous peoples, obstacles persist regarding teacher education, pedagogical practices, the production of contextualized materials, and the development of public policies that engage with the realities of Indigenous communities. In this context, this chapter analyzes the contributions of welcoming, pedagogical mediation, and traditional knowledge to strengthening inclusive educational processes in Indigenous schools. This is a bibliographic study based on books, scientific articles, normative documents, and research addressing the interface between Indigenous School Education, Special Education, and interculturality. The dialogue established with authors such as Gersem Baniwa, Vera Maria Candau, Célia Xakriabá, Ailton Krenak, Paulo Freire, Maurice Tardif, and Maria Teresa Eglér Mantoan demonstrates that inclusion cannot be understood merely as ensuring access to education, but rather as an ethical and political commitment to recognizing cultural differences, distinctive ways of learning, and the knowledge produced by Indigenous peoples. It is concluded that welcoming and pedagogical mediation, when articulated with traditional knowledge and community participation, constitute structural elements in the development of intercultural educational practices capable of fostering belonging, equity, and meaningful learning.

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INTRODUCTION

The development of educational systems committed to diversity constitutes one of the greatest challenges facing contemporary public policy. In Brazil, this debate becomes even more complex when it involves Indigenous students with disabilities, as it underscores the need to articulate two fields historically shaped by struggles and the assertion of rights: Indigenous School Education and Special Education from an inclusive perspective. On the one hand, Indigenous peoples call for an education that strengthens their languages, territories, forms of social organization, and traditional knowledge; on the other, persons with disabilities demand effective conditions for participation, learning, and continued attendance within educational systems. The convergence of these two agendas reveals challenges that go beyond simply ensuring access to school and require the development of pedagogical practices capable of recognizing human diversity in its cultural, linguistic, social, and educational dimensions.

In recent decades, significant legal frameworks have consolidated fundamental rights for both Indigenous peoples and persons with disabilities. Nevertheless, the realization of these rights continues to face obstacles related to social inequalities, schools' structural limitations, the education of teaching professionals, and the persistence of pedagogical models that are insufficiently responsive to the cultural specificities of different Indigenous peoples. In this context, Indigenous students with disabilities frequently experience a condition of invisibility produced by overlapping cultural, linguistic, territorial, and pedagogical barriers, making evident the need for educational approaches that integrate inclusion and interculturality as inseparable dimensions of the educational process.

Understanding this reality requires moving beyond perspectives that address disability exclusively through biomedical frameworks or reduce interculturality to a superficial recognition of cultural differences. Critical intercultural education proposes a broader movement grounded in dialogue among

different epistemologies, appreciation of the knowledge produced by Indigenous communities, and efforts to confront the historical relations of inequality that permeate educational processes. From this perspective, inclusion no longer means adapting students to established school models; instead, it entails transforming the school itself, along with its curriculum and practices, to accommodate different ways of learning, teaching, and producing knowledge.

It is within this context that welcoming and pedagogical mediation assume central importance. More than methodological procedures, they constitute ethical principles that guide the development of educational relationships grounded in listening, respect, and recognition of students' cultural identities. In Indigenous schools, welcoming means recognizing that learning processes are profoundly shaped by orality, ancestry, first language, territory, and community participation. Likewise, pedagogical mediation involves building bridges between scientific knowledge and traditional knowledge, fostering educational experiences that simultaneously respect specific educational needs and each people's distinctive ways of living and learning.

In this setting, traditional knowledge ceases to occupy a peripheral position and becomes one of the principal foundations of intercultural pedagogical practice. The participation of families, elders, Indigenous leaders, and the community strengthens the connection between school and territory, expands opportunities for meaningful learning, and reaffirms that Indigenous School Education cannot be understood separately from the collective experiences produced by communities. This perspective broadens the very concept of inclusion, understanding it as a process that recognizes cultural differences not as obstacles, but as constitutive dimensions of the right to education.

Based on these reflections, this chapter analyzes the contributions of welcoming, pedagogical mediation, and traditional knowledge to the inclusion of Indigenous students with disabilities in the context of Indigenous School Education, discussing contemporary challenges and possibilities for strengthening intercultural educational practices. Grounded in qualitative bibliographic research, the text establishes a dialogue among scholarship on Indigenous School Education, Special Education, and

interculturality, seeking to contribute to a deeper discussion of a subject that remains underexplored in the academic literature but is essential to consolidating an education committed to equity, social justice, and recognition of the plurality of forms of knowledge.

INDIGENOUS SCHOOL EDUCATION, SPECIAL EDUCATION, AND INTERCULTURALITY: NECESSARY INTERFACES

The discussion concerning the inclusion of Indigenous students with disabilities requires recognition that Indigenous School Education and Special Education are historically distinct fields, although they share principles related to the recognition of human rights, appreciation of diversity, and defense of an education committed to equity. For many years, both fields were marked by exclusionary practices produced by homogeneous educational models that disregarded both the cultural specificities of Indigenous peoples and the educational needs of persons with disabilities. The convergence of these two areas therefore represents a relatively recent movement, driven by the expansion of social rights and the strengthening of public policies directed toward inclusion and recognition of diversity.

Indigenous School Education became established as a result of Indigenous peoples' historical mobilizations in defense of the right to a school system that would not reproduce the processes of cultural assimilation characteristic of the colonial period and much of Brazil's republican history. For centuries, schooling was used as an instrument for denying Indigenous identities by imposing the Portuguese language, rendering ancestral knowledge invisible, and weakening cultural practices transmitted across generations. This model was gradually overcome, especially following the 1988 Federal Constitution, which recognized Indigenous peoples' right to preserve their languages, traditions, distinctive forms of social organization, and educational processes. From this landmark onward, the Indigenous school came to be conceived as a space for cultural strengthening, the reaffirmation of identity, and the production of knowledge in dialogue with communities' life projects.

In discussing this process, Gersem Baniwa observes that an Indigenous school fulfills its social function only when it strengthens the autonomy of Indigenous peoples and contributes to the continuity of their knowledge without disrupting the distinctive dynamics of each community. This understanding shifts the school away from its traditional role as a mere transmitter of content and brings it closer to a perspective in which teaching also entails preserving memories, strengthening identities, and ensuring that scientific knowledge enters into dialogue with the knowledge historically produced by Indigenous peoples. Thus, the school ceases to represent a space of cultural replacement and becomes an environment in which different ways of understanding the world encounter one another.

This conception aligns with Célia Xakriabá's reflections, according to which Indigenous School Education should be understood as a territory of epistemological resistance. The author argues that educational processes cannot be dissociated from memory, territory, ancestry, and Indigenous peoples' distinctive forms of producing knowledge. From this perspective, interculturality does not merely correspond to recognizing the existence of different cultures; rather, it represents the development of educational relationships capable of challenging the historically established hierarchies between scientific and traditional knowledge.

At the same time as Indigenous School Education was consolidating its foundations, Special Education was also undergoing profound conceptual transformations. For much of the twentieth century, a perspective centered on the medical model of disability predominated, according to which learning difficulties were attributed almost exclusively to students' individual limitations. The expansion of social movements led by persons with disabilities and the incorporation of new international frameworks significantly changed this understanding, shifting the focus from individual limitations to barriers within society and educational systems. Disability then came to be understood also as the result of contexts that restrict participation and the exercise of rights.

This shift had direct repercussions on Brazilian education policies. The Federal Constitution, the Brazilian National Education Guidelines and Framework Law, the Salamanca Statement, the Convention

on the Rights of Persons with Disabilities, and the National Policy on Special Education from the Perspective of Inclusive Education consolidated the understanding that the right to education presupposes not only access to school, but also effective conditions for participation, learning, and continued attendance. School inclusion ceased to represent a policy directed exclusively toward students with disabilities and became an organizing principle of educational systems, requiring curricular, methodological, attitudinal, and institutional transformations.

However, when these two historical trajectories converge, a field of challenges emerges that remains insufficiently explored in academic scholarship. Indigenous students with disabilities occupy a position marked by the intersection of cultural, social, linguistic, and educational inequalities. Frequently described as a condition of “double invisibility,” this reality demonstrates that policies directed exclusively toward Indigenous peoples or exclusively toward persons with disabilities tend to be insufficient to address the specific experiences of this population. The development of genuinely inclusive practices requires an understanding that disability and ethnic belonging are not independent dimensions of the school experience, but aspects that continuously interact in shaping these students’ educational trajectories.

In this context, interculturality assumes a structural role. As Vera Maria Candau argues, critical interculturality goes beyond recognizing cultural diversity and proposes the development of democratic relationships among different sociocultural groups, confronting the inequalities produced by historical processes of exclusion. This perspective makes important contributions to Special Education by demonstrating that inclusive practices cannot be universally applied in a homogeneous manner; instead, they must engage with the cultural, linguistic, and territorial specificities of each educational context. From this perspective, inclusion ceases to be understood as adapting students to prevailing school standards and comes to mean transforming the school itself so that it is capable of welcoming different ways of learning, communicating, participating, and producing knowledge.

This understanding significantly broadens the scope of inclusive policies. Rather than regarding traditional knowledge as peripheral or supplementary, it recognizes such knowledge as a constitutive component of learning and human development. The participation of families, community leaders, elders, and other individuals who are part of the collective life of Indigenous communities comes to be understood as an essential element of educational practice, strengthening the relationship among school, territory, and culture. Accordingly, the interface between Indigenous School Education, Special Education, and interculturality represents not merely the convergence of three fields of knowledge, but the development of a new educational perspective grounded in dialogue among different epistemologies and in the recognition of diversity as a structural principle of the contemporary school.

WELCOMING AND PEDAGOGICAL MEDIATION AS FOUNDATIONS OF INTERCULTURAL INCLUSIVE EDUCATION

The consolidation of genuinely inclusive education in Indigenous schools does not depend exclusively on the existence of legislation, pedagogical resources, or specialized services. Although these elements are indispensable to ensuring the right to education, they become insufficient when disconnected from the human relationships that constitute daily school life. It is in this context that welcoming and pedagogical mediation assume a structural role, as they represent ethical dimensions of teaching practice that guide the development of educational environments capable of simultaneously recognizing cultural differences and the specific educational needs of Indigenous students with disabilities.

For many years, school inclusion was understood primarily as ensuring physical access to mainstream schools. Although important in expanding the rights of persons with disabilities, this perspective proved insufficient to secure students' effective participation in teaching and learning processes. Enrollment alone does not eliminate the attitudinal, linguistic, cultural, or pedagogical barriers that remain within educational institutions. In the context of Indigenous School Education, this limitation becomes even more evident because a student's admission to school does not, in itself, ensure recognition

of their cultural identity, first language, or the distinctive ways in which their community produces and shares knowledge.

From this perspective, welcoming goes beyond the administrative meaning of receiving a student at the beginning of the school year. It constitutes a permanent stance of recognizing the other as a rights-bearing subject with a history, a cultural identity, and particular ways of interpreting the world. In Indigenous schools, this understanding acquires an even broader meaning because it involves recognizing that each student belongs to a collective whose knowledge, values, and social practices constitute an inseparable part of their educational trajectory. Welcoming therefore means developing pedagogical relationships grounded in respect for differences, appreciation of Indigenous culture, and the creation of conditions that allow all students to feel that they belong within the school environment.

This understanding is closely aligned with the Freirean conception of education. For Paulo Freire, teaching presupposes a dialogical relationship in which educators and learners construct knowledge through listening, the problematization of reality, and recognition of individuals' lived experiences. From this perspective, dialogue is not merely a methodological strategy, but an ethical principle that breaks with authoritarian practices of knowledge transmission. When this conception is applied to Indigenous School Education, welcoming ceases to represent an isolated action and becomes a way of recognizing that the knowledge produced within Indigenous communities is legitimate and must remain in continuous dialogue with school content.

Vera Maria Candau's reflections broaden this understanding by arguing that critical interculturality requires the development of educational relationships based on confronting inequalities historically produced among different sociocultural groups. It is not enough to recognize that diverse cultures exist; conditions must be created so that these cultures can participate effectively in the production of school knowledge. From this perspective, welcoming Indigenous students with disabilities entails recognizing that they experience processes of exclusion produced by overlapping cultural, linguistic, and attitudinal

barriers. Intercultural pedagogical practices thus become instruments for confronting these inequalities, fostering the development of more democratic and socially engaged school environments.

If welcoming constitutes the relational dimension of inclusion, pedagogical mediation represents its formative dimension. To mediate means to create conditions for learning to occur through meaningful experiences by organizing teaching situations that respect students' different learning times, paces, and approaches. From this perspective, teachers cease to occupy exclusively the position of content transmitters and assume the role of articulators among different knowledge systems, building bridges among scientific frameworks, traditional knowledge, and experiences developed within Indigenous territories.

This understanding is supported by the work of Maurice Tardif, which recognizes that teachers' knowledge is constituted not only by academic knowledge, but also by the professional, social, and cultural experiences developed throughout each educator's trajectory. In Indigenous schools, this knowledge is broadened further by incorporating knowledge collectively produced by communities through orality, interaction with elders, observation of nature, and traditional practices. Teachers thus act as mediators among different rationalities, articulating scientific and community knowledge without establishing hierarchical relationships between them.

When discussing pedagogical mediation in Indigenous contexts, it is equally necessary to consider that educational processes are not confined to the physical boundaries of the school. Learning takes place within the territory, through collective activities, rituals, oral narratives, relationships with nature, and interactions among different generations. This understanding aligns with Ailton Krenak's reflections, according to which human development cannot be dissociated from the bonds established among people, their territories, and their communities. In this sense, the school relinquishes a centralizing position and becomes part of a broader network of knowledge production, sharing responsibility for educational processes with the community.

This perspective also transforms the understanding of disability. Rather than focusing exclusively on a student's individual limitations, pedagogical mediation begins by identifying barriers within the school environment and organizing strategies that foster everyone's participation. This movement is consistent with the social model of disability, according to which many of the difficulties people face arise from the conditions provided by society, rather than solely from their individual characteristics. In Indigenous schools, this analysis becomes even more relevant because it demonstrates that inclusive practices will be effective only when they simultaneously respect the functional and cultural diversity present within communities.

Another fundamental aspect concerns the participation of families, leaders, and elders in the educational process. Unlike school models centered exclusively on teachers' work, Indigenous School Education recognizes that learning results from collective processes developed within the community. The presence of these participants strengthens students' sense of belonging, broadens the cultural repertoire of school activities, and fosters the development of more contextualized pedagogical practices. For Indigenous students with disabilities, this participation represents an important protective factor because it helps the school understand their potential through cultural frameworks shared by the community, thereby avoiding narrow or decontextualized interpretations of their learning processes.

Accordingly, welcoming and pedagogical mediation are not independent dimensions of teaching practice. Both are part of the same educational project grounded in intercultural dialogue, appreciation of traditional knowledge, and a commitment to developing a school capable of recognizing diversity as a constitutive element of learning. When articulated with one another, these principles foster not only the inclusion of Indigenous students with disabilities, but also the transformation of school culture itself by strengthening relationships of respect, reciprocity, and shared responsibility among teachers, students, families, and communities.

TRADITIONAL KNOWLEDGE AND THE DEVELOPMENT OF INCLUSIVE PEDAGOGICAL PRACTICES

The development of inclusive pedagogical practices in Indigenous schools requires overcoming conceptions that regard school knowledge as the only legitimate form of knowledge production. Historically associated with Eurocentric educational models, this perspective disregards the fact that, over generations, Indigenous peoples have developed distinctive ways of teaching, learning, and transmitting knowledge that are profoundly connected to orality, community life, the observation of nature, ancestry, and territory. Recognizing this knowledge as a constitutive component of school education represents one of the principal challenges of interculturality and, at the same time, one of the greatest possibilities for strengthening the inclusion of Indigenous students with disabilities.

For a long time, Brazilian schools were structured around the idea of universalizing content and teaching methods, based on the assumption that all students should learn in the same way and through the same pathways. This logic produced significant processes of exclusion by ignoring the cultural, linguistic, and social specificities of different groups. In Indigenous contexts, this process had even more profound consequences because the knowledge produced by communities was frequently classified as inferior or incompatible with scientific knowledge. As a result, many schools began reproducing practices that distanced children and young people from their own cultural frameworks, compromising not only their learning but also the development of their identities.

Indigenous School Education breaks with this logic by recognizing traditional knowledge as the intellectual heritage of Indigenous peoples and, therefore, as something that should occupy a central place in educational processes. Teaching in this context means establishing relationships among different epistemologies, enabling scientific knowledge to engage with the knowledge historically produced by communities without presenting either as superior to the other. In this sense, interculturality ceases to be understood as the simple coexistence of distinct cultures and becomes an ongoing process of negotiation, recognition, and appreciation of different ways of producing knowledge.

This understanding aligns with the reflections of Gersem Baniwa, who advocates for the Indigenous school as a space for strengthening Indigenous peoples' collective projects. According to the author, the school's social function is not to replace traditional knowledge with scientific knowledge, but to enable both to enter into dialogue in the education of new generations. The school thus becomes a territory for articulating different rationalities, simultaneously strengthening communities' autonomy and access to the knowledge produced by the national society.

This perspective is also advocated by Célia Xakriabá, who states that Indigenous education should strengthen Indigenous peoples' memory, ancestry, and identity. The author draws attention to the fact that learning does not mean abandoning distinctive ways of living, but rather expanding the possibilities for understanding the world without severing bonds with the territory and the collective. This reflection is especially relevant when discussing the inclusion of Indigenous students with disabilities because it demonstrates that human development cannot be analyzed solely through biomedical or school-based parameters. The ways in which each community understands care, learning, and social participation constitute fundamental elements in developing genuinely inclusive pedagogical practices.

Alongside these reflections, Ailton Krenak offers a forceful critique of contemporary forms of knowledge production that fragment the relationships among human beings, nature, and community. According to the author, learning means participating in collective life and recognizing that human existence is profoundly connected to territory and to relationships established with others. This understanding significantly broadens the concept of school learning, making it possible to recognize that the development of Indigenous students with disabilities also occurs through experiences outside the classroom, including cultural practices, oral narratives, collective celebrations, and knowledge shared by elders. From this perspective, inclusion is not restricted to access to the formal curriculum; it also involves effective participation in community life.

Orality occupies a central position in this process. In Indigenous communities, much knowledge is transmitted through narratives, stories, songs, rituals, and teachings shared across generations. These

educational processes strengthen collective memory and contribute to the development of students' cultural identities. When incorporated into daily school life, traditional narratives expand learning opportunities by establishing connections between curricular content and students' concrete experiences. For students with disabilities, these practices may foster different forms of communication, expression, and participation, respecting individual learning paces and potential without severing connections with the community's cultural frameworks.

Another fundamental aspect concerns territory. For Indigenous peoples, territory does not merely represent a physical space for housing or economic production; it is a structural element of identity, spirituality, memory, and knowledge production. Educational experiences developed through contact with nature, the observation of environmental cycles, the traditional management of natural resources, and community activities produce learning that could hardly be developed exclusively within the classroom. Valuing these experiences broadens opportunities for Indigenous students with disabilities to participate by recognizing different ways of engaging with knowledge and breaking with pedagogical models centered exclusively on written language or teachers' oral exposition.

This understanding is supported by the contributions of Paulo Freire, according to whom learning acquires meaning when it is connected to learners' concrete lived realities. By arguing that school content should engage with students' experiences, Freire provides important elements for conceiving Indigenous School Education as a space in which the curriculum emerges from the encounter between scientific knowledge and knowledge collectively constructed by communities. Pedagogical practice thus ceases to consist of transmitting previously defined content and becomes an ongoing process of shared knowledge construction.

From this perspective, inclusion ceases to be understood as the exclusive responsibility of teachers or specialized services. Instead, it becomes a collective commitment undertaken by the entire community. Families, leaders, elders, teachers, and students share responsibility for educating new generations, contributing to the development of contextualized, culturally responsive pedagogical strategies committed

to each student's holistic development. For students with disabilities, this collective participation represents an important protective factor because it strengthens bonds of belonging, expands opportunities for communication, and fosters the development of educational pathways compatible with the realities experienced within Indigenous communities.

Accordingly, traditional knowledge cannot be understood as supplementary content within the school curriculum or as folkloric elements intended solely to celebrate Indigenous culture. It constitutes an epistemological framework capable of guiding inclusive pedagogical practices, broadening students' forms of participation, and strengthening the articulation among school, community, and territory. When recognized as legitimate knowledge, traditional knowledge becomes an instrument for transforming the school itself, contributing to the development of intercultural educational processes committed to cognitive justice, appreciation of diversity, and realization of the right to education for all.

INTERCULTURAL TEACHER EDUCATION AND CONTEMPORARY CHALLENGES IN INCLUSIVE EDUCATION

The transformations that have occurred in Brazilian education policies in recent decades have demonstrated that the consolidation of inclusive education depends to a considerable extent on teacher education. However, understanding teacher education merely as the acquisition of techniques or methodologies for serving students with disabilities constitutes a limited perspective in view of the complexity present in Indigenous schools. Teaching in these contexts requires competencies that extend beyond traditional didactic knowledge and involve understanding the cultural, linguistic, historical, and territorial specificities that characterize each Indigenous people. Educating teachers for inclusion therefore means preparing them to establish pedagogical relationships grounded in intercultural dialogue and recognition of diversity as a structural principle of education.

This understanding shifts the focus of teacher education from a perspective centered exclusively on disability to an approach that integrates Special Education, Indigenous School Education, and

interculturality. The challenges teachers face in Indigenous communities arise not only from the need to develop curricular adaptations or use accessibility resources, but also from the responsibility to develop pedagogical practices capable of engaging with different forms of knowledge production while respecting Indigenous languages, traditional knowledge, community organization, and each people's life projects. In this context, continuing education assumes a strategic role because it enables educators to revisit their practices continually in light of social transformations and the demands presented by communities.

Paulo Freire understands teacher education as an ongoing process of critical reflection on one's own practice. According to the author, teaching entails continuous learning, questioning lived experiences, and reconstructing the knowledge produced in daily school life. This perspective becomes especially significant in Indigenous schools, where teachers are constantly called upon to articulate different cultural and epistemological universes. Educational practice ceases to be understood as the application of predefined methods and becomes an ongoing process of listening, dialogue, and knowledge reconstruction in partnership with students and the community.

This conception aligns with the reflections of Maurice Tardif, who understands teachers' knowledge as the result of articulating academic knowledge, professional experience, and learning developed through social relationships. In Indigenous schools, this articulation acquires particular characteristics because it incorporates knowledge produced by elders, community leaders, families, and students themselves. Teachers cease to be regarded as the sole holders of knowledge and assume the role of mediators among different forms of knowledge, recognizing that learning also occurs through collective experiences, cultural practices, and community life. Intercultural teacher education therefore does not consist merely of preparing teachers to teach in Indigenous contexts; it entails developing professionals capable of continually learning from those contexts.

Vera Maria Candau's contributions broaden this discussion by arguing that critical interculturality presupposes confronting the power relations historically established among different sociocultural groups. From this perspective, educating teachers also means developing a critical stance toward school practices

that, often unconsciously, reproduce processes of exclusion, prejudice, and the erasure of Indigenous knowledge. Intercultural teacher education should foster the development of practices committed to social justice, articulating equality policies with recognition of the cultural identities present in the school environment.

This reflection becomes even more relevant when considering the circumstances of Indigenous students with disabilities. Teaching requires sensitivity to understand that specific educational needs cannot be analyzed separately from students' cultural experiences. Pedagogical strategies developed exclusively through urban or Western frameworks tend to produce limited responses in view of the diversity found within Indigenous communities. It is therefore necessary to develop contextualized practices in dialogue with families, leaders, and the knowledge collectively produced within the territory.

In this regard, community participation ceases to represent a supplementary element of teacher education and instead becomes an integral part of the process. Elders, traditional leaders, parents, and other community members help broaden teachers' understanding of Indigenous ways of teaching, learning, and interpreting the world. This interaction strengthens the development of culturally contextualized curricula and helps educational processes respect collective identities without disregarding students' individual needs.

Experiences developed in Mato Grosso do Sul demonstrate that this perspective is entirely feasible. The **Teko Arandu** Intercultural Indigenous Teacher Education Degree Program at the Federal University of Grande Dourados and the Intercultural Pedagogy Program at the State University of Mato Grosso do Sul are initiatives that articulate academic education with knowledge produced in Indigenous communities. By adopting methodologies that bring universities, schools, and territories closer together, these programs contribute to educating teachers capable of working in intercultural and inclusive contexts, strengthening Indigenous leadership in the production of educational knowledge.

Nevertheless, the challenges remain substantial. Many Indigenous schools still face difficulties regarding the provision of continuing education, the production of bilingual teaching materials, the

availability of accessibility resources, and specialized support for students eligible for Special Education services. These challenges are compounded by the scarcity of research consistently articulating Indigenous School Education, Special Education, and interculturality, which limits the production of theoretical and methodological frameworks capable of guiding public policies that are more responsive to the specificities of Indigenous peoples.

In view of this scenario, it is essential to understand teacher education as a collective and ongoing process developed in dialogue with Indigenous communities and committed to valuing their knowledge. More than preparing teachers to address diversity, it entails educating professionals capable of recognizing diversity as the very foundation of democratic education. When articulated with welcoming, pedagogical mediation, and traditional knowledge, intercultural teacher education significantly broadens the possibilities for developing schools that foster belonging, participation, and learning for all students, reaffirming inclusion as an ethical, political, and cultural project.

PROSPECTS FOR STRENGTHENING INTERCULTURAL INCLUSIVE EDUCATION

The advances achieved in recent decades in the fields of Indigenous School Education and Special Education represent important milestones in consolidating an education committed to human rights and appreciation of diversity. Nevertheless, the realization of these rights continues to depend on overcoming historical challenges that extend beyond the boundaries of the school and encompass public policy, teacher education, the production of scientific knowledge, and the strengthening of Indigenous communities' participation in determining the direction of education. In this context, considering prospects for intercultural inclusive education means envisioning pathways that articulate social justice, cognitive justice, and recognition of differences as structural principles of educational practices.

One of the principal challenges consists of consolidating public policies capable of effectively integrating Indigenous School Education and Special Education. Although Brazilian legislation guarantees the right to inclusive education and recognizes the cultural specificities of Indigenous peoples,

difficulties related to funding, the provision of specialized services, the production of bilingual teaching materials, accessibility, and pedagogical support for Indigenous students with disabilities remain common. Many initiatives continue to be fragmented and are implemented through isolated programs without coordination among different education systems. The development of cross-sectoral policies involving education, health, social assistance, and human rights constitutes an essential step toward increasing the effectiveness of these actions.

Another decisive aspect concerns strengthening pre-service and continuing teacher education. Intercultural education must cease to occupy a peripheral position in teacher education curricula and become a structural component of teacher preparation, especially in regions with significant Indigenous populations. Likewise, Special Education must engage with the cultural specificities of different peoples, avoiding universalizing models that disregard distinctive forms of community organization, learning, and knowledge production. Educating teachers for intercultural contexts means developing competencies for dialogue, collaborative research, and the collective development of pedagogical strategies that respect the particularities of students and communities.

The production of pedagogical materials also constitutes an area requiring continuous investment. Most resources used in Brazilian schools were developed for urban and monolingual contexts and have little connection with the sociocultural realities experienced by Indigenous peoples. The development of contextualized materials with the participation of communities, traditional leaders, and Indigenous teachers broadens learning opportunities by integrating scientific knowledge, Indigenous languages, traditional narratives, and experiences within the territory. For Indigenous students with disabilities, such contextualization fosters more meaningful educational processes because it brings school content closer to their experiences and strengthens their sense of belonging to the community.

Within this process, expanding Indigenous leadership in the production of educational knowledge represents an indispensable prospect. Throughout history, much of the research on Indigenous education has been produced from perspectives outside the communities, frequently interpreting their realities

through cultural frameworks foreign to Indigenous ways of understanding the world. Strengthening the participation of Indigenous researchers in universities and graduate programs contributes to expanding the epistemological plurality of scientific production by incorporating interpretations developed from the experiences, territories, and cosmologies of Indigenous peoples themselves. This movement strengthens not only Indigenous School Education, but also Brazilian science itself by recognizing different ways of producing knowledge.

Another relevant prospect concerns expanding research that examines the interface among disability, interculturality, and Indigenous education. Despite the growth of academic scholarship on school inclusion and Indigenous School Education, studies that analyze the experiences of Indigenous students with disabilities in an integrated manner remain relatively scarce. This gap constrains the development of public policies and pedagogical practices grounded in evidence produced within Indigenous contexts themselves. Encouraging collaborative research conducted in partnership with schools, universities, and communities represents a promising pathway for expanding knowledge of this reality and strengthening educational processes that are more responsive to cultural and territorial specificities.

Experiences developed in different regions of the country demonstrate that the most consistent advances occur when universities, schools, and communities establish lasting cooperative relationships. Community outreach projects, continuing education programs, participatory research, and interinstitutional actions enable knowledge to circulate among different educational spaces, fostering the development of shared solutions to the challenges faced by Indigenous schools. These collaborative networks contribute to overcoming top-down models of knowledge production by recognizing that teachers, students, families, and community leaders also produce knowledge that is fundamental to the development of inclusive pedagogical practices.

Within this horizon, it is necessary to understand that intercultural inclusion is not a fully completed objective, but an ongoing process of institutional, pedagogical, and social transformation. As

new demands emerge within Indigenous communities, challenges for educational systems are likewise renewed, requiring flexible policies, continuing education, and a willingness to foster dialogue among different forms of knowledge. An intercultural inclusive school is defined not merely by the presence of Indigenous students with disabilities in its classrooms, but by its capacity to recognize that each individual expands the possibilities for collective learning and contributes to the development of a more democratic education.

Thus, strengthening intercultural inclusive education means reaffirming a commitment to a school that respects differences without transforming them into inequalities, values traditional knowledge without relinquishing dialogue with science, and recognizes each student's right to learn in an environment where identity, culture, and diversity are understood as constitutive dimensions of human development. One of the greatest potentials of contemporary Indigenous School Education resides in this encounter among different forms of knowledge, different individuals, and different ways of understanding the world.

FINAL CONSIDERATIONS

The discussion developed in the undergraduate thesis that became this chapter demonstrated that the inclusion of Indigenous students with disabilities constitutes a challenge that extends beyond the boundaries of Special Education and Indigenous School Education when these fields are considered separately. It is a subject that requires the articulation of different fields of knowledge, public policies, and pedagogical practices, with interculturality and recognition of human diversity in its multiple dimensions serving as its structural axes. Throughout the analysis, it became evident that the realization of the right to education depends not only on ensuring access to school, but also on developing educational environments capable of fostering belonging, participation, learning, and appreciation of Indigenous peoples' cultural identities.

The reflection presented here made it possible to understand that Indigenous School Education has distinctive characteristics that differentiate it from other educational contexts, particularly because it recognizes the centrality of territory, ancestry, orality, Indigenous languages, and traditional knowledge in educating new generations. These elements do not constitute peripheral aspects of the curriculum, but epistemological foundations that guide teaching and learning processes. From this perspective, the inclusion of Indigenous students with disabilities cannot be conceived merely as methodological adaptation or the provision of specialized services; it presupposes recognition of different ways of producing knowledge, learning, and participating in community life.

In discussing welcoming and pedagogical mediation, the chapter emphasized that these dimensions represent ethical principles of educational practice, guiding the development of relationships based on respect, listening, and intercultural dialogue. Welcoming was understood as a permanent stance of recognizing the particularities of students and their communities, while pedagogical mediation was presented as a process of articulating scientific and traditional knowledge and fostering culturally contextualized learning experiences. Thus, both constitute indispensable elements in consolidating inclusive pedagogical practices committed to equity and social justice.

Another aspect discussed extensively concerns the importance of traditional knowledge as a framework for developing intercultural curricula. Recognizing that the knowledge produced by Indigenous peoples possesses scientific, cultural, and pedagogical legitimacy broadens the understanding of the school itself as a space for dialogue among different epistemologies. This perspective breaks with educational models based on the homogenization of teaching processes and strengthens the development of practices that respect each student's learning times, ways of learning, and forms of participation, especially those of students with disabilities.

The analysis further demonstrated that teacher education occupies a strategic position in consolidating intercultural inclusive education. More than merely preparing teachers to serve students eligible for Special Education services, it is necessary to educate professionals capable of understanding

the complexity of the cultural relationships present in Indigenous schools, engaging with communities, and recognizing the value of the knowledge produced in their territories. Pre-service and continuing education must foster ongoing processes of reflection on practice, encouraging the development of intercultural, collaborative, and socially engaged competencies.

The prospects presented throughout the chapter also reveal that consolidating intercultural inclusive education depends on strengthening public policies, expanding research at the interface between Special Education and Indigenous School Education, producing contextualized teaching materials, and ensuring the active participation of Indigenous communities in the formulation, implementation, and evaluation of educational actions. The development of collaborative networks among schools, universities, Indigenous movements, and public agencies constitutes a promising pathway for addressing persistent challenges and broadening the possibilities for the holistic development of Indigenous students with disabilities.

This chapter sought to contribute to a deeper discussion of a subject that remains underexplored in Brazilian academic scholarship, demonstrating that inclusion in Indigenous contexts cannot be understood merely as an access policy, but as an ethical, political, and epistemological commitment to recognizing the plurality of knowledge and human diversity. By bringing Indigenous School Education, Special Education, and interculturality into dialogue, it has sought to demonstrate that these fields are not competing but complementary in the development of educational practices committed to human rights and social justice.

Finally, it is reaffirmed that the realization of inclusive education in Indigenous schools depends on the capacity to recognize that cultural, linguistic, and functional differences do not represent obstacles to learning, but opportunities to broaden educational experiences and strengthen democracy. Developing a school that welcomes, engages in dialogue, and learns from diversity means recognizing that the right to education is realized only when all students are guaranteed not only access to knowledge, but also the right to learn without relinquishing their own identity, culture, and the knowledge that constitutes their

history. From this perspective, interculturality ceases to be merely a guiding principle of education policies and affirms itself as an enduring commitment to building a more just, plural, and genuinely inclusive society.

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THE PARADOX OF INCLUSION: HOW CAN INCLUSIVE EDUCATION BE PROMOTED WITHOUT COMPROMISING TEACHERS' MENTAL HEALTH?

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Abstract

The development of inclusive education represents one of the greatest challenges facing contemporary education policies, particularly given the need to guarantee every student's right to learning without disregarding teachers' working conditions. This chapter aims to analyze the paradox between the expansion of inclusive practices and the preservation of teachers' mental health by examining the factors that influence this process and the strategies capable of promoting a better balance among inclusion, teaching quality, and professional well-being. The methodology adopted consists of a narrative literature review based on Brazilian and international scientific publications issued in recent years, as well as an analysis of legal documents and public policies related to inclusive education and the recognition of the teaching profession. The results show that the lack of specific continuing professional development, excessive workloads, a shortage of pedagogical resources, increasing bureaucratic demands, and insufficient institutional support contribute to occupational stress, anxiety, and emotional exhaustion among teachers. It is concluded that effective school inclusion depends on integrated policies that combine investments in infrastructure, multidisciplinary teams, ongoing professional development, participatory school management, and initiatives aimed at promoting teachers' mental health, thereby making sustainable and socially committed inclusive education possible.

Keywords: Continuing professional development, Education policies, Inclusive education, Teachers' mental health.

INTRODUCTION

Over the past few decades, inclusive education has become one of the foremost commitments of contemporary education policies. It is grounded in the principle that all students, regardless of their physical, intellectual, sensory, social, or cultural circumstances, have the right to learn in mainstream school environments, with equity, respect for diversity, and opportunities for participation. In Brazil, this paradigm gained greater prominence following the enactment of the 1988 Federal Constitution, the

National Education Guidelines and Framework Law (Law No. 9,394/1996), the National Policy on Special Education from the Perspective of Inclusive Education (BRASIL, 2008), and the Brazilian Inclusion Law (Law No. 13,146/2015), all of which reinforce the responsibility of the state and educational institutions to guarantee education for all.

Although legislative advances have significantly expanded access to mainstream education for students who are the target population of special education, their effective implementation continues to face numerous challenges related to teachers' working conditions. School inclusion requires curricular, methodological, and assessment adaptations, as well as the development of collaborative pedagogical practices capable of meeting students' specific needs without compromising the quality of education. In this context, teachers have assumed new responsibilities, often without the institutional support, continuing professional development, or resources required to fulfill them satisfactorily.

According to Maria Teresa Eglér Mantoan (2015), school inclusion does not merely consist of enrolling students with disabilities in mainstream schools; rather, it entails transforming school culture, pedagogical practices, and institutional organization so that everyone can learn with equal opportunities. For the author, inclusion requires structural changes that extend beyond the actions of individual teachers and demand consistent public policies and sustained investment.

From this perspective, an important paradox emerges: while society calls for increasingly inclusive schools, many teachers experience work intensification, greater responsibilities, emotional overload, and feelings of insecurity in the face of the demands imposed by everyday school life. This situation contributes to the development of occupational stress, anxiety, emotional exhaustion, and other forms of psychological distress, compromising both professionals' health and the quality of the educational process.

According to Michael Fullan (2007), education reforms achieve lasting results only when they take teachers' actual working conditions into account by providing institutional support, collaborative leadership, and continuing professional development. Similarly, Andy Hargreaves and Michael Fullan

(2012) argue that recognition of the teaching profession is indispensable to improving education quality and ensuring the sustainability of education policies.

In the field of occupational health, Christina Maslach and Michael P. Leiter (2016) demonstrate that professions characterized by intensive human interaction, such as teaching, are more vulnerable to the development of burnout syndrome when professionals are exposed to high levels of demand and low levels of organizational support. The authors emphasize that professional burnout reduces motivation, compromises pedagogical performance, and directly affects the quality of relationships established within the school environment.

In the Brazilian context, studies by José Carlos Libâneo (2013) show that the democratization of access to education must be accompanied by recognition of teachers' work, improvements in institutional conditions, and the implementation of policies that enable professionals to perform their work effectively. Likewise, Dermeval Saviani (2019) stresses that fulfillment of the right to education depends not only on expanding enrollment but also on guaranteeing tangible conditions under which socially relevant, high-quality teaching can take place.

In light of this reality, the following research question was formulated: How can effective inclusive education be promoted without compromising the mental health of the teachers responsible for implementing inclusive practices?

Based on this problem, the general objective of this chapter is to analyze the challenges teachers face in implementing inclusive education and to discuss strategies that help reconcile the guarantee of the right to education with the preservation of education professionals' mental health.

The specific objectives are to understand the foundations of inclusive education within Brazilian public policies; identify the primary factors associated with mental health problems among teachers working in inclusive settings; analyze the relationship among working conditions, teacher education, and mental health; and discuss institutional strategies and public policies aimed at promoting teachers' well-being and strengthening sustainable inclusive practices.

The relevance of this study is justified by the continuing expansion of school inclusion policies and the increasing attention given to mental health problems among education professionals. Although the literature recognizes inclusion as a fundamental human right, further studies are needed to address the effects of these policies on teachers' working conditions in an integrated manner. Understanding this paradox therefore contributes to strengthening more sustainable educational practices, benefiting both student learning and the recognition of teachers.

From a theoretical perspective, this chapter is primarily based on the contributions of Mantoan (2015), Libâneo (2013), Saviani (2019), Fullan (2007), Hargreaves and Fullan (2012), and Maslach and Leiter (2016), as well as Brazilian legal documents governing inclusive education. These theoretical frameworks make it possible to understand that school inclusion becomes effective only when it is accompanied by investments in teacher education, multidisciplinary support, democratic school management, public policies that recognize the teaching profession, and systematic initiatives aimed at promoting educators' mental health. This ensures that the right to education is guaranteed without compromising the well-being of those responsible for making it a reality.

METHODOLOGY

RESEARCH DESIGN

This chapter is characterized as qualitative, descriptive, and exploratory research conducted through a narrative literature review. This approach was selected because it enables a broad and critical understanding of scientific research on the relationship between inclusive education and teachers' mental health, allowing different theoretical perspectives and evidence from the fields of Education, Psychology, and Public Health to be integrated.

According to Antônio Carlos Gil (2022), descriptive research seeks to identify and analyze the characteristics, relationships, and phenomena present within a given reality, whereas exploratory research promotes greater familiarity with the issue under investigation and contributes to advancing scientific

discussion. In this regard, combining these research approaches was considered suitable for understanding the challenges teachers face in implementing inclusive education policies.

With respect to technical procedures, a narrative literature review was adopted. This type of review enables critical analysis of different studies on a particular topic without requiring rigid selection protocols, thereby facilitating a contextualized and interdisciplinary discussion. As Marina de Andrade Marconi and Eva Maria Lakatos (2021) emphasize, bibliographic research is an important strategy for bringing together previously produced knowledge, identifying gaps in scientific research, and supporting new interpretations of the phenomenon under study.

INFORMATION-COLLECTION PROCEDURES

The theoretical framework was developed through a bibliographic search of Brazilian and international scientific databases recognized by the academic community, including the Scientific Electronic Library Online (SciELO), Virtual Health Library (Biblioteca Virtual em Saúde—BVS), Google Scholar, Education Resources Information Center (ERIC), and the CAPES Journal Portal. Official documents issued by the Ministry of Education, Brazilian legislation related to inclusive education, and publications by international organizations were also consulted.

Descriptors in Portuguese and English were combined using Boolean operators. These included “inclusive education,” “teachers’ mental health,” “teacher burnout,” “teacher mental health,” “teacher well-being,” and “inclusive policies.”

The inclusion criteria covered scientific articles, books, book chapters, master’s dissertations, doctoral theses, and official documents published primarily between 2015 and 2025, available in full, and related to the research objective. Duplicate studies, works lacking a consistent scientific basis, publications that addressed school inclusion exclusively from a clinical perspective, and works that did not discuss issues related to teachers’ work and mental health were excluded.

DATA-ANALYSIS TECHNIQUE

The information obtained was examined through thematic analysis of the literature, identifying convergences, divergences, and the principal categories found in the selected studies. The material was organized in successive stages: exploratory reading, analytical reading, categorization of information, and interpretive synthesis of the results.

Data interpretation was grounded in theoretical frameworks concerning inclusive education, education policies, and teachers' occupational health, making it possible to establish relationships among the challenges associated with school inclusion, teachers' working conditions, and the effects on their mental health.

According to Laurence Bardin (2016), content analysis makes it possible to organize and interpret information systematically, facilitating the development of consistent inferences about the phenomena under investigation. Although this study does not conduct a conventional content analysis, the principles proposed by the author guided the systematization and interpretation of the evidence identified.

METHODOLOGICAL FOUNDATIONS

The choice of a qualitative approach is justified by the complexity of the phenomenon under study, since the effects of inclusive education on teachers' mental health involve pedagogical, social, emotional, and institutional dimensions that cannot be understood exclusively through quantitative indicators.

Authors such as José Carlos Libâneo (2013) emphasize that education quality depends directly on the concrete working conditions provided to teachers, while Maria Teresa Eglér Mantoan (2015) stresses that school inclusion requires structural changes in school organization that extend beyond merely placing students in mainstream classrooms. At the same time, studies by Christina Maslach and Michael P. Leiter (2016) show that work environments characterized by high demands and limited institutional support contribute to occupational stress and burnout syndrome among teachers.

Thus, the methodology adopted makes it possible to integrate different scientific perspectives and provide a well-founded discussion of the paradox of school inclusion: the need to guarantee genuinely inclusive education without neglecting the working conditions and mental health of the professionals responsible for making this right a reality. Integrating theoretical frameworks from Education, Psychology, and Public Health broadens the understanding of the topic and provides a foundation for developing public policies and institutional practices that promote both student inclusion and teachers' recognition and well-being.

RESULTS AND DISCUSSION

The literature analysis demonstrates that the consolidation of inclusive education represents an important advance in guaranteeing the right to education by promoting access to, continued attendance in, and participation in mainstream education among students with disabilities, neurodevelopmental disorders, and high abilities/giftedness. However, the studies show that the expansion of inclusive policies has not been accompanied, to the same extent, by investments in school infrastructure, continuing professional development, multidisciplinary teams, and initiatives aimed at promoting teachers' mental health. As a result, professional demands and teachers' workloads have increased significantly.

According to Maria Teresa Eglér Mantoan (2015), school inclusion cannot be understood solely as providing students with access to mainstream schools. Instead, it must be recognized as a process that transforms pedagogical practices, school culture, and institutional relationships. The success of inclusion therefore depends on reorganizing the school environment and recognizing the professionals involved in the educational process.

The studies reviewed reveal that the principal challenges teachers face are related to insufficient specialized training for work in inclusive settings, shortages of teaching resources, large class sizes, the absence of support professionals, and increasing administrative demands. These factors increase the complexity of teaching and contribute to occupational stress, anxiety, and emotional exhaustion.

Table 1

Primary factors associated with compromised teacher mental health

Factors identified	Effects on teachers' work
Excessive workload	Physical and emotional exhaustion
Insufficient continuing professional development	Pedagogical insecurity
Shortage of pedagogical resources	Difficulties in adapting the curriculum
Absence of multidisciplinary teams	Greater responsibility placed on the teacher
Excessive bureaucratic demands	Less time available for planning
Limited institutional support	Occupational stress and lack of motivation

Source: Prepared by the author based on Mantoan (2015), Libâneo (2013), and Maslach and Leiter (2016).

The results presented in Table 1 demonstrate that excessive workload is the factor most frequently associated with teachers' psychological distress. In addition to traditional pedagogical activities, many teachers assume responsibility for individualized planning, preparing curricular adaptations, completing administrative records, meeting with families, and supporting students with different educational needs, without a proportionate reduction in working hours or specialized technical support.

These findings corroborate the research conducted by Christina Maslach and Michael P. Leiter (2016), which demonstrates that work environments characterized by high demands and limited organizational support contribute to the development of burnout syndrome. The authors emphasize that emotional exhaustion reduces professional motivation, compromises teaching quality, and negatively affects relationships between teachers and students.

Another issue widely identified in the literature is the importance of continuing professional development as a key element in strengthening inclusive practices. Studies indicate that teachers who receive ongoing professional development feel more confident in preparing curricular adaptations, using active methodologies, and developing pedagogical strategies capable of addressing the diversity present in classrooms.

Table 2*Benefits of continuing professional development for inclusive education*

Areas strengthened	Contributions to teaching practice
Updated pedagogical knowledge	Expanded knowledge of inclusion
Collaborative planning	Improved teaching strategies
Curriculum adaptation	Responsiveness to different educational needs
Professional development	Greater confidence in teaching practice
Interdisciplinary work	Integration among different professionals
Teacher well-being	Reduced professional insecurity

Source: Prepared by the author based on Saviani (2019), Libâneo (2013), and Mantoan (2015).

The literature also shows that recognition of the teaching profession is an indispensable condition for making school inclusion effective. According to José Carlos Libâneo (2013), education quality is directly related to teachers' actual working conditions, including adequate remuneration, continuing professional development, school infrastructure, and institutional support. From the same perspective, Dermeval Saviani (2019) emphasizes that the democratization of education requires sustained investment in teacher education and the development of public policies capable of guaranteeing socially relevant education.

In addition, the studies demonstrate that the presence of multidisciplinary teams composed of psychologists, educational psychologists, occupational therapists, social workers, and specialized educational services professionals significantly reduces teachers' workloads and contributes to the development of more effective pedagogical strategies.

Table 3

Institutional strategies for promoting school inclusion and teacher mental health

Proposed strategies	Expected effects
Ongoing continuing professional development	Improved pedagogical practice
Multidisciplinary teams	Shared responsibilities
Institutional psychological support	Prevention of mental health problems
Participatory school management	Strengthened collaborative work
Investment in pedagogical resources	Improved quality of inclusion
Professional recognition	Greater job satisfaction and career retention

Source: Prepared by the author based on Hargreaves and Fullan (2012), Fullan (2007), Libâneo (2013), and Mantoan (2015).

The discussion of the results demonstrates that inclusive education and teachers' mental health are not inherently incompatible. What compromises teachers' well-being is the implementation of inclusive policies without adequate institutional support. As Andy Hargreaves and Michael Fullan (2012) argue, education reforms achieve sustainable results only when they reconcile pedagogical innovation, professional recognition, and strengthened working conditions.

The results of this review therefore show that effective inclusive education depends on coordination among public policies, continuing professional development, school infrastructure, multidisciplinary support, and programs aimed at promoting teachers' mental health. Only through this integrated approach will it be possible to guarantee high-quality inclusive education, safeguarding students' right to learning without compromising the health and well-being of the teachers responsible for making this process a reality.

CONCLUSION

This study aimed to analyze the paradox between the implementation of inclusive education and the preservation of teachers' mental health by seeking to understand the principal challenges teachers face and identify strategies capable of promoting high-quality school inclusion without compromising the

well-being of education professionals. The literature review showed that inclusion is a fundamental right of students and represents an important advance in Brazilian education policies. Its implementation, however, continues to face obstacles related to teachers' working conditions.

The results showed that excessive workloads, insufficient continuing professional development, a shortage of pedagogical resources, the absence of multidisciplinary teams, and limited institutional support are among the main factors associated with increased occupational stress, anxiety, and emotional exhaustion among teachers. At the same time, the studies analyzed demonstrated that schools that invest in professional recognition, collaborative work, and ongoing professional development have better conditions for developing effective and sustainable inclusive practices.

The study also made it possible to understand that the success of inclusive education does not depend exclusively on teachers' individual commitment. Rather, it depends on developing public policies that guarantee adequate infrastructure, democratic management, specialized support, and decent working conditions. In this regard, the promotion of teachers' mental health must be understood as a strategic component of education quality, given that emotionally healthy teachers are better able to develop innovative pedagogical practices, establish more positive relationships with students, and contribute to building inclusive school environments.

The contributions of this chapter lie in integrating knowledge from the fields of Education, Psychology, and public policy, demonstrating that school inclusion and recognition of the teaching profession are inseparable processes. By bringing together up-to-date scientific evidence, the study provides a foundation for education administrators, public policymakers, researchers, and education professionals to develop strategies that reconcile the right to inclusive education with the protection of teachers' mental health.

Finally, it is recommended that future research include empirical studies involving different education systems and levels of education, investigating teachers' perceptions of their working conditions, the effectiveness of inclusion policies, and the effects of institutional programs aimed at

promoting mental health. Further studies are also needed to evaluate interventions related to continuing professional development, multidisciplinary support, and care practices for educators, thereby contributing to strengthening inclusive education that is simultaneously equitable, sustainable, and socially committed.

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INCLUSIVE EDUCATION AND TEACHER MENTAL HEALTH: CHALLENGES AND STRATEGIES FOR PROMOTING SUSTAINABLE SCHOOL ENVIRONMENTS

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Abstract

Inclusive education is a fundamental principle of contemporary educational policies, promoting access, participation, and learning for all students in school environments that respect diversity. However, the expansion of inclusive practices has been accompanied by new demands on teachers, who frequently face excessive workloads, complex pedagogical demands, and structural limitations that may compromise their mental health and professional performance. This chapter aims to analyze the challenges related to teacher mental health in the context of inclusive education and to discuss strategies for building sustainable school environments that reconcile inclusion, educational quality, and the recognition of education professionals. The study is characterized as an integrative literature review based on the

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analysis of scientific studies published in national and international databases, as well as legal and regulatory documents concerning inclusive education and policies for recognizing and supporting teachers. The findings indicate that factors such as insufficient continuing professional development, a shortage of pedagogical resources, a lack of multidisciplinary support, and the intensification of administrative demands contribute to increased occupational stress, anxiety, and emotional exhaustion among teachers. It is concluded that the consolidation of sustainable school environments depends on coordination among public policies, institutional investment, participatory school management, and ongoing mental health promotion initiatives, thereby strengthening both school inclusion and teachers' quality of life and professional development.

Keywords: Continuing professional development, Inclusive education, Sustainable school environments, Teacher mental health, Teacher recognition.

INTRODUCTION

Inclusive education has occupied a central position in debates concerning educational quality and the guarantee of the right to learn, establishing itself as a guiding principle of public education policies in recent decades. Grounded in the principles of equity, respect for diversity, and the participation of all students, this perspective seeks to ensure that children, adolescents, and young people have access to educational opportunities in school environments that value their individual characteristics and promote their holistic development. In Brazil, this commitment is supported by legal provisions such as the 1988 Federal Constitution, the National Education Guidelines and Framework Law (Lei de Diretrizes e Bases da Educação Nacional—Law No. 9,394/1996), the National Policy on Special Education from the Perspective of Inclusive Education (Política Nacional de Educação Especial na Perspectiva da Educação Inclusiva; Brazil, 2008), and the Brazilian Law on the Inclusion of Persons with Disabilities (Lei Brasileira de Inclusão da Pessoa com Deficiência—Law No. 13,146/2015), which reinforce the responsibility of the State and educational institutions to build inclusive education systems.

Although regulatory advances have significantly expanded access to mainstream education for students who are the target population of special education, the effective implementation of inclusion continues to face challenges related to the conditions under which teachers work. The need to plan diversified pedagogical strategies, adapt teaching resources, accommodate different learning paces, and promote collaborative practices requires teachers to possess increasingly broad competencies, often without adequate institutional conditions for meeting these demands. This situation demonstrates that consolidating inclusive education depends not only on guaranteeing access to school but also on providing appropriate support to the professionals responsible for implementing inclusive policies.

In this regard, Maria Teresa Eglér Mantoan (2015) emphasizes that school inclusion entails transforming institutional culture and pedagogical practices and goes beyond merely placing students with disabilities in mainstream classrooms. According to the author, building a genuinely inclusive school presupposes structural changes, ongoing educator development, and the reorganization of educational processes, allowing diversity to be understood as a constitutive element of the school environment.

Alongside the strengthening of inclusive policies, concern regarding teachers' mental health has increased. The expansion of pedagogical responsibilities, combined with heavy workloads, bureaucratic requirements, insufficient resources, and limited institutional support, may contribute to occupational stress, anxiety, emotional exhaustion, and burnout syndrome. These factors compromise not only teachers' well-being but also the quality of pedagogical practices and relationships within the school environment, highlighting the need to understand mental health as an essential component of sustainable inclusive education.

According to Michael Fullan (2007), educational reforms produce more consistent results when accompanied by investment in teacher recognition, collaborative leadership, and continuing professional development. Similarly, Hargreaves and Fullan (2012) argue that sustainable education systems depend on building professional capital capable of strengthening collective work, pedagogical innovation, and the quality of teachers' working conditions.

In the field of occupational health, Maslach and Leiter (2016) demonstrate that professions characterized by intensive human interaction are more vulnerable to psychological illness when subject to high demands and limited organizational support. In education, this situation is particularly relevant given the increasing complexity of inclusive practices, which require teachers to adapt continually, pursue professional development, and sustain a high degree of emotional involvement.

Brazilian authors such as Libâneo (2013) and Saviani (2019) emphasize that educational quality is directly related to the objective working conditions provided to teachers. Professional recognition, continuing professional development, democratic management, the availability of pedagogical resources, and multidisciplinary support are therefore indispensable to the effective and sustainable implementation of school inclusion, benefiting students and educators alike.

Against this backdrop, the present study is guided by the following question: What challenges affect the promotion of mental health among teachers working in inclusive education contexts, and what strategies can contribute to building more sustainable school environments?

Based on this problem, the general objective of this chapter is to analyze the relationship between inclusive education and teacher mental health, discussing the main challenges faced by teachers and identifying strategies capable of promoting sustainable school environments grounded in professional recognition and educational quality.

The specific objectives are to understand the legal and pedagogical foundations of inclusive education; identify factors associated with mental illness among teachers working in inclusive contexts; analyze the influence of working conditions and continuing professional development on professional well-being; and discuss institutional strategies aimed at strengthening teacher mental health and the sustainability of inclusive practices.

The relevance of this study is associated with the growth of discussions concerning school inclusion and the need to broaden the debate regarding teachers' working conditions. Although the literature presents significant advances in the implementation of inclusive policies, further studies

integrating pedagogical, organizational, and psychosocial dimensions are still needed to demonstrate that the promotion of inclusion must proceed in conjunction with initiatives aimed at recognizing and caring for education professionals.

From a theoretical perspective, this chapter draws on the contributions of Mantoan (2015), Libâneo (2013), Saviani (2019), Fullan (2007), Hargreaves and Fullan (2012), and Maslach and Leiter (2016), as well as Brazilian legislation concerning inclusive education. These frameworks support the understanding that sustainable school environments are built by coordinating public policies, democratic management, continuing professional development, multidisciplinary support, and ongoing mental health promotion initiatives, ensuring that school inclusion is accompanied by adequate conditions for the practice of teaching.

METHODOLOGY

RESEARCH DESIGN

This chapter adopts a qualitative, descriptive, and exploratory research approach conducted through an integrative literature review. This methodological approach was selected because it enables the collection, critical analysis, and synthesis of scientific evidence concerning the relationship among inclusive education, teacher mental health, and strategies for building sustainable school environments. In addition to bringing together different theoretical perspectives, an integrative review makes it possible to identify knowledge gaps and understand how studies have addressed the challenges teachers face in the context of inclusive policies.

According to Gil (2022), descriptive studies seek to characterize phenomena and establish relationships among variables within a particular context, whereas exploratory studies help broaden the understanding of complex topics that are still undergoing scientific consolidation. Combining these approaches proved appropriate for analyzing the factors that influence teacher well-being and discussing strategies capable of strengthening school inclusion sustainably.

Regarding technical procedures, an integrative literature review was selected because it makes it possible to systematize knowledge produced in different contexts, facilitating a comprehensive analysis of the topic under investigation. According to Souza, Silva, and Carvalho (2010), this method enables the integration of findings from studies with different methodological designs, contributing to the development of a broad understanding of the phenomenon under study and informing future research and professional practice.

INFORMATION COLLECTION PROCEDURES

The literature search was conducted in national and international databases widely used in the fields of Education and Health, including SciELO, the Virtual Health Library (Biblioteca Virtual em Saúde—BVS), ERIC, the CAPES Journals Portal (Portal de Periódicos CAPES), Google Scholar, Scopus, and Web of Science. Official documents published by the Ministry of Education, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), and Brazilian legislation concerning inclusive education were also consulted.

The searches employed descriptors in Portuguese and English combined using the Boolean operators AND and OR, including the Portuguese terms *educação inclusiva*, *saúde mental docente*, *bem-estar do professor*, and *ambientes escolares sustentáveis*, and the English terms *inclusive education*, *teacher mental health*, *teacher well-being*, and *inclusive school*.

The materials included scientific articles, books, book chapters, master's dissertations, doctoral theses, and institutional documents published preferably between 2015 and 2026, available in full text, and directly related to the research objective. Duplicate studies, publications lacking a consistent scientific foundation, works addressing only the clinical aspects of special education, and studies that did not establish a relationship among school inclusion, teachers' working conditions, and mental health were excluded.

DATA ANALYSIS TECHNIQUE

After the publications had been selected, the material was read both exploratorily and analytically, after which the information was organized into thematic categories related to the research objectives. The evidence identified was grouped according to the main areas of discussion found in the literature, making it possible to analyze the challenges teachers face, the factors associated with mental illness, and the strategies described for strengthening inclusive and sustainable school environments.

Data interpretation was based on a thematic analysis of the literature, seeking to identify convergences, divergences, and contributions among the selected studies. As Bardin (2016) emphasizes, thematic categorization facilitates the systematic organization of information and enables consistent interpretations of complex phenomena, even when content analysis is not conducted in the strict sense.

METHODOLOGICAL FOUNDATION

The adoption of a qualitative approach is justified by the multidimensional nature of the object under investigation, since the relationship between inclusive education and teacher mental health encompasses pedagogical, institutional, social, and emotional aspects that cannot be understood solely through quantitative indicators. Analyzing the literature makes it possible to understand how different factors affect teachers' daily work and how educational policies, management practices, and working conditions influence the development of healthier school environments.

Within this context, the frameworks proposed by Mantoan (2015), Libâneo (2013), Saviani (2019), Hargreaves and Fullan (2012), and Maslach and Leiter (2016) provide theoretical support for understanding that the effectiveness of inclusive education depends on coordination among continuing professional development, professional recognition, institutional support, and the promotion of educators' mental health.

Thus, the adopted methodology makes it possible to integrate different scientific perspectives and produce a comprehensive analysis of the challenges and strategies related to building sustainable school

environments. By bringing together evidence from the fields of Education, Psychology, Public Health, and Public Policy, this study seeks to contribute to strengthening inclusive practices that reconcile educational quality, teacher well-being, and institutional sustainability.

RESULTS AND DISCUSSION

The literature analyzed demonstrates that the effective implementation of inclusive education depends on a set of factors that extend beyond guaranteeing students access to mainstream education. Although Brazilian legislation has brought about significant advances in expanding the right to education, several studies demonstrate that school attendance, participation, and success are directly related to the institutional conditions provided to schools and education professionals. Within this context, the development of sustainable school environments emerges as an essential element in ensuring the quality of inclusive practices and preserving teachers' mental health.

According to Mantoan (2015), school inclusion should be understood as an ongoing process of transforming pedagogical practices, institutional culture, and school organization. Responsibility for inclusion therefore cannot be assigned exclusively to teachers; rather, it must be shared among administrators, pedagogical teams, families, and public policies capable of providing educational institutions with ongoing support.

The literature review revealed that a lack of adequate teaching conditions remains one of the principal obstacles to consolidating inclusive education. Excessive workloads, limitations in specialized training, shortages of teaching resources, and inadequate specialized support are among the factors most frequently associated with teachers' psychological distress and the diminished quality of pedagogical practices.

Table 1

Main Challenges in Building Sustainable School Environments

Identified challenges	Effects on teaching practice
Excessive workload	Increased physical and emotional strain
Insufficient training in inclusive education	Lack of confidence in conducting pedagogical practices
Limited pedagogical resources	Difficulty diversifying teaching strategies
Lack of multidisciplinary support	Accumulation of responsibilities by the teacher
Inadequate school facilities	Reduced effectiveness of inclusive initiatives
Excessive administrative duties	Less time to plan and monitor students' progress

Source: Prepared by the author based on Mantoan (2015), Libâneo (2013), Saviani (2019), and Maslach and Leiter (2016).

The studies demonstrate that the intensification of professional demands contributes to occupational stress, anxiety, and emotional exhaustion, particularly when teachers are required to address simultaneously the pedagogical, administrative, and socioemotional demands present in inclusive classrooms. Maslach and Leiter (2016) emphasize that organizational environments characterized by intense pressure and limited institutional support are more likely to trigger work-related illness.

Another aspect widely emphasized in the literature concerns the importance of continuing professional development in strengthening teachers' professional confidence and expanding their ability to respond to the different educational needs encountered in everyday school life. Teachers who regularly participate in professional development tend to develop greater autonomy in making curricular adaptations, employing diversified methodologies, and establishing collaborative practices.

Table 2
Contributions of Continuing Professional Development to Sustainable School Environments

Strengthened dimensions	Observed benefits
Updating knowledge	Greater mastery of inclusive practices
Pedagogical planning	Organization of more diversified strategies
Collaborative work	Integration among teachers and support teams
Professional development	Increased teacher confidence and autonomy
Methodological innovation	Expanded learning opportunities
Professional well-being	Reduced insecurity and occupational stress

Source: Prepared by the author based on Libâneo (2013), Saviani (2019), Nóvoa (2022), and Mantoan (2015).

In addition to teacher development, the studies analyzed indicate that the sustainability of inclusive processes depends on coordinated work among different professionals and the implementation of institutional policies focused on caring for educators. The presence of school psychologists, educational psychologists, Specialized Educational Services professionals (Atendimento Educacional Especializado—AEE), social workers, and committed management teams helps both to support students and to reduce the burden placed on teachers.

In this context, sustainable school environments are characterized by the promotion of collaborative relationships, collective participation in pedagogical decision-making, professional recognition, and ongoing investment in infrastructure, educational resources, and psychosocial support. Hargreaves and Fullan (2012) emphasize that educational reforms produce lasting results only when they reconcile pedagogical innovation, professional development, and stronger working conditions.

Table 3

Strategies for Promoting Sustainable School Environments and Strengthening Teacher Mental Health

Institutional strategies	Expected outcomes
Ongoing continuing professional development	Improvement of inclusive practices
Multidisciplinary support	Shared pedagogical responsibilities
Mental health promotion programs	Prevention of stress and burnout
Participatory school management	Strengthening of a collaborative culture
Investment in infrastructure and resources	Improved teaching conditions
Teacher recognition policies	Greater professional satisfaction and career retention

Source: Prepared by the author based on Fullan (2007), Hargreaves and Fullan (2012), Libâneo (2013), Nóvoa (2022), and UNESCO (2020).

An integrated analysis of the evidence makes it possible to understand teacher mental health and inclusive education as complementary and interdependent dimensions. Consolidating inclusive practices depends not only on legal provisions but also on creating institutional conditions that ensure pedagogical support, professional recognition, and care for educators. In this sense, investing in sustainable school environments is a strategy capable of promoting educational quality, teacher well-being, and the effective realization of every student’s right to learn.

CONCLUSION

This chapter aimed to analyze the relationship between inclusive education and teacher mental health, seeking to understand the challenges teachers face in implementing inclusive practices and to discuss strategies capable of promoting sustainable school environments. The analysis of the literature showed that school inclusion represents a significant advance in guaranteeing the right to education. Its effective implementation, however, requires more than legal provisions; it demands institutional conditions that support both student learning and the well-being of education professionals.

The studies reviewed demonstrated that factors such as excessive workloads, insufficient continuing professional development, shortages of pedagogical resources, structural limitations, and a lack of multidisciplinary support compromise professional performance and increase teachers’

vulnerability to occupational stress, anxiety, and emotional exhaustion. Conversely, schools that invest in teacher recognition, participatory management, continuing professional development, and stronger collaborative work are better positioned to develop consistent and enduring inclusive practices.

The study also demonstrated that building sustainable school environments depends on coordination among public policies, educational management, and institutional initiatives focused on teacher care. Promoting teacher mental health should be understood as an integral component of educational quality, since professionals who are valued, supported, and emotionally healthy are better able to develop inclusive pedagogical practices, establish more meaningful educational relationships, and respond effectively to students' different needs.

In addition to bringing together current scientific evidence, this study helps broaden the understanding that school inclusion and teacher recognition are complementary and inseparable processes. Accordingly, administrators, public policymakers, and educational institutions may use the reflections presented here to guide initiatives that strengthen continuing professional development, expand multidisciplinary support, improve working conditions, and foster a school culture grounded in cooperation, respect for diversity, and the sustainability of educational practices.

Finally, it is recommended that future research conduct empirical studies in different educational contexts, investigate the effects of institutional programs aimed at promoting teacher mental health, and evaluate the impact of teaching-support strategies on the consolidation of inclusive education. Further investigation may inform the formulation of more effective education policies capable of ensuring sustainable and inclusive school environments committed to learning, professional recognition, and the social quality of education.

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THE SCHOOL AS A PROTAGONIST IN COMBATING THE SEXUAL EXPLOITATION OF CHILDREN AND ADOLESCENTS: DIALOGICITY AND INTERDISCIPLINARY REFLECTIONS

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Abstract

This article analyzes, from a theoretical and documentary perspective, the role of the school as a leading agent in combating the sexual exploitation of children and adolescents. It is grounded in the understanding that the educational institution is responsible not only for the transmission of knowledge but also for social protection, recognizing signs of rights violations, and mediating relationships among students, families, the community, and the intersectoral protection network. The discussion brings together Freirean principles of dialogicity, the concept of interdisciplinarity, and the Brazilian legal framework, with particular emphasis on the Statute of the Child and Adolescent (Estatuto da Criança e do Adolescente—ECA), Law No. 13,431/2017, Decree No. 9,603/2018, and Law No. 14,811/2024. The study also considers recent data from the United Nations Children's Fund (Fundo das Nações Unidas para a Infância—UNICEF) and the Brazilian Forum on Public Security (Fórum Brasileiro de Segurança Pública—FBSP), indicating an increase in reported cases of rape and statutory rape involving individuals aged 0 to 19 between 2021 and 2023. In light of this reality, the article aims to analyze, from a theoretical perspective, the role of the school as a leading agent in combating the sexual exploitation of children and adolescents, investigating how dialogicity and interdisciplinarity contribute to strengthening the protection network. Methodologically, this is a qualitative bibliographic and documentary study guided by the critical analysis of legislation, official documents, and educational literature. The findings indicate that effective school leadership requires teacher training, referral protocols, a cross-curricular approach,

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sensitive listening, and integration with healthcare, social assistance, the Guardianship Council, and the justice system. It is concluded that preventing the sexual exploitation of children and adolescents requires a school that is ethically committed, legally informed, and pedagogically equipped to transform silence into protective dialogue.

Keywords: Dialogicity, Interdisciplinarity, Protection of Children and Adolescents, School Leadership, Sexual Exploitation of Children and Adolescents.

INTRODUCTION

The sexual exploitation of children and adolescents constitutes one of the most serious forms of human rights violations affecting children and adolescents, as it compromises the victims' physical, psychological, emotional, educational, and social well-being. It is a phenomenon that cannot be understood merely as a criminal occurrence or an issue confined to the justice system. Its effects permeate family, community, and school life, directly interfering with learning, social interaction, self-esteem, and the development of trusting relationships. For this reason, schools must be recognized as strategic spaces for prevention, protection, and responsible referral.

Educational institutions occupy a unique position in the lives of children and adolescents. It is through daily classroom routines, breaks, collective activities, and interactions with teachers and peers that many behavioral changes become noticeable. Sudden declines in academic performance, recurrent absenteeism, social withdrawal, fear, irritability, sadness, aggression, or difficulty concentrating may indicate distress and require qualified attention. None of these signs, in isolation, is sufficient to conclude that sexual violence has occurred. However, when such indicators recur or are associated with disclosures, emotional distress, or abrupt behavioral changes, they require a careful institutional response.

The Statute of the Child and Adolescent (Estatuto da Criança e do Adolescente—ECA) (Brazil, Law No. 8,069/1990) establishes the principle of comprehensive protection and provides that no child or adolescent shall be subjected to neglect, discrimination, exploitation, violence, cruelty, or oppression.

Within this legal framework, the school is no longer viewed merely as a setting for formal education but as an integral part of a broader system for safeguarding rights. This requires recognizing that teachers, school administrators, pedagogical coordinators, and other education professionals bear ethical and legal responsibilities whenever there are suspicions or confirmations of violence.

The debate becomes even more urgent in light of recent data. The report *Overview of Lethal and Sexual Violence Against Children and Adolescents in Brazil* (*Panorama da Violência Letal e Sexual contra Crianças e Adolescentes no Brasil*), prepared by the United Nations Children's Fund (UNICEF) and the Brazilian Forum on Public Security (FBSP), recorded 164,199 victims of rape and statutory rape aged 0 to 19 in Brazil between 2021 and 2023 (UNICEF; FBSP, 2024). These figures refer only to reported cases, highlighting the existence of substantial underreporting and reinforcing the importance of institutions capable of breaking the silence. In 2024, the Disque 100 national human rights hotline recorded 657,200 reports of human rights violations, with children and adolescents representing the group with the highest number of complaints among the vulnerable populations included in the official report (Brazil, 2025).

Within this context, dialogicity and interdisciplinarity assume a central role. Dialogicity, inspired by Paulo Freire, enables the school to be understood as a space for listening, relationship-building, and recognizing the voice of others. Interdisciplinarity, in turn, makes it possible to integrate pedagogical, legal, psychological, social, and health-related knowledge in addressing a problem that cannot be contained within a single field of expertise. Combating the sexual exploitation of children and adolescents requires a school capable of engaging in dialogue, providing support, making appropriate referrals, and working collaboratively within a protection network, without assuming investigative responsibilities that belong to the competent authorities.

Given the complexity involved in guaranteeing the rights of children and adolescents in contemporary society, it is essential to investigate the institutional and community mechanisms aimed at addressing violations that threaten their full development. Against this backdrop of complex

vulnerabilities, the following guiding research question emerges: How can intersectoral coordination among public policies, network-based care, and social support effectively guarantee the right to childhood and comprehensive protection in the face of the impacts of the ecology of sexual violence? Understanding this issue is fundamental to revealing both the strengths and the limitations of the current protection structures.

The rationale for this study rests on three central arguments. The first is social: sexual violence against children and adolescents remains a persistent and underreported phenomenon, deeply shaped by power asymmetries. Owing to their particular stage of development, children and adolescents are not always able to identify the violence they have suffered, understand their rights, or seek help independently. When the perpetrator belongs to the family, community, or institutional environment, silence may be reinforced by fear, economic dependence, guilt, and threats. Because it is one of the few places regularly attended by most children and adolescents, the school occupies a strategic position for recognizing warning signs and activating the protection network.

The second argument is legal and institutional. Law No. 13,431/2017 (Brazil, 2017) organizes the system for guaranteeing the rights of child and adolescent victims or witnesses of violence, distinguishing between specialized listening (*escuta especializada*) and the special testimonial (*depoimento especial*), with the aim of preventing revictimization and ensuring appropriate care. Decree No. 9,603/2018 (Brazil, 2018) regulates this system, reinforcing the need for coordinated procedures among public policies. More recently, Law No. 14,811/2024 (Brazil, 2024) established protective measures for children and adolescents against violence in educational institutions and similar settings and created the National Policy for the Prevention and Combating of Child and Adolescent Sexual Abuse and Exploitation. Together, these legal instruments move the school from a merely reactive position to one of shared responsibility.

The third argument is pedagogical. Preventing the sexual exploitation of children and adolescents cannot be reduced to occasional awareness campaigns. Isolated lectures, sporadic posters, or initiatives

concentrated solely in the month of May may raise awareness, but they are insufficient unless integrated into a continuous educational project. The National Common Curricular Base (Base Nacional Comum Curricular—BNCC) (Brazil, 2018) and the Cross-Cutting Contemporary Themes (Temas Contemporâneos Transversais) (Brazil, 2019) indicate that issues such as human rights, health, citizenship, diversity, and social coexistence should be incorporated throughout the curriculum in an integrated manner. Consequently, preventive education must be ethical, evidence-based, age-appropriate, and aligned with the rights of children and adolescents.

The general objective of this article is to analyze, from a theoretical perspective, the role of the school as a leading agent in combating the sexual exploitation of children and adolescents, investigating how dialogicity and interdisciplinarity contribute to strengthening the protection network. To achieve this purpose, specific objectives are established to guide the investigation. First, the study discusses the concept of dialogicity within the school environment as a strategy for breaking the silence surrounding rights violations and facilitating their identification. Next, it reflects on the importance of interdisciplinarity in integrating pedagogical, legal, and social knowledge to understand the complexity of this phenomenon. It also examines the legal and theoretical foundations supporting the leading role of educational institutions in responding to the social and subjective impacts of these crimes against children and adolescents. Finally, it proposes theoretical guidelines to support teaching practice in developing preventive education that is ethical and integrated with protection networks.

Methodologically, this study is characterized as a qualitative bibliographic and documentary investigation guided by the critical analysis of legislation, official documents, and educational literature. Its theoretical and analytical framework is based on the examination of legal sources, public data, and pedagogical references, with particular emphasis on the contributions of Paulo Freire. This foundation supports the argument that a school assumes a leading role when it is capable of recognizing signs of vulnerability, listening responsibly, communicating identified concerns to the appropriate authorities, and developing continuous preventive actions.

THEORETICAL FRAMEWORK

DIALOGICITY IN THE SCHOOL ENVIRONMENT: FREIREAN FOUNDATIONS

In Freirean thought, dialogicity is not merely informal conversation. Rather, it is a pedagogical stance grounded in recognizing the other as a subject endowed with voice, history, and dignity. In *Pedagogy of the Oppressed*, Freire criticizes the banking model of education, characterized by the vertical transmission of knowledge, and advocates dialogue as a practice of freedom (Freire, 1987). This principle is especially relevant when schools address sensitive issues such as sexual exploitation, domestic violence, abuse, neglect, and psychological suffering. Silence cannot be broken through imposition; rather, it is broken when the school environment becomes sufficiently trustworthy for children and adolescents to believe that their voices will be taken seriously.

Within the field of child and adolescent protection, dialogicity requires sensitive listening, age-appropriate language, and a commitment to preventing revictimization. Schools should not pressure children to recount details, conduct interrogations, or gather evidence. Such responsibilities belong to the competent authorities, as established by Law No. 13,431/2017 (Brazil, 2017) and Decree No. 9,603/2018 (Brazil, 2018). The school's initial pedagogical role is to provide support, document relevant information, protect the victim, and activate the appropriate protection procedures. School-based listening must therefore be carried out with great care: it should foster trust without exceeding the ethical and legal limits of educational practice.

Dialogicity also enables prevention to move beyond the status of a social taboo. Combating the sexual exploitation of children and adolescents requires clear communication about rights, bodily autonomy, consent, personal boundaries, self-protection, reporting channels, and the recognition of situations of risk. When sexuality education is delivered in a scientific, ethical, and age-appropriate manner, it does not sexualize children. On the contrary, it contributes to their protection by providing vocabulary, body awareness, and the capacity to identify and report situations of violence. UNESCO (2018) emphasizes that structured educational approaches addressing sexuality, relationships, rights, and

health can contribute to informed decision-making, respectful relationships, and the prevention of violence.

THE SCHOOL AS A LEADING AGENT WITHIN THE PROTECTION NETWORK

The school's leadership in combating the sexual exploitation of children and adolescents must be understood within the broader protection network. Leadership does not mean institutional isolation. Schools do not act alone, nor do they replace the Guardianship Council, social assistance services, healthcare providers, the Public Prosecutor's Office, specialized police units, or the judiciary. Their leadership lies in recognizing their privileged position for observation, prevention, and referral. Consequently, schools must establish clear internal procedures, provide continuous staff training, and maintain close coordination with local support services.

The Statute of the Child and Adolescent (Statute of the Child and Adolescent—ECA) (Brazil, Law No. 8,069/1990) establishes that cases involving suspected or confirmed child maltreatment must be reported to the Guardianship Council, without prejudice to any other legal measures that may be required. This provision is fundamental for schools because it removes violence from the realm of personal judgment and places it within the sphere of institutional responsibility. Absolute certainty is not required before activating the protection network. A well-founded suspicion alone warrants referral, since the investigation is the responsibility of specialized authorities. Conversely, omission may prolong the victim's exposure to the perpetrator.

Law No. 14,811/2024 (Brazil, 2024) further reinforced the central role of educational institutions in preventing violence. By establishing protective measures against violence in educational settings and creating a national policy for the prevention and combating of child and adolescent sexual abuse and exploitation, the legislation recognizes schools as essential spaces for identifying risks, preventing harm, and promoting safe educational environments. This legislative development expands the responsibilities

of education systems and underscores the need for established protocols, ongoing professional development, and integration with public policies.

The Faça Bonito Guide, developed by the United Nations Children's Fund (UNICEF), the Roberto Marinho Foundation, and Childhood Brasil (Fundação Roberto Marinho; UNICEF; Childhood Brasil, 2023), provides guidance for municipalities and public services in organizing awareness activities for the National Day to Combat the Sexual Abuse and Exploitation of Children and Adolescents, established by Law No. 9,970/2000 (Brazil, 2000). However, combating sexual exploitation cannot be limited to a commemorative date. Awareness campaigns serve as an entry point, but schools must transform public mobilization into a sustained educational policy. This involves annual planning, teacher training, qualified listening, family participation, and continuous collaboration with the local protection network.

INTERDISCIPLINARY REFLECTIONS: WEAVING KNOWLEDGE FOR COMBATING SEXUAL EXPLOITATION

The sexual exploitation of children and adolescents is a complex phenomenon and therefore requires an interdisciplinary approach. Pedagogy contributes to understanding curriculum, school coexistence, learning, and ethical education. Psychology assists in interpreting subjective impacts and signs of emotional distress without turning teachers into therapists. Law defines institutional duties, guarantees, and procedures. Social assistance helps explain family, territorial, and socioeconomic vulnerabilities. Healthcare provides comprehensive care for victims, while public security and the justice system are responsible for investigation and accountability. By integrating these different fields, the school becomes a point of connection rather than one of substitution.

Interdisciplinarity is not merely the superficial accumulation of knowledge from different disciplines. According to Japiassu (1976), it emerges from the need to overcome the fragmentation of knowledge when confronting problems that transcend rigid disciplinary boundaries. Fazenda (2011) likewise associates interdisciplinarity with an attitude of openness, cooperation, and dialogue among

fields of knowledge. In addressing sexual exploitation, this perspective prevents schools from treating the issue solely as a science topic, a legal lecture, or a disciplinary matter. Rather, the phenomenon is simultaneously educational, legal, social, and psychological.

However, a cross-curricular approach must not come at the expense of academic rigor. The topic should be addressed in ways appropriate to students' age, maturity, and the guidelines established by the education system. It should avoid exposing real cases, moralistic discourse, alarmist language, or practices that may embarrass students. The objective is to educate for protection and human rights, not to create widespread fear. Consequently, teacher training is essential to ensuring quality. Teachers need to understand basic concepts, warning signs, referral protocols, reporting channels, and the limits of their own professional responsibilities. Good intentions alone, without adequate preparation, may result in harm.

THE IMPACTS OF SEXUAL EXPLOITATION CRIMES AND THE EDUCATIONAL CHALLENGE

The impacts of the sexual exploitation of children and adolescents are multifaceted and extend far beyond the moment when the violence occurs. They may affect emotional bonds, self-esteem, physical development, relationships of trust, mental health, school attendance, and learning. In the classroom, emotional distress may manifest itself in various ways, including silence, aggression, regression, self-harm, frequent crying, premature sexualized behavior, fear of certain adults, declining academic performance, school dropout, sleep disturbances, and difficulty concentrating. No individual sign is sufficient to establish a diagnosis; however, persistent changes require careful attention and appropriate referral.

The UNICEF and FBSP report (2024) shows that sexual violence has a marked gender profile. Between 2021 and 2023, the majority of victims of sexual violence aged 0 to 19 were female, with a particularly high concentration among those between 10 and 14 years of age. These findings reinforce the need for educational practices that address rights, power relations, bodily protection, and gender

inequalities in an ethical and age-appropriate manner. Ignoring these issues does not protect students. On the contrary, silence tends to benefit perpetrators by preventing children and adolescents from recognizing abusive situations and knowing where to seek help.

Schools must also recognize that sexual exploitation can occur in digital environments. The widespread use of smartphones, social media, online games, and messaging applications has created new forms of grooming, blackmail, non-consensual sharing of intimate content, and technology-facilitated sexual violence. Comprehensive protection must therefore include digital literacy, guidance on privacy, awareness of the risks associated with sharing images, information about reporting channels, and safe online interactions. Addressing this dimension also requires dialogue with families, since exclusively punitive forms of control rarely solve the problem.

THEORETICAL GUIDELINES FOR PREVENTIVE TEACHING PRACTICE

Preventive teaching practice may be organized around five key guidelines. The first is continuous professional development. Teachers and school administrators need to understand the legal framework, referral procedures, warning signs, and the distinction between pedagogical listening, specialized listening (*escuta especializada*), and the special testimonial (*depoimento especial*). The second guideline is the creation of a dialogic school environment. Students should be able to identify trusted adults within the school, know the available communication channels, and have access to spaces where they can speak about fear, discomfort, or violations of their personal boundaries (Santos & Ippolito, 2011).

The third guideline is curricular interdisciplinarity. Efforts to combat the sexual exploitation of children and adolescents should not depend solely on commemorative dates. Instead, they should be integrated into pedagogical projects addressing human rights, health, citizenship, ethics, social coexistence, digital culture, and protection. The fourth guideline is coordination with the protection network. Schools must know which agencies to contact, how to document cases, how to safeguard information, and how to monitor referrals without encroaching upon the responsibilities of other

institutions. The fifth guideline is the participation of families and the community. Prevention becomes more effective when schools clearly communicate their objectives, address misunderstandings, and foster a culture of care among parents, guardians, and the broader community (Japiassu, 1976).

METHODOLOGY

This article was developed through bibliographic and documentary research employing a qualitative approach and a theoretical-reflective purpose. The bibliographic research was based on the criteria proposed by Gil (2002) and focused on authors who discuss dialogicity, critical education, interdisciplinarity, curriculum, sensitive listening, teacher education, and the social role of the school. Among the principal theoretical references consulted are Freire (1987, 1996), Fazenda (2011), Japiassu (1976), Furlani (2011), Sacristán (2013), Araújo (2014), Carvalho (2021), Paixão (2021), Maia (2006), Lima and Maio (2014), Brino and Williams (2009), among others.

According to Marconi and Lakatos (2011), the documentary research encompassed Brazilian legislation, official documents, institutional reports, and guidance materials related to the protection of children and adolescents. Priority was given to official and verifiable sources, particularly federal legislation and documents produced by governmental or international organizations. The principal legal sources included the Statute of the Child and Adolescent (*Estatuto da Criança e do Adolescente—ECA*) (Brazil, Law No. 8,069/1990), Law No. 13,431/2017 (Brazil, 2017), Decree No. 9,603/2018 (Brazil, 2018), and Law No. 14,811/2024 (Brazil, 2024). The technical and institutional sources comprised data from the Ministry of Human Rights and Citizenship (Brazil, 2025), the United Nations Children's Fund (*Fundo das Nações Unidas para a Infância—UNICEF*) (Brazil, 2024), the Brazilian Forum on Public Security (*Fórum Brasileiro de Segurança Pública—FBSP*) (Brazil, 2024), the United Nations Educational, Scientific and Cultural Organization (UNESCO), as well as pedagogical materials focused on violence prevention.

Following the methodological principles proposed by Severino (2017), the analysis was organized around four interpretative axes: school leadership and teacher education; cross-curricular integration and sensitive listening; referral protocols and coordination with healthcare and social assistance; and the Guardianship Council and the justice system. These analytical axes were selected because of their direct relationship with the central argument of the study, namely that the school's role in combating the sexual exploitation of children and adolescents requires professional preparation, institutional organization, a continuous cross-curricular approach, and effective intersectoral coordination.

RESULTS AND DISCUSSION

As this is a bibliographic and documentary study, the findings presented are analytical in nature. The literature review supports the argument that a school exercising a leading role in combating the sexual exploitation of children and adolescents is not one that assumes investigative responsibilities, but rather one that pedagogically structures prevention, strengthens practices of attentive listening, identifies signs of vulnerability, activates the protection network, and contributes to the development of an institutional culture grounded in human rights. The analysis of legal documents, public data, and the specialized literature validates four central dimensions: school leadership and teacher education; cross-curricular integration and sensitive listening; referral protocols and coordination with healthcare and social assistance; and the Guardianship Council and the justice system (Brazil, 1990; Brazil, 2017; UNICEF; FBSP, 2024).

The first analytical finding reveals that school leadership depends directly on teacher education. A school that assumes a central role in protecting children and adolescents is not limited to transmitting curricular content. Rather, it recognizes its social function, understands students as whole individuals, and serves as a space for citizenship education, social interaction, care, and the safeguarding of rights. From this perspective, Maia (2006) contributes to the discussion by emphasizing that sexuality, when addressed

pedagogically, must be approached in a broad, ethical manner that is attentive to the specific characteristics of learners, particularly those living in contexts of vulnerability.

Brino and Williams (2009) argue that schools can act as agents in preventing child sexual abuse, primarily because teachers and other education professionals interact continuously with children and adolescents. This ongoing relationship enables them to recognize signs that often do not emerge during isolated or occasional interventions. As an institutional environment that exists, to some extent, outside the domestic sphere, the school can become a trusted space for students experiencing fear, threats, or enforced silence.

Lima and Maio (2014) emphasize that teacher education is a fundamental prerequisite for enabling schools to respond effectively to sexual violence against children. Teachers who are insufficiently prepared may ignore warning signs, interpret situations merely as disciplinary issues, or, conversely, act prematurely, exposing children to further harm and contributing to revictimization. Teacher education should therefore not be regarded as an ancillary component but rather as an essential requirement for ethical professional practice.

Paixão (2021) further argues that educational initiatives aimed at preventing child sexual abuse must be carefully planned, continuous, and pedagogically intentional. Occasional lectures or isolated awareness campaigns are insufficient. Prevention requires schools to cultivate an institutional culture of protection in which teachers, administrators, students, and families recognize that the issue forms an integral part of human development and education.

Furlani (2011) likewise maintains that school-based sexuality education, when grounded in respect for diversity, gender relations, and human rights, can make a significant contribution to preventing violence. According to the author, the classroom can serve as a space for meaningful discussions about the body, care, personal boundaries, equality, and mutual respect. This perspective challenges the misconception that discussing sexuality poses a threat to childhood. On the contrary, silence tends to

benefit perpetrators, whereas appropriate knowledge strengthens children's and adolescents' capacity for self-protection and help-seeking.

Accordingly, school leadership requires well-prepared teachers because identifying situations of violence depends on more than an individual educator's sensitivity. It requires knowledge, procedural confidence, and institutional commitment. A leading school understands that it should neither investigate crimes nor ignore warning signs. Its role is to welcome, document, protect, and refer cases in accordance with the limits established by the protection network (Brazil, 2017; Lima & Maio, 2014).

The second analytical finding indicates that preventing the sexual exploitation of children and adolescents must be integrated into the curriculum through a cross-curricular approach, accompanied by practices of sensitive listening. Sacristán (2013) conceptualizes the curriculum as a social and cultural practice rather than simply a neutral sequence of subject matter. From this perspective, topics such as human rights, child protection, health, citizenship, social coexistence, gender, digital culture, and violence prevention cannot be treated as issues external to the educational process.

Araújo (2014) contributes to this analysis by discussing cross-cutting themes and project-based pedagogy as pathways for educational transformation. When prevention of sexual exploitation is addressed only through isolated activities, its impact is likely to be limited. However, when incorporated into interdisciplinary projects, discussion circles, age-appropriate reading materials, debates on rights, citizenship activities, and initiatives that promote positive social interaction, it becomes embedded within the school's culture.

Nevertheless, cross-curricular integration must not be confused with improvisation. A curriculum committed to protection should be planned according to students' age, developmental stage, and the guidelines established by the educational system. In the early grades, activities may focus on body autonomy, identifying trusted adults, understanding personal boundaries, and recognizing the right to refuse uncomfortable situations. With adolescents, educational activities may include discussions on

consent, power relations, gender-based violence, sexual exploitation, digital exposure, privacy, and reporting mechanisms (Brazil, 2018; Brazil, 2019).

Carvalho (2021) provides an important foundation for understanding sensitive listening as a core element of educational leadership. Sensitive listening is not limited to passive hearing; it requires presence, attentiveness, empathy, respect for the student's own pace, and the ability to recognize both verbal and nonverbal expressions. In the context of the sexual exploitation of children and adolescents, this practice is particularly important because children and adolescents do not always disclose violence directly.

Barbier (1998) expands this understanding by advocating a form of listening that is open to the complexity of human experience. Within the school environment, this means recognizing students not only as cognitive learners but also as emotional, social, and historical subjects. Sensitive listening enables educators to identify vulnerabilities without turning the school into a setting for interrogation.

Thus, a cross-curricular curriculum and sensitive listening constitute an inseparable whole. The curriculum establishes collective conditions for preventive dialogue and human rights education, while sensitive listening enables schools to recognize individual situations of suffering and respond responsibly. Without a cross-curricular curriculum, prevention remains confined to isolated events. Without sensitive listening, schools may speak about protection while failing to recognize the students who need it most (Sacristán, 2013; Carvalho, 2021).

The third analytical finding demonstrates that combating the sexual exploitation of children and adolescents requires clear referral protocols and effective coordination with healthcare and social assistance services. Schools alone cannot provide comprehensive responses to situations involving domestic violence, psychological suffering, social vulnerability, threats, neglect, and violations of rights. Consequently, school leadership should not be mistaken for institutional self-sufficiency, but rather understood as coordinated and responsible action within the protection network (Brazil, 2017; Brazil, 2018).

Costa et al. (2025) reinforce this discussion by emphasizing the need for biopsychosocial care for victims, perpetrators, and families affected by sexual violence. Their approach demonstrates that sexual violence creates not only legal consequences but also emotional, social, familial, and health-related impacts. Children and adolescents who have experienced sexual exploitation may require psychological support, medical assessment, social assistance, protective measures, and educational follow-up.

Freitas and Romites (2021), in discussing intersectoral intervention for preventing sexual violence in early childhood, underscore the importance of coordination among different public policy sectors. Intersectorality enables education, healthcare, social assistance, and child protection agencies to share responsibilities without fragmenting the care provided to victims. When each sector acts independently, there is an increased risk of repeated victim disclosures, delays in referrals, loss of critical information, and revictimization.

Within this context, referral protocols perform an indispensable function. They provide schools with guidance on how to proceed in cases of suspected or confirmed violence, specifying whom to notify, how to document information, how to protect victims, what precautions should be taken regarding family members, and which agencies should be contacted. Clear protocols reduce improvised decision-making and protect both students and education professionals (Brazil, 2018; Costa et al., 2025).

Coordination with healthcare services is essential because sexual violence may result in physical, emotional, and psychosomatic harm. Health services may provide initial support, clinical evaluation, psychological care, and referrals to specialized services. Social assistance, in turn, plays a fundamental role in understanding the child's or adolescent's family, territorial, and socioeconomic context, as well as monitoring situations involving vulnerability, neglect, dependency, and social risk (Freitas & Romites, 2021).

The analysis supports the conclusion that schools must be integrated into local protection systems. This requires familiarity with community-based services, maintaining dialogue with the Guardianship Council, Specialized Social Assistance Reference Centers (CREAS), healthcare units, the Public

Prosecutor's Office, and specialized police departments. Intersectoral coordination should not begin only after violence has occurred; it must be established proactively through training, meetings, protocols, and effective communication channels (Brazil, 2017; Brazil, 2018).

The fourth analytical finding concerns the role of the Guardianship Council and the justice system. Schools must clearly understand when and how to engage these institutions, thereby avoiding two common mistakes: failing to report serious suspicions and treating the Guardianship Council as a punitive authority for matters that are merely disciplinary in nature. The Guardianship Council is neither a punitive body nor an extension of the school administration. Rather, it is an institution responsible for safeguarding the rights of children and adolescents (Brazil, 1990).

Santos (2024) contributes to this discussion by relating sexual violence against children to the responsibilities of human rights education and the competent public authorities. Human rights education enables schools to understand that their actions should be guided not by fear, moral judgment, or prejudice, but by institutional responsibility. When there is suspicion of sexual violence, schools must activate the appropriate protection mechanisms without investigating the truthfulness of the report, confronting alleged perpetrators, or demanding evidence from the child.

Silva (2024) further explains that, in contexts of social vulnerability, the Guardianship Council serves as the link between the identification of rights violations and the implementation of appropriate protective measures. In cases of sexual violence, its role is to receive reports, apply or request protective measures, coordinate with public services, and refer cases to the competent authorities whenever necessary.

The relationship between schools and the justice system must likewise be understood with caution. The justice system is responsible for legal proceedings, accountability, legal protection, and the safeguarding of rights. Schools, however, must avoid practices that could compromise testimonies, expose victims, or contribute to revictimization. Law No. 13,431/2017 (Brazil, 2017) and Decree No. 9,603/2018 (Brazil, 2018) are particularly important because they distinguish specialized listening (*escuta*

especializada) from the special testimonial (depoimento especial), establishing that child and adolescent victims or witnesses of violence must be heard in protected settings by appropriately trained professionals.

Teachers' understanding of the appropriate moment to contact the Guardianship Council is therefore crucial. When educators are unfamiliar with the Council's responsibilities, they may hesitate in situations involving serious suspicions or, conversely, refer cases that should be addressed through internal pedagogical mediation. This paradox highlights the importance of institutional training. Schools must distinguish between school conflict, disciplinary problems, social vulnerability, and violations of rights. In cases involving the sexual exploitation of children and adolescents, a well-founded suspicion requires referral because failure to act may leave victims exposed to continuing violence (Santos, 2024; Silva, 2024).

Accordingly, the Guardianship Council and the justice system should not be viewed as external institutions disconnected from the school. Rather, they are integral components of the protection network. School action becomes more effective when education professionals understand institutional procedures, recognize the limits of their own responsibilities, and engage the appropriate authorities without exposing victims. Such coordination preserves the school's pedagogical mission while ensuring that violations of rights receive an appropriate institutional response (Brazil, 1990; Brazil, 2017).

The analysis of these four dimensions confirms that combating the sexual exploitation of children and adolescents requires a school that is well prepared, well coordinated, and pedagogically committed. School leadership depends on teacher education because teachers and administrators must know how to recognize warning signs, respond appropriately to disclosures, and refer cases without causing revictimization. A cross-curricular curriculum strengthens prevention by incorporating human rights, citizenship, health, body autonomy, digital culture, and positive social interaction into everyday school life. Sensitive listening enables educators to identify vulnerabilities that are not always expressed explicitly (Furlani, 2011; Araújo, 2014; Carvalho, 2021).

These findings also demonstrate that prevention cannot rely solely on the initiative of individual teachers who happen to be particularly committed to the issue. Instead, it must be institutionalized. This requires incorporating the topic into the school's pedagogical project, organizing continuing professional development, establishing internal procedures, implementing permanent curricular initiatives, and strengthening partnerships within the local community. A leading school is one that transforms protection into an everyday educational practice rather than treating it as an emergency response or an occasional awareness campaign (Paixão, 2021; Brazil, 2024).

Finally, the findings indicate that schools must act with balance. They must neither remain silent in the face of signs of sexual exploitation nor assume investigative functions. They must not regard the Guardianship Council as an institution of punishment but rather as an agency dedicated to protection. They must not reduce sexuality education to biological content but instead approach it as an essential dimension of human rights education. Nor should they confine prevention to commemorative dates; rather, it should be incorporated into both the curriculum and the school's institutional culture. This is the essential condition for transforming silence into protective dialogue (Brazil, 2017; Santos, 2024; Silva, 2024).

FINAL CONSIDERATIONS

This article examined the role of the school as a leading agent in combating the sexual exploitation of children and adolescents by bringing together the concepts of dialogicity, interdisciplinarity, and the protection network. The discussion demonstrated that, owing to its daily presence in the lives of children and adolescents, the school occupies a strategic position for identifying warning signs, welcoming disclosures, implementing preventive actions, and activating the appropriate authorities. However, this role is not fulfilled spontaneously. It depends on professional training, established protocols, curriculum development, ethical commitment, and intersectoral coordination.

Dialogicity, inspired by Paulo Freire, proved to be an indispensable pedagogical foundation for breaking the silence surrounding sexual exploitation. A dialogic school neither transforms sensitive issues into taboos nor treats students as passive recipients of rules. Instead, it creates conditions in which individuals can speak responsibly, become aware of their rights, and have their suffering recognized. At the same time, dialogicity must be accompanied by clear institutional boundaries, since school-based listening does not replace specialized listening (*escuta especializada*) or the special testimonial (*depoimento especial*) established by law.

Interdisciplinarity likewise proved to be essential because the sexual exploitation of children and adolescents cannot be addressed by a single field of knowledge. Education, healthcare, social assistance, the Guardianship Council, and the justice system must work in a coordinated manner. Within this process, the school fulfills the roles of observation, prevention, support, and referral. Its greatest strength lies precisely in its ability to recognize students as whole individuals and to connect identified situations with the appropriate protection services.

It is therefore concluded that school leadership consists of acting preventively and making responsible referrals. Schools should not investigate crimes, expose victims, or replace the specialized protection network. They must, however, recognize warning signs, avoid trivializing well-founded suspicions, preserve relevant information, notify the Guardianship Council, and foster a pedagogical culture centered on protection. At a time when public data continue to reveal the persistence of serious violations against children and adolescents, institutional omission is incompatible with the social mission of education.

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PEDAGOGICAL STRATEGIES FOR THE INCLUSION OF STUDENTS WITH AUTISM SPECTRUM DISORDER IN MAINSTREAM EDUCATION: CHALLENGES AND TEACHING PRACTICES

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Abstract

The school inclusion of students with Autism Spectrum Disorder (ASD) constitutes one of the main challenges of contemporary education, requiring pedagogical practices that ensure not only access to school but also participation, learning, and development within inclusive educational contexts. In this scenario, this chapter aims to analyze the principal pedagogical strategies aimed at the inclusion of students with ASD in mainstream education, discussing the challenges faced by teachers and the possibilities for strengthening inclusive educational practices. This is a bibliographic study based on the analysis of books, scientific articles, legal documents, and academic publications related to Special Education, Inclusive Education, and Autism Spectrum Disorder. Among other theoretical references, the study engages with the contributions of Maria Teresa Eglér Mantoan, Lev Vygotsky, Eugênio Cunha, Sílvia Ester Orrú, Paulo Freire, CAST, and Zerbato and Mendes, fostering reflection on the role of schools and teachers in building accessible educational environments. The analysis demonstrated that the effective implementation of school inclusion depends on the articulation of teacher education, pedagogical planning, curriculum flexibility, pedagogical mediation, the use of structured resources, and the principles of Universal Design for Learning. It also showed that strengthening public policies, collaborative work among schools, families, and support services, as well as the reorganization of pedagogical practices, constitute fundamental elements for promoting an education committed to equity and the recognition of diversity. It is concluded that school inclusion requires a transformation of

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educational conceptions and practices, understanding diversity as a structuring principle of the school and an indispensable condition for guaranteeing the right to learning for all students.

Keywords: Autism Spectrum Disorder, Inclusive Education, Pedagogical Practices, Teacher Education, Universal Design for Learning.

INTRODUCTION

The school inclusion of students with Autism Spectrum Disorder (ASD) constitutes one of the principal challenges of contemporary education, particularly in light of the need to guarantee not only access to school but also permanence, participation, and learning in educational contexts committed to valuing diversity. Although legislative advances over recent decades have consolidated the right to inclusive education in Brazil, the effective implementation of this principle still encounters obstacles related to teacher education, the organization of pedagogical practices, curriculum flexibility, and the institutional conditions necessary to address the diverse ways of learning present in the school environment.

The 1988 Federal Constitution recognizes education as a right of all and a duty of the State and the family, establishing principles that guide the construction of an educational system based on equal opportunities. Subsequently, the National Education Guidelines and Framework Law (Law No. 9,394/1996), the National Policy on Special Education from the Perspective of Inclusive Education (Brasil, 2008), Law No. 12,764/2012, known as the Berenice Piana Law, and the Brazilian Inclusion Law (Law No. 13,146/2015) strengthened the commitment to an education that recognizes human diversity as a fundamental principle of school organization. These legal provisions demonstrate that inclusion should not be understood as a concession or a welfare-oriented measure, but rather as a right guaranteed to all students, regardless of their characteristics or educational needs.

In this context, Autism Spectrum Disorder presents specific characteristics related to communication, social interaction, and behavioral patterns that require pedagogical practices sensitive to

students' individual needs, without losing sight of their participation in the classroom collective.

Contemporary understandings of ASD go beyond perspectives focused exclusively on clinical diagnosis and increasingly recognize that development and learning are influenced by educational opportunities, social interactions, and the mediations carried out within the school environment. Thus, the inclusion process requires schools to organize experiences capable of fostering the active participation of students while respecting their different rhythms, forms of communication, and ways of learning.

From this perspective, teachers occupy a central position in the construction of inclusive pedagogical practices. Their role extends beyond the transmission of content, involving the planning of diverse strategies, curriculum flexibility, the use of accessible resources, and the organization of learning environments that support the participation of all students. However, numerous studies indicate that many teachers still face difficulties resulting from insufficient initial and continuing education, a scarcity of pedagogical resources, and the need for greater coordination among teachers, management teams, Specialized Educational Services (SES), and families. These factors demonstrate that school inclusion is a collective responsibility whose implementation depends on institutional commitment to the development of more equitable educational practices.

Among the possibilities for strengthening this process are strategies such as curriculum adaptation, pedagogical mediation, the use of structured resources, the organization of predictable routines, and the principles of Universal Design for Learning (UDL), which propose the construction of educational environments capable of addressing diversity from the initial planning stage. By recognizing that differences are an inherent part of the human condition, these strategies shift the focus from individual limitations to the elimination of barriers that hinder student learning and participation within the school context.

In view of this scenario, this chapter aims to analyze the principal pedagogical strategies directed toward the inclusion of students with Autism Spectrum Disorder in mainstream education, discussing the challenges faced by teachers and the teaching practices that foster more inclusive educational processes.

To this end, the chapter is grounded in bibliographic research developed through the analysis of scientific publications, legal documents, and references in Special Education and Inclusive Education, engaging with authors such as Maria Teresa Eglér Mantoan, Eugênio Cunha, Sílvia Ester Orrú, Lev Vygotsky, Enicéia Gonçalves Mendes, and other scholars who discuss the construction of pedagogical practices committed to the learning and development of all students.

By reflecting on the challenges and possibilities of the school inclusion of students with ASD, this chapter seeks to contribute to the strengthening of teaching practices and to broaden discussions on the construction of a truly inclusive school. More than presenting teaching strategies, it proposes understanding inclusion as an ethical, political, and pedagogical commitment grounded in the recognition of differences, the appreciation of each student's potential, and the defense of everyone's right to learn under equitable conditions.

UNDERSTANDING AUTISM SPECTRUM DISORDER FROM THE PERSPECTIVE OF INCLUSIVE EDUCATION

Understanding of Autism Spectrum Disorder (ASD) has undergone significant transformations over recent decades, accompanying advances in research across the fields of health, education, and the human sciences. Whereas earlier interpretations were predominantly centered exclusively on clinical diagnosis and individuals' limitations, a broader perspective now prevails, recognizing the diversity that exists within the spectrum and emphasizing the importance of social and educational contexts in the development of each student's potential.

Autism Spectrum Disorder is classified as a neurodevelopmental disorder characterized by persistent differences in communication and social interaction, associated with restricted and repetitive patterns of behavior, interests, or activities. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), these characteristics manifest in the early years of life and vary in intensity, which is why the term "spectrum" highlights the broad variability among diagnosed individuals (American

Psychiatric Association, 2014). This understanding breaks with homogeneous views of autism and reinforces the need to recognize the singularities present in each student.

The levels of support described in the DSM-5 are not intended to establish hierarchical classifications among people with ASD but rather to guide the identification of the support necessary to foster participation in different dimensions of social life, including the school context. Thus, understanding support levels means recognizing that some students will require specific adaptations, while others will depend on more systematic strategies of monitoring, pedagogical mediation, and educational-environment organization. This perspective shifts the focus from disability to the identification of conditions necessary for learning and participation, strengthening educational practices committed to equity.

However, understanding ASD solely through diagnostic criteria is insufficient when the goal is to promote genuinely inclusive education. The school environment constitutes a privileged space for human development in which learning experiences, social interactions, and pedagogical mediation play a fundamental role in knowledge construction. From this perspective, the student with ASD should not be defined exclusively by limitations but recognized as a rights-bearing individual with potential that can be developed when educational opportunities compatible with their needs are available.

From this standpoint, school inclusion requires teachers and educational institutions to understand the characteristics of Autism Spectrum Disorder without reducing the educational process to diagnosis. Each student displays particular forms of communication, learning, interaction, and expression, making standardized strategies inappropriate for all cases. As Orrú (2012) and Cunha (2015) emphasize, effective pedagogical practices are those that begin with observation of the student's singularities and organize interventions capable of expanding participation in school activities while respecting interests, learning rhythms, and learning styles.

This understanding aligns directly with Vygotsky's (2007) sociocultural perspective, which recognizes that human development occurs through social interactions and mediation carried out by more

experienced individuals. Thus, teachers assume an essential role in creating conditions that facilitate access to knowledge by organizing experiences that stimulate participation, communication, and the development of higher psychological functions. Learning, from this perspective, ceases to be understood as the exclusive result of individual characteristics and comes to depend also on the opportunities offered by the educational context.

Furthermore, understanding ASD from the perspective of inclusive education implies recognizing that barriers to learning do not always arise from the student's characteristics but often from the conditions provided by the school itself. Inflexible environments, rigid curricula, a lack of accessible pedagogical resources, and insufficient professional preparation can significantly limit opportunities for participation among students with ASD. Therefore, inclusion requires institutional transformations that go beyond isolated adaptations and promote changes in teaching organization, pedagogical practices, and the conceptions that guide educational work.

Accordingly, understanding Autism Spectrum Disorder from the perspective of inclusive education means recognizing diversity as an inherent element of the school environment. More than understanding clinical characteristics, education professionals must construct pedagogical practices based on appreciation of students' potential, the elimination of barriers to learning, and the guarantee of everyone's right to effective participation in educational processes. This understanding constitutes the starting point for reflecting on the challenges faced by schools and teachers in building a truly inclusive education.

THE CHALLENGES OF INCLUDING STUDENTS WITH AUTISM SPECTRUM DISORDER IN MAINSTREAM EDUCATION

The consolidation of inclusive education represents one of the greatest challenges faced by educational institutions in contemporary society. Although Brazilian legislation guarantees the right of students with Autism Spectrum Disorder (ASD) to schooling in mainstream education, the

implementation of this right still encounters obstacles related to school organization, pedagogical practices, teacher education, and the institutional conditions necessary to ensure the participation and learning of all students.

Among the most evident challenges is teacher education. The inclusion of students with ASD requires knowledge that extends beyond mastery of curricular content, demanding an understanding of developmental specificities, different forms of communication, mediation strategies, and possibilities for adapting pedagogical practices. However, numerous studies indicate that many teachers still feel insecure about working in inclusive contexts, a situation frequently related to limitations in initial teacher preparation and insufficient opportunities for continuing professional development. This reality directly affects the organization of pedagogical work and the construction of genuinely inclusive practices.

Another challenge concerns coordination among the different professionals involved in the educational process. School inclusion cannot be understood as the exclusive responsibility of the classroom teacher, support teacher, or Specialized Educational Services (SES). On the contrary, it is a collective undertaking that requires shared planning, ongoing dialogue among school professionals, and family participation in developing strategies that support student development. When such coordination does not occur, actions tend to become fragmented, compromising the continuity of pedagogical interventions.

Difficulties related to the organization of pedagogical practices also stand out. In many situations, curricula remain structured according to homogeneous teaching models that disregard the different rhythms, interests, and learning styles present in the classroom. This logic hinders the participation of students with ASD and highlights the need for more flexible practices capable of promoting diverse pathways to knowledge without lowering expectations regarding students' development.

Another recurring issue in the literature concerns the scarcity of pedagogical resources and institutional conditions for developing inclusive practices. The lack of adapted materials, the absence of adequate spaces for Specialized Educational Services, limited technological resources, and insufficient

time allocated to collaborative planning are factors that directly affect the quality of school inclusion.

These elements demonstrate that the implementation of inclusive education depends not only on teachers' commitment but also on investments in public policies capable of providing concrete conditions for pedagogical work.

In addition to structural issues, challenges related to attitudinal barriers in everyday school life persist. Conceptions still exist that associate inclusion exclusively with the student's presence in the classroom without considering the need to ensure effective participation in proposed activities. In other contexts, there is an expectation that students fully adapt to practices already established by the school, whereas the principle of inclusive education presupposes that the institution itself should reorganize its practices to accommodate the diversity present among its students.

These challenges become even more evident when considering aspects related to communication, social interaction, and the organization of school routines. Many students with ASD require more predictable environments, objective instructions, visual resources, and mediation that supports their understanding of proposed activities. When these needs are not considered in pedagogical planning, difficulties in participation and learning become more likely, reinforcing barriers that could be reduced through more accessible and intentionally planned practices.

Given this scenario, it becomes clear that building an inclusive school requires changes that extend beyond isolated adaptations. Overcoming the identified challenges depends on the articulation of teacher education, pedagogical planning, strengthening of public policies, collaborative work, and the reorganization of school practices. More than ensuring access to mainstream education, inclusion requires the creation of educational environments that recognize diversity as a constitutive element of the educational process and guarantee all students genuine opportunities for learning, participation, and development.

PEDAGOGICAL STRATEGIES FOR INCLUSIVE TEACHING PRACTICE

The implementation of inclusive education depends on the construction of pedagogical practices capable of recognizing diversity as an inherent characteristic of educational processes. In the case of students with Autism Spectrum Disorder (ASD), this perspective requires pedagogical planning that takes into account different ways of learning, communicating, and participating in school activities. Thus, rather than merely adapting isolated content, teachers are called upon to organize accessible, flexible, and intentionally planned learning experiences that promote the participation of all students.

Among the most relevant strategies is curriculum adaptation, understood as a process of making teaching practices more flexible without compromising learning objectives. Unlike the simplification of content, curriculum adaptation seeks to reorganize methodologies, resources, timing, and assessment methods, enabling students to access the curriculum according to their needs and potential. From this perspective, pedagogical planning comes to recognize that students learn in different ways and that a diversity of strategies is an essential condition for promoting learning.

This understanding is closely aligned with the conception defended by Mantoan (2003), who argues that an inclusive school reorganizes its curriculum to respond to the diversity present in the classroom, replacing homogeneous teaching models with practices that value differences as an enriching element of the educational process. In this way, curriculum flexibility ceases to represent an exceptional adaptation and becomes integrated into daily planning, benefiting not only students with ASD but the entire class.

However, curriculum adaptation alone does not guarantee inclusive processes. Its effectiveness depends on the teacher's role as a mediator of learning, organizing educational situations that encourage active student participation. From a sociocultural perspective, Vygotsky (2007) emphasizes that human development occurs through social relationships and that teacher mediation is a fundamental element in expanding learning opportunities. Thus, teachers must create conditions enabling each student to participate in school activities while respecting their rhythms, forms of communication, and particular

ways of constructing knowledge.

In this context, pedagogical mediation requires constant observation, attentive listening, and flexible planning. Teachers cease to occupy exclusively the role of content transmitters and instead assume the function of organizers of educational experiences, promoting situations that foster dialogue, cooperation, and collective knowledge construction. For students with ASD, such mediation may involve the use of objective instructions, visual supports, advance notice of activities, predictable routines, and diverse forms of communication—strategies that facilitate a better understanding of classroom proposals.

Another strategy widely discussed in the literature concerns the use of structured pedagogical resources. Concrete materials, visual resources, educational games, digital technologies, visual schedules, social stories, and various support tools constitute important mediators of learning, helping to broaden understanding of activities and promote student participation. When integrated into pedagogical planning, these resources enhance the predictability of school routines, reduce situations of anxiety, and strengthen student autonomy during activities.

Among the approaches that have most significantly contributed to the organization of inclusive practices is Universal Design for Learning (UDL). Grounded in the understanding that students have different ways of learning, UDL proposes that pedagogical planning be conceived from the outset to address the diversity present in the classroom. Rather than creating adaptations only after identifying specific difficulties, this perspective guides the development of flexible proposals that offer multiple means of presenting content, different possibilities for participation, and varied ways of demonstrating learning.

The principles of Universal Design for Learning, systematized by CAST (2018) and further developed by Zerbato and Mendes (2018), demonstrate that inclusive pedagogical practices benefit the entire school community. By diversifying resources, methodologies, and assessment strategies, teachers broaden learning opportunities for students with different profiles, reducing barriers that have historically limited many students' participation in educational processes. From this perspective, inclusion ceases to

be understood as a service directed exclusively at the target population of Special Education and becomes a guiding principle of the school's pedagogical organization.

Another essential aspect concerns strengthening social interactions in everyday school life. Learning does not occur in isolation but through relationships established among teachers, students, and the school community. Therefore, collaborative practices, small-group activities, cooperative games, interdisciplinary projects, and experiences that encourage dialogue foster relationship-building, expand opportunities for participation, and contribute to the development of social skills among students with ASD. More than promoting coexistence, these strategies strengthen a school culture grounded in respect for differences and appreciation of diversity.

Within this process, it is equally important to involve the entire school community in the construction of inclusive practices. Coordination among teachers, management teams, Specialized Educational Services, families, and other education professionals expands opportunities for student support and strengthens pedagogical planning. Inclusion therefore ceases to be the individual responsibility of the teacher and comes to be understood as a shared institutional commitment based on co-responsibility and the collective construction of solutions to the challenges present in daily school life.

Thus, the pedagogical strategies discussed in this chapter demonstrate that building inclusive practices does not depend on applying standardized methods but on the school's ability to organize educational experiences that recognize students' potential and eliminate barriers to learning. Curriculum adaptation, pedagogical mediation, structured resources, Universal Design for Learning, and the strengthening of social interactions constitute complementary pathways toward consolidating an education committed to everyone's right to learning, participation, and development under equitable conditions.

PERSPECTIVES FOR STRENGTHENING SCHOOL INCLUSION

Building a truly inclusive school requires understanding that inclusion is not achieved merely through granting students with Autism Spectrum Disorder access to mainstream education, but rather through creating conditions that ensure their participation, learning, and development on an equal basis. In this sense, the literature reviewed demonstrates that the implementation of inclusive education depends on the articulation of public policies, teacher education, pedagogical planning, and institutional commitment to valuing diversity.

Throughout this study, it was observed that different pedagogical strategies contribute to reducing barriers to learning and expanding opportunities for participation among students with ASD. Curriculum adaptation, pedagogical mediation, the use of structured resources, Universal Design for Learning, and the organization of accessible environments are practices capable of promoting not only the development of students who are the target population of Special Education but also the learning of the entire class. This finding reinforces the understanding that inclusive practices benefit the whole school community by promoting educational environments that are more democratic, collaborative, and committed to the right to learn.

However, implementing these strategies still faces limitations related to the concrete operating conditions of schools. Insufficient pedagogical resources, the need for greater coordination among education professionals, limited offerings of continuing professional development, and difficulties in collaborative planning remain recurring challenges identified in the literature. These factors demonstrate that responsibility for inclusion cannot be attributed exclusively to teachers but must be shared among administrators, pedagogical teams, education systems, families, and other professionals involved in the educational process.

Among the most recurrent themes in the publications analyzed is the need to strengthen teacher education. School inclusion requires teachers capable of understanding the specificities of Autism Spectrum Disorder, planning flexible pedagogical practices, and employing strategies that respect the

different ways of learning present in the classroom. More than providing technical knowledge, initial and continuing teacher education should foster the development of investigative, reflective, and collaborative attitudes, preparing teachers to face the everyday challenges of inclusive education.

Another fundamental element concerns strengthening an inclusive culture within schools. Inclusion ceases to be understood as a set of adaptations intended for particular students and instead guides the organization of curriculum, methodologies, assessments, and the relationships established within the school environment. From this perspective, recognition of differences becomes a structuring principle of pedagogical work, enabling each student to participate in educational experiences according to their potential, interests, and needs.

The results of this research also demonstrate the importance of integrated action among schools, families, and support services. Ongoing dialogue among these different actors supports the construction of more consistent pedagogical strategies, broadens understanding of students' needs, and strengthens monitoring processes throughout the educational trajectory. When such collaborative work is established, opportunities for the academic, social, and emotional development of students with ASD are considerably enhanced.

From this perspective, it is also necessary to expand investments in public policies aimed at consolidating inclusive education. Ensuring pedagogical resources, strengthening Specialized Educational Services, promoting continuing professional development, and guaranteeing adequate working conditions for teachers are indispensable actions for effectively translating the principles established by Brazilian legislation into everyday school life. School inclusion requires political commitment, institutional planning, and continuous investment in building accessible and welcoming educational environments.

Thus, the reflections presented in this chapter make it possible to understand that the implementation of inclusion for students with Autism Spectrum Disorder depends on overcoming barriers that still limit their participation in mainstream education. More than implementing specific strategies, it is necessary to promote a change in educational conceptions, recognizing diversity as a constitutive

element of the school and as a guiding principle of pedagogical practices. Only from this perspective will it be possible to build educational processes committed to equity, participation, and the full development of all students.

FINAL CONSIDERATIONS

The school inclusion of students with Autism Spectrum Disorder represents an ethical, social, and pedagogical commitment that extends beyond guaranteeing access to mainstream education. Throughout this chapter, it has been demonstrated that the implementation of inclusive education depends on the construction of planned pedagogical practices grounded in the appreciation of diversity and the recognition of each student's potential. In this regard, schools are challenged to reorganize their educational processes, promoting environments that support participation, learning, and development under equitable conditions.

The discussions developed herein made it possible to understand that inclusive pedagogical strategies constitute essential elements for consolidating this process. Curriculum flexibility, pedagogical mediation, the use of structured resources, the principles of Universal Design for Learning, and the strengthening of social interactions represent concrete possibilities for reducing barriers to learning and expanding opportunities for participation among students with ASD in daily school life. More than methodological resources, these strategies express a conception of education committed to respect for differences and to guaranteeing the right to learn.

However, the literature reviewed also demonstrates that the consolidation of inclusive education still depends on addressing challenges related to teacher education, working conditions, strengthening public policies, and constructing collaborative practices among schools, families, and support services. Overcoming these barriers requires continuous investment in the qualification of education professionals and in the creation of institutional conditions that enable the development of genuinely inclusive pedagogical practices.

It is therefore concluded that the inclusion of students with Autism Spectrum Disorder cannot be understood as the individual responsibility of the teacher or as a set of isolated adaptations. Rather, it is a collective process requiring institutional commitment, intentional pedagogical planning, and the appreciation of diversity as a structuring principle of education. When these elements are articulated, the possibility expands for building a school capable of recognizing differences as a constitutive part of learning and ensuring all students genuine opportunities for development.

It is hoped that the reflections presented in this chapter will contribute to strengthening the debate on inclusive education and support teachers, administrators, and other education professionals in constructing pedagogical practices that are more accessible, collaborative, and committed to democratic, high-quality education. By recognizing that each student learns in a unique way, it is reaffirmed that inclusion is not a challenge restricted to Special Education, but rather a guiding principle of the contemporary school and of guaranteeing the right to education for all.

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DIAGNOSTIC EPIDEMIC AND CHALLENGES FOR EDUCATION: THE RISING SCENARIO OF AUTISM DIAGNOSES

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Abstract

This article investigates the phenomenon that has come to be known as the “diagnostic epidemic” of Autism Spectrum Disorder (ASD) and the challenges it poses for education in light of the growing number of diagnoses in recent decades. The study adopted a qualitative, exploratory approach, using documentary analysis of scientific articles, official reports, and reputable journalistic publications to discuss the causes and implications of this increase from a critical, depathologizing perspective. The findings indicate substantial growth in the prevalence of ASD, driven by scientific advances, greater social awareness, and the expansion and popularization of diagnostic criteria, but also by a diagnostic culture that tends to pathologize behaviors previously regarded as part of the variability of human

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development and the diverse possibilities of being. In Brazil, the 2022 Demographic Census identified 2.4 million people with autism, representing 1.2% of the population, while the 2024 School Census recorded a 44.4% increase in the enrollment of students with ASD in basic education in just one year. These findings point to the urgent need for curricular adaptations, teacher education, and specialized support, but above all for ethical and critical reflection on the medicalization of childhood, excessive psychodiagnostic processes—sometimes inaccurate and hasty—and their consequences for the school context.

Keywords: Autism, Diagnosis, Diagnostic Epidemic, Inclusive Education, Medicalization.

INTRODUCTION

Autism Spectrum Disorder (ASD) has received increasing attention in recent decades, both scientifically and socially. Amid the rapid transformations of contemporary reality, a substantial increase in the number of diagnoses worldwide has become observable within a short period, prompting discussions about a possible “diagnostic epidemic” (Almeida; Neves, 2020). This phenomenon has been shaped by changes introduced through the Diagnostic and Statistical Manual of Mental Disorders (DSM), particularly the DSM-5-TR, released in 2022.

In Brazil, this rapid increase in autism diagnoses is corroborated by data from the 2022 Demographic Census (IBGE, 2025) and the 2024 School Census (Brazil, 2025), which document substantial growth in the identification of individuals with autism, especially in educational settings.

Although this phenomenon has been attributed partly to scientific progress, improvements in diagnostic tools, and the expansion of classification criteria, it must be examined critically and on a sound evidentiary basis. Differential diagnosis is not always considered, and, at least in Brazil, a multidisciplinary diagnostic culture with clear protocols for conducting reliable differential diagnoses has yet to be consolidated.

The accelerating pace of diagnoses, particularly autism diagnoses, has posed substantial challenges to healthcare systems and, especially, to education. The inclusion of students with ASD in mainstream schools, as advocated by inclusive education policies, requires profound pedagogical adaptations and continuing teacher education (Oliveira, 2024). At the same time, it raises ethical questions about the medicalization of childhood and the risk of pathologizing behaviors that, in other historical or cultural contexts, would be recognized as legitimate expressions of human diversity (Vasconcelos; Costa, 2023). Behaviors previously viewed through a moral lens, such as laziness or stubbornness, are now also being pathologized and medicalized.

Against this backdrop, this article proposes an initial analysis of the phenomenon of the autism “diagnostic epidemic” and its effects on Brazilian education. To this end, we investigate the factors that we understand to have contributed to the increase in ASD diagnoses; discuss the implications for the education system; seek to identify the principal challenges faced by educators and institutions; and propose reflections on the need for policies that meet the needs of the autistic population without engaging in excessive pathologization.

The relevance of this study lies in the urgent need for a critical and well-founded understanding of the impact of increasing diagnoses on education, ensuring not only formal enrollment but also genuine learning conditions, respect for each individual’s uniqueness, and the development of a truly inclusive school system.

THEORETICAL FRAMEWORK

AUTISM SPECTRUM DISORDER: FROM DIAGNOSTIC CLASSIFICATION TO CONTEMPORARY PREVALENCE

ASD is officially defined by the DSM-5 as a neurodevelopmental condition characterized by persistent impairments in social communication and interaction, associated with restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2014).

Initially described by Leo Kanner in 1943 as a specific disorder, the definition of autism was progressively broadened until, in 2013, conditions previously treated separately were unified: Autistic Disorder, Asperger's Syndrome, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS). By placing these conditions under the concept of a spectrum, this nosological shift represented a decisive clinical and epidemiological turning point, substantially expanding the population eligible for diagnosis.

It is not difficult to consider revisions to diagnostic criteria as one of the principal drivers of the current statistical increase in the prevalence of ASD. Nor does doing so constitute an attack on diagnostic processes. Rather, it entails examining a phenomenon permeated by human interpretive decisions that have changed over time and may be understood differently in the future, after having affected an entire generation.

From an epidemiological perspective, the figures relevant to this discussion are striking. The first systematic study of autism, conducted by Lotter in England in 1966, found a prevalence of 4.5 cases per 10,000 children (Lotter, 1966 apud Almeida; Neves, 2020). Since then, global prevalence has increased approximately thirtyfold. The latest 2025 data from the United States Centers for Disease Control and Prevention (CDC) indicate that 1 in every 31 eight-year-old children has ASD, compared with 1 in 68 in 2014 (CDC, 2025 apud Instituto Pensi, 2026). In Brazil, the 2022 Demographic Census identified 2.4 million people diagnosed with autism, corresponding to 1.2% of the population, with the highest concentration among children aged five to nine (IBGE, 2025).

This dramatic growth raises several central questions: Does it represent a genuine increase in the incidence of the disorder, or is it an effect of changes in diagnostic criteria and identification systems? Could it also result from inaccurate or hasty diagnoses that will suddenly need to be structured to account for an entire spectrum? Almeida and Neves (2020) argue that all these processes coexist, but they caution against interpreting the phenomenon exclusively as scientific progress, emphasizing the need to consider

the social, institutional, and economic determinants that also produce it. This critical interpretation is central to the present article.

DIAGNOSTIC CRITERIA, NOSOLOGY, AND THE PROBLEM OF SPECTRUM EXPANSION AND THE MEDICALIZATION OF LIFE

We begin this section by affirming our understanding that the expansion of diagnostic categories in psychiatry is not a neutral phenomenon. Whitaker (2016), for example, demonstrates that contemporary psychiatry's progressive relaxation of nosological boundaries—illustrated particularly clearly by the history of attention-deficit/hyperactivity disorder (ADHD), but equally observable in ASD—has resulted in substantial growth in the number of diagnoses without evidence of an equivalent increase in the biological prevalence of these conditions.

This dynamic can be understood in light of the logic underlying revisions to diagnostic manuals. Each new edition of the DSM broadens the possibilities for diagnostic classification, lowers the required symptom thresholds, and incorporates clinical presentations that were previously excluded. The practical result is that individuals who would not have received any diagnosis in previous decades are now identified as belonging to the spectrum (Almeida; Neves, 2020), which helps explain the large number of late autism diagnoses among people who, until then, had simply been considered different. Although this development has enabled previously invisible segments of the population to access healthcare, it has also produced what Welch, Schwartz, and Woloshin (2008) call an “epidemic of diagnoses”: the reinterpretation of normal variations in behavior and development as symptoms of illness.

In the Brazilian context, the diagnostic issue takes on additional dimensions when one considers that legislation has linked formal diagnostic reports to access to rights and benefits, such as specialized pedagogical support under the Brazilian Inclusion Act (Law No. 13,146/2015) and exemptions from certain testing requirements in national assessments. This legal and institutional arrangement creates a structural incentive for the formalization of diagnoses that operates relatively independently of the

severity or clinical consistency of the condition presented (Christmann; Pavão, 2018). News reports, for example, frequently contain allegations involving people attempting to circumvent quota systems, falsify diagnoses, or even obtain diagnoses through personal arrangements with professionals of questionable ethics. This occurs because, in a certain sense and for certain individuals—rather than those who genuinely need affirmative-action policies—these rights appear to offer opportunities for privilege.

When the discussion of a “diagnostic epidemic” arises, we understand the term to emerge primarily from the debate over whether the increase in ASD records reflects a genuine rise in the incidence of the condition or is, at least partly, the result of other scientific, social, and institutional factors. Almeida and Neves (2020) propose that the phenomenon may be understood as a “false epidemic” because, as already noted, it may result from the interaction between increasingly broad psychiatric perspectives and social demands for nosological categories that account for behaviors regarded as deviant. In this context, the medicalization of childhood occupies a central position in both attention and analysis.

In examining this phenomenon, Welch, Schwartz, and Woloshin (2008) point to the appropriation, through pathologization and medicalization, of ordinary physical or psychological sensations that are now regarded as symptoms of illness, as previously noted. This phenomenon assumes even greater proportions in the school context: adjectives denoting moral judgments or behavioral characteristics, such as “mischievous,” “distracted,” or “restless,” are now analyzed and described—and are progressively being replaced—through medical terms such as “disorder,” “syndrome,” or “disturbance” (Vasconcelos; Costa, 2023).

Freitas (2014 apud Vasconcelos; Costa, 2023, p. 6) observes:

Increasingly, schools are identifying substantial numbers of children with a variety of diagnoses. Endorsed by medical discourse, these labels associate problems of contemporary life, such as sadness, fatigue, and restlessness, with health concepts such as depression, bipolar disorder, obsessive-compulsive disorder, and Attention-Deficit/Hyperactivity Disorder (ADHD), among others.

This tendency reflects a diagnostic culture in which the “deviant” individual is promptly labeled so that they may be “normalized.” Silva (2000) emphasizes that “to normalize means arbitrarily selecting a specific identity as the standard against which other identities are evaluated and ranked.” Autism diagnoses have therefore become part of everyday school life from both an administrative perspective, linked to access to resources and services, and a psychopedagogical perspective, which seeks to explain learning difficulties through biological accounts.

EXCESSIVE PSYCHODIAGNOSIS: ETHICAL DIMENSIONS OF PSYCHOLOGY

In this article, we align ourselves with the theorists and researchers who have denounced the increasing number of diagnoses that are sometimes made without the necessary clinical rigor and may even be motivated by institutional, commercial, or family pressures. In their study of this phenomenon in educational settings, for example, Vasconcelos and Costa (2023, p. 2) warn that “schools seem to have lost the sensitivity required to understand personal characteristics and now require a nosological process before taking action.” This erosion of the pedagogical capacity to embrace difference without resorting to medical reports—which is also evident in other social contexts—constitutes an ethical, educational, and social setback.

Christofari (2014) emphasizes that schools ultimately become major producers of labels for students. These labels affect subjectivities, alleviate anxieties, and explain failures in assessments. In the private sector, the pursuit of diagnosis may also be linked to institutional marketing strategies: schools under pressure to produce results resort to medical diagnoses as a way of assigning students responsibility for their own failure, thereby preserving the institution’s reputation.

Through Technical Note No. 23/2025, the Federal Council of Psychology (Conselho Federal de Psicologia—CFP) advises psychology professionals on the need for an ethical, technical, and multidisciplinary approach to the growing demand for ASD diagnosis and treatment. It reaffirms that psychodiagnosis should be an instrument of care rather than exclusion or labeling (CFP, 2025).

In the field of inclusive education, Oliveira (2024) systematizes the main challenges faced by Brazilian schools in integrating students with ASD: insufficient teacher education, the absence of specialized support, and the tendency to confuse formal inclusion, understood as enrollment, with genuine inclusion, understood as effective participation and meaningful learning.

Regarding the practice of psychology in the school setting, psychology professionals must therefore be guided by an understanding of why psychology exists and whom it serves: the individual and their well-being. It must never serve profit, personal advantage, the power to define others, or an attempt to impose and produce a single “normal” way of being for everyone.

METHODOLOGY

This study adopts a qualitative, exploratory approach, with documentary analysis as its principal method of data collection and interpretation. We selected this perspective because we recognize the multifaceted nature of the phenomenon under investigation, which encompasses scientific, social, political, and ethical dimensions that cannot be adequately captured by purely quantitative indicators (Minayo, 2014).

The exploratory nature of the research, in turn, allows us to map the state of knowledge on the subject, identify trends, and formulate hypotheses for future studies.

DOCUMENTARY ANALYSIS

By documentary analysis, we mean the systematic investigation of documents as primary or secondary sources of information about the object under study (Gil, 2021). For this article, the documentary corpus was organized into three categories: a) Official reports and documents: publications by government agencies and research institutions containing statistical data, epidemiological analyses, and guidelines concerning autism and inclusive education. Priority was given to documents published from 2022 onward, including data from the 2022 Demographic Census conducted by the Brazilian

Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística—IBGE), the 2024 School Census conducted by the Anísio Teixeira National Institute for Educational Studies and Research/Ministry of Education (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira/Ministério da Educação—INEP/MEC), the CDC (2025), and Technical Note No. 23/2025 issued by the CFP. b) Scientific articles: academic publications indexed in databases such as SciELO that discuss the evolution of autism diagnostic criteria, the prevalence of the condition, the challenges of educational inclusion, and the concept of a “diagnostic epidemic,” with an emphasis on critical perspectives concerning the medicalization of childhood. c) Reputable journalistic publications: reports and news articles published by major national media outlets between 2023 and 2026, presenting data, cases, and debates concerning the increase in ASD diagnoses in the school context.

ANALYTICAL PROCEDURES

For the analysis of the documents, we adopted a critical and interpretive stance guided by the principles of content analysis (Bardin, 2016). Following the author’s recommendations, the process involved three stages: (1) pre-analysis, including an initial, open-ended reading and selection of the corpus; (2) exploration of the material, involving the identification of emerging thematic categories; and (3) treatment and interpretation of the results, involving a comparison between the empirical data and the critical theoretical framework adopted. *The analytical categories developed were: ASD prevalence and epidemiology—epidemiological perceptions; factors explaining diagnostic growth; implications for inclusive education; and the risk of excessive psychodiagnosis and its consequences.*

We acknowledge as a limitation of this study that documentary analysis does not provide access to primary data produced directly with those involved in the educational process: teachers, families, students, and healthcare professionals. These perspectives will be addressed in future studies intended to complement this investigation through empirical ethnographic or action-research approaches.

DATA ANALYSIS AND DISCUSSION

THE GROWTH IN DIAGNOSES: AN EPIDEMIOLOGICAL PERSPECTIVE

We begin the presentation of these analyses by sharing, in greater detail, data concerning the increase in the number of autism diagnoses. These data point to a dramatic and consistent rise in ASD diagnoses in Brazil and worldwide. Internationally, the CDC (2025 apud Instituto Pensi, 2026) reported that 3.2% of eight-year-old children in the United States are identified as autistic, compared with 1.5% in 2014 and 2.8% in 2023. The agency interprets this increase of more than 100% over a decade as the combined result of expanded diagnostic criteria, greater access to assessment services, and growing awareness among families and healthcare professionals.

In Brazil, the 2022 Demographic Census (IBGE, 2025) identified 2.4 million people diagnosed with autism, corresponding to 1.2% of the Brazilian population. Prevalence is highest among children aged five to nine, at 2.6%, indicating a concentration of diagnoses in the age group in which children enter and become established in school. This is why we focus on the ways in which this institution operates.

As the first official nationwide data of their kind, these figures represent a historic advance for public policymaking in Brazil. They also point, however, to the urgent need for qualitative reflection on the processes that produce them, particularly when schools become the principal setting in which suspicions arise and referrals for diagnosis are made, despite the fact that these institutions lack the necessary expertise, especially in the absence of psychology professionals.

In the educational sphere, the 2024 School Census (Brazil, 2025) recorded a 44.4% increase in the enrollment of students with ASD in basic education compared with 2023 and a more than twentyfold increase over the previous decade. This does not necessarily indicate that students with ASD are only now gaining access to school. Rather, it appears that students who are already enrolled are being diagnosed, including in response to demands from educational institutions. The case of Campinas, São Paulo, is illustrative: the municipal school system recorded a 1,204% increase in the number of autistic students

between 2014 and 2024 (G1, 2025). Although part of this growth reflects genuine advances in screening and access to diagnosis, specialists caution that the pace of the increase raises questions about the consistency of the diagnostic processes currently in use (Metrópoles, 2026).

FACTORS EXPLAINING DIAGNOSTIC GROWTH

The documentary analysis enabled us to identify three interrelated, rather than mutually exclusive, categories of factors that explain the increase in ASD diagnoses.

The first category comprises scientific and nosological factors. As the concept of autism transitioned from classical autism to a broad spectrum—a shift consolidated by the DSM-5 (APA, 2014)—clinical profiles that had previously been classified under other categories or left undiagnosed were incorporated into the autism spectrum, indisputably increasing the number of diagnoses. Growing awareness among healthcare professionals and the development of standardized screening instruments, such as the Modified Checklist for Autism in Toddlers (M-CHAT), also contributed to the identification of cases that would previously have remained invisible to the system (Almeida; Neves, 2020).

The second category comprises social and institutional factors. Greater awareness of ASD among families and society, amplified by the dissemination of information through digital platforms, has led to increased demand for diagnostic assessments, especially among parents concerned about their children's behavior and persuaded that treatment initiated at an early age may produce greater developmental gains. At the same time, Brazilian legislation—particularly Law No. 12,764/2012, known as the Berenice Piana Law, and Law No. 13,977/2020, known as the Romeo Mion Law—has linked formal diagnosis to access to rights and benefits, thereby creating a structural incentive for diagnostic formalization irrespective of the severity of the clinical presentation.

Finally, there are institutional and pedagogical factors. Studies by Vasconcelos and Costa (2023) concerning everyday experiences of inclusion in the school environment indicate that schools transfer responsibility for difficulties that are often pedagogical, relational, or socioeconomic in nature to the

medical field. Demand for diagnostic reports grows as schools feel unprepared to address the heterogeneity of students and their different ways of learning without the support of clinical categorization. In addition, students' resistance or failure to engage with curricular proposals is frequently explained by invoking and naming disorders. This shifts responsibility onto students for what is often a shortcoming in the pedagogical practices offered to them. Christofari (2014) identified this phenomenon as the "production of labels," whose paradoxical effect is to alleviate institutional anxiety arising from the inability to achieve behavioral homogeneity and adjust ways of being to social and moral rules, ultimately producing new forms of exclusion.

IMPLICATIONS FOR INCLUSIVE EDUCATION

Our analysis of schooling data revealed an apparent contradiction: the school enrollment rate of the autistic population, at 36.9%, is higher than that of the general population, at 24.3%, and more than two-thirds of students with ASD attend elementary or lower secondary education [*ensino fundamental*] (IBGE, 2025). Although these figures appear positive at first, they do not necessarily reflect effective inclusion, because formal enrollment is a necessary but insufficient condition for ensuring meaningful learning and full participation.

Oliveira (2024) systematizes the principal challenges identified in studies of the inclusion of students with ASD in Brazil. The first is teacher education. Most teachers have not received adequate initial or continuing education to work with the diversity associated with ASD. The absence of a specific pedagogical repertoire therefore leads to the adoption of generic, improvised strategies that lack theoretical consistency and frequently fail to address students' individual needs.

The second challenge concerns curricular and methodological adaptation. Curricula and teaching practices must be made flexible enough to accommodate different learning styles and paces through visual resources, assistive technologies, and structured approaches that promote autonomy and active participation. Alongside the challenges involving initial and continuing teacher education, Brazil faces a

complex and often chaotic situation in the management of educational inclusion processes. This situation becomes increasingly strained as the number of diagnoses grows.

Oliveira (2024) identifies a third challenge: specialized support. The presence of classroom aides, support professionals, and multidisciplinary teams—including occupational therapists, speech-language pathologists, and psychologists—is a fundamental condition for effective inclusion, yet such support remains scarce in most public education systems. Some initiatives have emerged in Brazilian legislation, such as Law No. 13,935, which establishes the mandatory provision of psychologists and social workers in schools. In many municipalities, however, the requirement has been addressed through the creation of a centralized unit composed of a small number of professionals responsible for every school in the system.

According to Oliveira, the fourth challenge is late diagnosis, given that the average age of ASD diagnosis in Brazil is approximately eleven years (Metrópoles, 2026), considerably higher than in developed countries, where diagnosis often occurs before age three. This delay restricts access to early interventions, which are widely recognized as more effective in developing communication, social, and cognitive skills.

When we examine this set of challenges as they manifest in everyday life, we find that the school inclusion of students with ASD in Brazil faces a structural contradiction. On the one hand, the number of diagnoses is increasing rapidly, including both diagnoses that may be accurate and false-positive results, placing pressure on schools to receive growing numbers of students identified as being on the spectrum. On the other hand, the objective conditions required for effective inclusion remain inadequate and unequal. The expansion of enrollment without consistent investment in teacher education, curricular adaptation, specialized support, and early screening produces an inclusion that is, in many cases, more formal than genuine. In this context, late diagnosis further aggravates the situation: children who could benefit from early interventions reach school already at a disadvantage, while schools that are unprepared to receive them tend to respond by making further demands for diagnosis, thereby perpetuating the cycle of the diagnostic epidemic.

We may therefore affirm that this is not merely a problem of educational management, but an ethical and political crisis in Brazilian inclusion: individuals are formally included even though there is neither the willingness nor the capacity to include them in practice.

THE RISK OF EXCESSIVE PSYCHODIAGNOSIS AND ITS CONSEQUENCES

A critical analysis of the documents allows us to identify a central paradox in the phenomenon addressed in this article. Although an ASD diagnosis may serve as a gateway to rights, care, and essential resources, its excessive, inaccurate, or hasty use may produce iatrogenic effects on individual development, the formation of subjectivity, and pedagogical practices.

In schools, excessive psychodiagnosis operates as a mechanism for externalizing pedagogical and institutional contradictions. By this, we mean that when school failure is systematically attributed to students' individual deficits through psychiatric categories, schools exempt themselves from questioning their own practices, curricula, structural conditions, and political-pedagogical projects (Vasconcelos; Costa, 2023). Within this dynamic, the diagnostic report becomes an instrument for managing difference rather than embracing it.

CFP Technical Note No. 23/2025 (2025) reaffirms that psychodiagnosis must be an ethical, rigorous, and contextualized process and must never be reduced to rapid screening or an instrument for conforming individuals to the demands of schools or the market. The note further warns of the risk that diagnoses, once established, tend to become fixed identities that limit expectations regarding an individual's developmental potential. We may never speak of a formerly autistic person, although inaccurate diagnoses may exist—and, we would venture to say, do exist. This also entails serious consequences and presents an ethical challenge that must be addressed.

Silva (2000) offers a fundamental theoretical perspective for this discussion by demonstrating that processes of normalization in schools are constructed upon arbitrary standards and that the pathologization of difference ultimately serves to maintain the hegemony of certain ways of being,

learning, and relating at the expense of others. These perspectives converge on the need to reposition diagnosis not as a destiny or definitive explanation, but as a working hypothesis that guides care and learning practices. Such practices must always remain subordinate to respect for the irreducible uniqueness of each individual and arise from professional practice that is responsible, critical, and attentive to assumptions considered self-evident within psychodiagnosis.

CONCLUSION

In this article, we sought to analyze the phenomenon of the autism “diagnostic epidemic” and the challenges it poses for education in Brazil from a critical perspective grounded in documentary analysis. Based on our inquiry and our ethical and theoretical perspectives, we adopt the following positions.

First, we understand the increase in ASD diagnoses to be a genuine phenomenon documented by robust epidemiological data, although its interpretation requires analytical caution. Part of this growth reflects legitimate advances: broader access to diagnosis, refinement of screening instruments, greater social awareness, and the consolidation of legal frameworks linking formal diagnosis to access to rights. Another portion of this growth, however, appears to reflect insufficient preparedness for differential diagnosis, clinical hastiness, and, above all, the pathologization of difference, driven by institutional, pedagogical, and commercial pressures that transform medical reports into substitutes for more pluralistic and inclusive educational practices.

Second, we understand that the Brazilian education system faces a twofold challenge. It must ensure effective conditions for the inclusion of students diagnosed with ASD through teacher education, curricular adaptation, specialized support, and early diagnosis. At the same time, it must resist the tendency to transform every expression of behavioral diversity or learning difficulty into a disorder to be medicated or categorized. These two challenges are complementary rather than antagonistic: a school capable of embracing difference without depending on diagnostic reports is also better prepared to identify, when necessary, children who genuinely require specialized support. Educational and

pedagogical action does not reside in a diagnostic report, but in careful sensitivity to another person's way of being and individual characteristics.

Third, the data analyzed here lead us to believe that formal inclusion, as reflected in growing enrollment, does not automatically translate into genuine inclusion, and schools do not fulfill their social role merely by accepting these enrollments. A school enrollment rate above the national average conceals disparities in the quality of services, the availability of support, and the appropriateness of pedagogical practices. It is therefore important to affirm that public policies focused exclusively on access without investment in quality reproduce, in another form, the same logic of exclusion they seek to overcome.

Finally, we emphasize that overcoming excessive psychodiagnosis in the school context is urgent and requires a cultural transformation extending beyond rules and regulations. It requires rebuilding the school as a space in which uniqueness is recognized and difference is not treated as an obstacle to be corrected, but as a constitutive dimension of the educational act. Within this horizon, diagnosis, when rigorous, ethical, and contextualized, can be a powerful ally of inclusive education; when reduced to a label or an instrument of institutional management, it becomes an obstacle to full human development.

As a future research agenda, we will undertake empirical studies employing mixed methods to investigate, directly with teachers, families, and students, their perceptions of the diagnostic process and its effects on everyday pedagogical practices.

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CHILDREN'S RIGHT TO CHILDHOOD IN THE MAKING: CARE NETWORKS, PUBLIC POLICIES, AND SOCIAL SUPPORT IN RESPONSE TO THE SOCIAL IMPACT OF THE ECOLOGY OF SEXUAL VIOLENCE

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Abstract

This article analyzes the structure of public policies, care networks, and social support as mechanisms for guaranteeing the right to childhood in the face of the impacts generated by the ecology of sexual violence against children and adolescents in Brazil. It starts from the premise that childhood, although recognized as a fundamental human right by the 1988 Federal Constitution and the Statute of Children and Adolescents (Estatuto da Criança e do Adolescente—ECA), constitutes a condition that must be continuously constructed and protected by the State, family, and society. Through bibliographic and documentary research, using governmental, legal, and scientific sources, the study maps the articulation among health, social assistance, education, and justice (CRAS, CREAS, Guardianship Councils, schools, and hospitals) as a protection network; examines public policies such as the National Plan to Combat Sexual Violence against Children and Adolescents and Law No. 13,431/2017; and discusses sexual violence from the perspective of the ecological model of Bronfenbrenner and Belsky, which understands it as a phenomenon determined by multiple individual, family, community, and cultural factors. Data from *Disque 100*, UNICEF, and the Brazilian Public Security Forum reveal a scenario of underreporting and an increase in violations, highlighting weaknesses in the integration of the protection network. It is concluded that guaranteeing childhood depends simultaneously on strengthening public policies, specialized listening, and coordinated intersectoral action, with recommendations presented for improving the child and adolescent protection network.

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INTRODUCTION

Childhood, although frequently treated in common sense as a natural and spontaneous stage of life, constitutes, from a legal and social perspective, a right that must be constructed, guaranteed, and continuously reaffirmed by the State, family, and society. Article 227 of the 1988 Constitution of the Federative Republic of Brazil established the legal framework for this conception by determining that it is the duty of the family, society, and the State to ensure children and adolescents, with absolute priority, the right to life, health, food, education, leisure, dignity, and family and community life, safeguarding them from all forms of negligence, discrimination, exploitation, violence, cruelty, and oppression (Brasil, 1988). Two years later, Law No. 8,069, of July 13, 1990, known as the Statute of Children and Adolescents (ECA), regulated this constitutional provision and consolidated the doctrine of comprehensive protection within the Brazilian legal system (Brasil, 1990).

This doctrine breaks with the former conception of *minors* as objects of guardianship and recognizes children and adolescents as subjects of rights, recipients of absolute priority, and persons in a particular condition of development (Maia, 2010). This represents a paradigmatic shift that imposes on the State and society the responsibility to establish concrete protection mechanisms rather than merely formal declarations of rights. It is in this sense that childhood is understood as a *construction*: being born a child is not sufficient to experience childhood fully; rather, a network of institutions, laws, and social practices must sustain, in everyday life, the conditions of safety and healthy development established by law.

The guiding question of this study is: in what way does the articulation among public policies, care networks, and social support act as an effective mechanism for guaranteeing the right to childhood in

the face of the social impacts generated by the ecology of sexual violence against children and adolescents?

This effort to construct childhood is put to a particularly serious test in the face of sexual violence against children and adolescents. Data from the report *Panorama da Violência Letal e Sexual contra Crianças e Adolescentes no Brasil* [Overview of Lethal and Sexual Violence against Children and Adolescents in Brazil], produced by UNICEF in partnership with the Brazilian Public Security Forum, show that between 2021 and 2023 Brazil recorded a total of 164,199 cases of sexual violence against children and adolescents, following an upward trajectory: 46,863 cases in 2021, 53,906 in 2022, and 63,430 in 2023, equivalent to one child or adolescent victimized every fifteen minutes in the country (UNICEF; Fórum Brasileiro de Segurança Pública, 2024). In 2023, girls accounted for 87.1% of victims, and in 67.4% of cases the violence occurred within the victim's own residential environment (UNICEF; Fórum Brasileiro de Segurança Pública, 2024). Added to this is technology-facilitated sexual violence, which affected, in a single year, one in every five children and adolescents aged 12 to 17 in the country, approximately three million victims (UNICEF, 2023). It is also estimated that only 10% of cases of child sexual abuse and exploitation are actually reported to the competent authorities, revealing a significant situation of underreporting (Childhood Brasil, 2019).

The general objective of this research is to analyze the structure of public policies, care networks, and social support as mechanisms for guaranteeing the right to childhood in the face of the impacts generated by the ecology of sexual violence against children and adolescents. To achieve this purpose, the following specific objectives were defined: a) to understand the concept of childhood in the making and how sexual violations interrupt the full development of these fundamental rights; b) to map the articulation and functioning of the services that comprise care networks, including health, social assistance, education, and justice; c) to identify the role of public policies and community social support in the reception and rehabilitation of victims and their families; d) to investigate the variables that comprise the ecology of sexual violence, assessing its psychosocial and structural impacts on society.

Methodologically, this is a qualitative study of a bibliographic and documentary nature, based on primary legal sources (Federal Constitution, ECA, and related laws), government documents (Ministry of Health, Ministry of Human Rights and Citizenship, and National Council for the Rights of Children and Adolescents—CONANDA), reports from national and international organizations (UNICEF, Childhood Brasil, and Brazilian Public Security Forum), and scientific articles indexed in databases such as SciELO and PePSIC. To support the discussion, the theoretical framework is structured around four thematic axes: the first discusses the theoretical and legal foundations of comprehensive protection; the second maps care networks; the third analyzes public policies and social support; and the fourth develops the ecology of sexual violence and its impacts.

THEORETICAL FRAMEWORK

CHILDREN'S RIGHT TO CHILDHOOD IN THE MAKING: FOUNDATIONS OF COMPREHENSIVE PROTECTION

The contemporary conception of childhood as a right is relatively recent in Brazilian legal history. Prior to the 1988 Constitution of the Federative Republic of Brazil, the legislation then in force, the 1979 Minors Code, was guided by the so-called doctrine of irregular circumstances, according to which only children and adolescents in situations of abandonment, delinquency, or social risk were subject to state intervention, being treated as objects of guardianship rather than as subjects of rights (Maia, 2010). The rupture with this paradigm came with Article 227 of the 1988 Constitution of the Federative Republic of Brazil, which inaugurated the doctrine of comprehensive protection by assigning the family, society, and State the joint duty of guaranteeing, with absolute priority, the fundamental rights of all children and adolescents, without any distinction (Brasil, 1988).

The Statute of Children and Adolescents, in regulating this provision, defined a child as a person under twelve years of age and an adolescent as a person between twelve and eighteen years of age, guaranteeing them all fundamental rights inherent to the human person, as well as all opportunities and

facilities necessary for physical, mental, moral, spiritual, and social development under conditions of freedom and dignity (Brasil, 1990). The doctrine of comprehensive protection rests on three interdependent pillars: the recognition of children and adolescents as subjects of rights, who cease to be passive objects of intervention; absolute priority in the formulation and implementation of public policies directed toward this population; and respect for their particular condition as persons in development, which requires differentiated protection in relation to adults (Maia, 2010).

It is precisely this particular condition of persons in development that underlies the idea of *childhood in the making* presented in the title of this work. Childhood is not a self-evident biological fact, but a socially mediated experience that depends on objective conditions, such as safety, affection, food, health, education, and the absence of violence, in order to be fully realized. When these conditions are disrupted, as occurs in cases of sexual violence, the child does not merely suffer an isolated harm but experiences an interruption in the continuous biopsychosocial development process that characterizes the very notion of healthy childhood.

Studies on the effects of childhood sexual abuse confirm this interruption across multiple dimensions of development. An integrative literature review identified that children and adolescents victimized by sexual abuse experience psychological, physical, sexual, and social repercussions that tend to persist throughout life, including post-traumatic stress disorder, depression, anxiety, and socialization difficulties that may extend into adulthood (Cruz et al., 2021). Another study identified risk indicators and consequences of sexual abuse for child development, reinforcing that trauma compromises not only the victim's immediate mental health but also their cognitive, affective, and relational developmental trajectory (Borges; Dell'Aglia, 2008). These findings corroborate the thesis that sexual violence constitutes a direct violation of the right to childhood enshrined in Article 227 of the Federal Constitution (Brasil, 1988), insofar as it compromises precisely the conditions of *freedom and dignity* that the ECA establishes as parameters for full development (Brasil, 1990).

Therefore, guaranteeing comprehensive protection cannot be limited to the formal recognition of rights: it requires the creation of concrete institutional mechanisms capable of preventing violations, identifying risk situations at an early stage, and providing qualified support to victims. It is this institutional arrangement, described in the literature and official documents as a *protection network or care network*, that will be examined in the following section.

CARE NETWORKS: INTERSECTORAL ARTICULATION IN THE PROTECTION OF CHILDHOOD

The protection of children and adolescents against sexual violence is not the responsibility of a single body but requires coordinated action by different sectors, such as health, social assistance, education, public security, and justice, so that no stage of care (identification, reception, notification, treatment, and follow-up) remains the sole responsibility of a single institution. The Unified Social Assistance System (Sistema Único de Assistência Social—SUAS) organizes, within the territory, two central facilities of this network: the Social Assistance Reference Center (Centro de Referência de Assistência Social—CRAS), which operates within basic social protection, serving as the user's gateway to the social assistance network, with a focus on prevention and strengthening family and community ties; and the Specialized Social Assistance Reference Center (Centro de Referência Especializado de Assistência Social—CREAS), responsible for special social protection, serving families and individuals experiencing rights violations, such as violence, abandonment, neglect, and child labor, through the Specialized Protection and Assistance Service for Families and Individuals (Serviço de Proteção e Atendimento Especializado a Famílias e Indivíduos—PAEFI) (Picolini, [n.d.]; Brasil, 2011; Brasil, 2009).

The Guardianship Council, created by the ECA (Brasil, 1990) and regulated with the support of Law No. 8,242, of October 12, 1991, which also established the National Council for the Rights of Children and Adolescents (Conselho Nacional dos Direitos da Criança e do Adolescente—CONANDA), constitutes another essential link in this network. It is a permanent and autonomous, non-jurisdictional

body composed of five members chosen by the local community for a three-year term, with one reappointment permitted, responsible for ensuring compliance with the rights of children and adolescents established by the ECA (Brasil, 1990; Brasil, 1991). In everyday practice, the guardianship counselor works directly with schools, health units, hospitals, CRAS, CREAS, social organizations, police stations, and the Public Prosecutor's Office, functioning as a connecting node among the different services that comprise the network (Fundação Abrinq Pelos Direitos da Criança, 2025).

CONANDA, in turn, is responsible for establishing the general rules of the national policy for addressing the rights of children and adolescents, monitoring its implementation, managing the National Fund for Children and Adolescents (Fundo Nacional para a Criança e o Adolescente—FNCA), and coordinating cooperation between governmental and nongovernmental organizations (Brasil, 2018).

In the field of health, the Ministry of Health established, in 2010, the *Care Pathway for Comprehensive Health Care for Children, Adolescents, and Their Families Experiencing Violence* (Linha de Cuidado para a Atenção Integral à Saúde de Crianças, Adolescentes e suas Famílias em Situação de Violências), a document intended for managers and professionals that organizes the health system's response into four interconnected dimensions: reception, care, mandatory notification, and follow-up of the victim within the care and protection network (Brasil, 2010). Mandatory notification of suspected or confirmed cases of violence against children and adolescents is a central stage in this process, because it is through notification that the other services in the network, such as the Guardianship Council, CREAS, specialized police station, and Public Prosecutor's Office, become aware of the case and can act in a coordinated manner.

Within the justice system, Law No. 13,431, of April 4, 2017, in force since April 2018, represented a significant advance by establishing the System for Guaranteeing the Rights of Child and Adolescent Victims or Witnesses of Violence, creating mechanisms for prevention and response and establishing two central procedures: specialized listening, conducted by a body within the protection network without an investigative purpose and limited to the account strictly necessary for providing care

to the victim; and special testimony, collected before a police or judicial authority in a welcoming environment capable of reducing the child's exposure to multiple interviews (Brasil, 2017; Childhood Brasil, 2018). This distinction is fundamental because it addresses a problem historically identified in the legal literature: institutional revictimization. Studies on secondary victimization show that traditional forms of intervention by the justice system, in which children were repeatedly interviewed by different authorities for the purpose of gathering evidence, constituted a form of institutional violence that compounded the original trauma (Roque et al., 2014). By restricting, whenever possible, the child's testimony to a single procedural occasion, special testimony specifically seeks to prevent this duplication of suffering (Brasil, 2017).

The functioning of this network, however, depends on the quality of the articulation among its nodes. When communication among CRAS, CREAS, the Guardianship Council, schools, health units, and the justice system is fragmented, whether due to a lack of defined procedural flows, insufficient professional training, or scarce human and financial resources, the protection network begins to operate reactively and discontinuously rather than preventively and in an integrated manner, thereby compromising precisely the *mechanism* that should ensure the comprehensive protection established by law.

PUBLIC POLICIES AND SOCIAL SUPPORT: FROM POLICY TO PRACTICE

If the care network describes the institutional arrangement for service provision, public policies are the instrument through which this arrangement is planned, financed, and strategically guided at the national level. The principal public policy framework specifically aimed at addressing sexual violence against children and adolescents in Brazil is the National Plan to Combat Sexual Violence against Children and Adolescents (Plano Nacional de Enfrentamento da Violência Sexual Infantojuvenil—PNEVSCA). Originally formulated in June 2000, during a national meeting held in Natal (RN), and approved by CONANDA on July 12 of that year, the plan was revised and reapproved by CONANDA

Resolution No. 162, of January 28, 2014 (CONANDA, 2000). Although it does not derive from a specific law, its approval by CONANDA grants it legitimacy as a public policy, aligned with the rights enshrined in Article 227 of the 1988 Constitution of the Federative Republic of Brazil and in the Statute of Children and Adolescents (CONANDA, 2000). The plan serves as a methodological reference for structuring policies, programs, and services to address the issue throughout the national territory, guiding states and municipalities in organizing their own ten-year plans.

These normative frameworks, in turn, only translate into effective protection when associated with direct social support for victims and families. Social support, in this sense, encompasses both the psychological and material assistance provided by the State through CREAS, health units, and legal assistance services, and the community and emotional support mobilized by schools, civil society organizations, and neighborhood and family networks. Specialized literature indicates that family support and intervention by the social assistance network constitute protective factors capable of minimizing the emotional and behavioral effects of trauma suffered by children (Cruz et al., 2021), reinforcing the importance of policies that do not limit themselves to the criminal-legal response to the perpetrator but also invest in the psychosocial rehabilitation of the victim and the strengthening of protective family bonds.

Civil society organizations play a relevant role in this support. Childhood Brasil, for example, has worked for more than two decades to coordinate public authorities, the private sector, and civil society in the development of prevention methodologies, training of network professionals, and dissemination of data on the subject, having contributed to the formulation and dissemination of Law No. 13,431/2017 within the protection network (Childhood Brasil, 2018). Similarly, UNICEF, in partnership with the Brazilian Public Security Forum, produces periodic assessments, such as the aforementioned *Panorama da Violência Letal e Sexual contra Crianças e Adolescentes no Brasil* [Overview of Lethal and Sexual Violence against Children and Adolescents in Brazil], which support the design and monitoring of public

policies at the federal, state, and municipal levels (UNICEF; Fórum Brasileiro de Segurança Pública, 2024).

On the other hand, the effectiveness of these policies encounters important practical limitations. The most recent data from *Disque 100*, the reporting channel of the Ministry of Human Rights and Citizenship, reveal the scale of the challenge: in 2024, the service recorded 657,200 complaints across all forms of rights violations, an increase of 22.6% compared with 2023, with children and adolescents being the group most frequently reported as victims, with 289,400 complaints during the year, ahead of older persons (179,600) and women (111,600), and with the majority of violations occurring in the victim's or suspect's own residence, in 301,400 cases (Brasil, 2025). This increase in the number of complaints may reflect both a worsening of the problem and greater public confidence in official reporting channels; in any event, it demonstrates growing pressure on a protection network whose response capacity does not always keep pace, in terms of human and budgetary resources, with the magnitude of demand. Added to this is the aforementioned underreporting: only approximately 10% of cases of child sexual abuse and exploitation come to the attention of the authorities (Childhood Brasil, 2019), indicating that the situation revealed by official statistics represents only a fraction of the sexual violence actually perpetrated against children and adolescents in the country.

THE ECOLOGY OF SEXUAL VIOLENCE: RISK FACTORS AND PSYCHOSOCIAL IMPACTS

Understanding sexual violence against children as an ecological phenomenon means moving away from an explanation that reduces it to an isolated act committed by a deviant individual and instead analyzing it as the result of interactions among multiple levels of the environment in which the child is situated. This approach originates in the bioecological theory of human development formulated by Urie Bronfenbrenner, which describes the developmental environment as a series of concentric structures, including the microsystem, mesosystem, exosystem, and macrosystem, which interact with one another and collectively influence the course of child development (Bronfenbrenner, 1979 as cited in Zillmer et

al., 2011). In later formulations, the author also incorporated the dimensions of process, person, context, and time, in what is known as the PPCT model, reinforcing that human development results from the continuous mutual accommodation between the developing individual and the changing properties of the contexts in which they live (Zillmer et al., 2011).

Belsky (1980) proposed a model for understanding violence against children as a phenomenon determined by multiple factors—individual, family, community, and cultural forces—integrating previously divergent explanations that emphasized, at different times, psychological disorders among perpetrators, characteristics of the children themselves, dysfunctional patterns of family interaction, social forces inducing stress, or cultural values that tolerate or normalize violence. This model remains central to contemporary literature on the subject because it makes it possible to understand why child sexual violence is not randomly distributed throughout society but is concentrated in contexts marked by specific structural vulnerabilities.

At the macrosystem level, Brazilian literature has identified the so-called *culture of silence* as a structural factor that is decisive in maintaining and rendering invisible sexual violence against children. Neto, Rezende, and Carvalho (2021) analyze child sexual abuse through the intersections of machismo, racism, and adultcentrism, arguing that these three axes of inequality—gender, race, and age—combine to hinder both the prevention and reporting of violence, especially when the perpetrator is a member of the child’s own family or circle of trust. This analysis directly corresponds with the data already presented: the fact that 87.1% of victims are girls and that 67.4% of violence occurs in residential environments (UNICEF; Fórum Brasileiro de Segurança Pública, 2024) is not accidental but reflects asymmetrical power relations based on gender, generation, and, often, socioeconomic status, which are reproduced at the level of the family microsystem and tolerated or normalized at the level of the cultural macrosystem.

At the mesosystem and exosystem levels, the weakness or fragmentation of the protection network described in the previous section—such as the absence of clear channels between schools, health services, social assistance, and justice, the insufficient number of professionals trained to identify signs of violence,

and the lack of safe channels through which children can be heard—also operates as a risk factor insofar as it delays the identification of cases and prolongs the victim’s exposure to the situation of violence. Thus, the ecological model makes it possible to understand the care network and public policies discussed in the previous sections not merely as responses to violence that has already occurred, but as protective factors capable of acting preventively at multiple levels of the child’s environment.

Regarding psychosocial impacts, the scientific literature consistently points to profound and lasting consequences. In addition to the aforementioned post-traumatic stress disorder, depression, anxiety, and socialization difficulties (Cruz et al., 2021), studies on risk indicators in child development identify impairments in the capacity for emotional attachment, emotional regulation, and school performance, as well as greater vulnerability to self-destructive behaviors and revictimization throughout life when the child does not receive adequate support and treatment (Borges; Dell’Aglío, 2008). At the broader social level, *Panorama da Violência Letal e Sexual contra Crianças e Adolescentes no Brasil* [Overview of Lethal and Sexual Violence against Children and Adolescents in Brazil] demonstrates that these individual impacts add up to a collective cost: every case of sexual violence that is not adequately addressed also represents a loss to the country’s social development insofar as it compromises the educational, occupational, and relational trajectory of a significant portion of the child and adolescent population (UNICEF; Fórum Brasileiro de Segurança Pública, 2024). In this sense, the ecology of sexual violence is not merely an explanatory model but also a call to action: if violence is multidetermined, its prevention and response must likewise operate simultaneously at all levels of the child’s environment—family, institutional, and cultural.

METHODOLOGY

The present study is characterized as qualitative research developed through bibliographic and documentary methods, with the objective of analyzing children’s rights to childhood in the making, care

networks, public policies, and social support in response to the impacts of sexual violence against children and adolescents.

Regarding its objectives, the research is descriptive and analytical in nature, seeking to understand the normative and institutional structure for the protection of childhood, as well as to examine the integrated action of public policies and the protection network in addressing sexual violence against children and adolescents.

With regard to technical procedures, bibliographic research was conducted based on books, scientific articles, specialized periodicals, and other academic works related to the subject. According to Gil (2002), bibliographic research is developed on the basis of previously prepared material, consisting mainly of books and scientific articles. Likewise, Lakatos and Marconi (2003) emphasize that bibliographic research enables researchers to become familiar with the principal studies previously conducted on the object under investigation, thereby making it possible to construct the theoretical framework of the research.

With regard to methodological aspects, this article employed bibliographic research. Thus, it is characterized as:

[...] Developed from previously published material, consisting mainly of: books, magazines, journal publications and scientific articles, newspapers, bulletins, monographs, dissertations, theses, cartographic material, the internet, with the purpose of placing the researcher in direct contact with all material already written on the subject of the research. In bibliographic research, it is important for the researcher to verify the reliability of the data obtained, observing possible inconsistencies or contradictions that the works may present (Prodanov; Freitas, 2013, p. 54).

Gil (2002) points out that bibliographic research is developed on the basis of previously prepared material, consisting mainly of books and scientific articles. Lakatos and Marconi (2003) state that bibliographic research constitutes a general survey of the principal works already conducted, which are important because they are capable of providing current and relevant data related to the subject.

Documentary research was also employed through the analysis of official documents, legislation, and data produced by public bodies and national and international organizations.

Gil (2002) explains that it uses materials that have not yet undergone analytical treatment or that may still be reworked according to the objectives of the research. It is also descriptive research whose primary objective is to describe the characteristics of a given population or phenomenon or, alternatively, to establish relationships between variables, as Gil (2002) emphasizes.

Among other sources, the 1988 Constitution of the Federative Republic of Brazil, the Statute of Children and Adolescents (Brasil, 1990), Law No. 13,431/2017, documents from the Ministry of Health, the Ministry of Human Rights and Citizenship, and the National Council for the Rights of Children and Adolescents (CONANDA), as well as reports prepared by UNICEF, Childhood Brasil, and the Brazilian Public Security Forum, were examined because they constitute important instruments for understanding the phenomenon under study.

The qualitative approach proved appropriate for the development of the study because it enabled a critical interpretation of legal norms, public policies, and specialized literature, allowing sexual violence against children and adolescents to be understood as a complex and multidimensional phenomenon, as well as identifying the importance of coordinated action by the protection network for the realization of the fundamental rights of childhood.

Finally, data analysis was based on a critical interpretation of the sources consulted, seeking to establish relationships among the theoretical framework, current legislation, public policies, and the evidence presented in the scientific literature in order to respond to the objectives proposed in this research.

RESULTS AND DISCUSSION

Analysis of the scientific literature, legislation, and official documents made it possible to identify that the realization of the right to childhood depends on integrated action among public policies, the

protection network, and social support. Although the Brazilian legal system has a solid body of legislation aimed at the comprehensive protection of children and adolescents, it was found that the practical implementation of these guarantees still faces significant structural and institutional challenges (Brasil, 1988; Brasil, 1990; CONANDA, 2000).

The results demonstrated that the 1988 Federal Constitution and the Statute of Children and Adolescents consolidated a new protection paradigm by recognizing children and adolescents as subjects of rights and recipients of absolute priority (Brasil, 1988; Brasil, 1990; Maia, 2010). However, the research demonstrated that the existence of legal norms alone does not ensure the realization of these rights, making coordinated action among the State, family, and society indispensable (Maia, 2010).

Within the sphere of public policies, it was observed that instruments such as Law No. 13,431/2017, the National Plan to Combat Sexual Violence against Children and Adolescents, and the guidelines of the Unified Social Assistance System represent important advances in the organization of the service network (Brasil, 2017; CONANDA, 2000; Brasil, 2010). Nevertheless, the literature consulted demonstrates that difficulties persist concerning integration among services, insufficient specialized human resources, regional inequalities in service provision, and the absence of uniform operational protocols (Childhood Brasil, 2018; Fundação Abrinq Pelos Direitos da Criança, 2025).

Another relevant aspect identified concerns the functioning of the intersectoral protection network. The research demonstrated that bodies such as CRAS, CREAS, Guardianship Councils, health units, schools, the Public Prosecutor's Office, and the Judiciary perform complementary and indispensable functions in receiving victims (Brasil, 1990; Brasil, 2017; Brasil, 2010). However, when there is no efficient communication among these institutions, care becomes fragmented, favoring delays in the identification of situations of violence, difficulties in monitoring victims, and, in many cases, institutional revictimization (Roque et al., 2014).

The documents analyzed also demonstrate that child sexual violence has complex and multidetermined characteristics, as explained by the ecological model of Bronfenbrenner and Belsky

(Belsky, 1980; Zillmer et al., 2011). In this context, individual, family, community, and sociocultural factors were found to interact simultaneously to facilitate the occurrence of violence, reinforcing the need for public policies that go beyond an exclusively repressive response and encompass preventive and educational actions and the strengthening of family and community bonds (Neto; Rezende; Carvalho, 2021).

Statistical data released by national and international organizations also reveal a concerning scenario of increasing reports of sexual violence against children and adolescents while simultaneously indicating high rates of underreporting (UNICEF; Fórum Brasileiro de Segurança Pública, 2024; Brasil, 2025; Childhood Brasil, 2019). This scenario demonstrates that official figures probably represent only part of the reality, indicating the persistence of obstacles related to fear of reporting, victims' dependence on perpetrators, and the so-called culture of silence, especially when violence occurs within the family environment (Neto; Rezende; Carvalho, 2021).

The literature also converges regarding the consequences of sexual violence for child development. Psychological, emotional, cognitive, and social impacts were identified that may persist throughout life, compromising victims' school performance, interpersonal relationships, mental health, and biopsychosocial development (Cruz et al., 2021; Borges; Dell'Aglia, 2008). These findings reinforce that comprehensive protection is not limited to holding the perpetrator accountable, requiring psychological care, social follow-up, and permanent prevention policies (Brasil, 2017; Cruz et al., 2021).

Thus, the research findings confirm that guaranteeing the right to childhood depends on effective coordination among legislation, public policies, and intersectoral action by the protection network (Brasil, 1988; Brasil, 1990; Brasil, 2017). It was found that strengthening communication among the responsible bodies, providing continuous professional training, investing in specialized services, and expanding prevention strategies are essential measures for reducing the incidence of sexual violence and ensuring the effectiveness of the fundamental rights of children and adolescents (Brasil, 2010; CONANDA, 2000; Childhood Brasil, 2018).

Accordingly, the findings corroborate the understanding that childhood should be understood as a permanent social and legal construction whose preservation requires an ongoing commitment from the State and society (Maia, 2010; Brasil, 1988). Thus, rather than merely expanding normative production, it is necessary to invest in the effective implementation of existing public policies, the integration of the protection network, and the promotion of a culture of prevention, support, and respect for the rights of children and adolescents (CONANDA, 2000; UNICEF; Fórum Brasileiro de Segurança Pública, 2024).

FINAL CONSIDERATIONS

This article analyzed the structure of public policies, care networks, and social support as mechanisms for guaranteeing the right to childhood in the face of the impacts of the ecology of sexual violence against children and adolescents in Brazil. The results of the bibliographic and documentary research confirm that childhood, as enshrined in the 1988 Federal Constitution and the Statute of Children and Adolescents, is a right that requires permanent construction: formal recognition of its holders' rights is not sufficient; coordinated action by a complex set of institutions, including health, social assistance, education, the Guardianship Council, and the justice system, is necessary for the comprehensive protection established by law to become effective protection in the concrete life of each child.

Analysis of the care network revealed a robust institutional architecture at the normative level, with CRAS, CREAS, the Guardianship Council, CONANDA, the Ministry of Health's care pathway, and the System for Guaranteeing Rights established by Law No. 13,431/2017, but it also identified risks of fragmentation when communication among these services is not properly managed and continuously monitored. The discussion of public policies and social support, in turn, showed that instruments such as the National Plan to Combat Sexual Violence against Children and Adolescents offer important methodological guidelines, but their effectiveness depends on sustained investment, continuous professional training, and coordination with organized civil society, as exemplified by the work of organizations such as Childhood Brasil and UNICEF.

The investigation of the ecology of sexual violence, grounded in the models of Bronfenbrenner and Belsky, made it possible to understand violence not as an isolated act but as a phenomenon determined by multiple factors, including individual, family, community, and cultural factors, among which the culture of silence stands out, intersected by inequalities of gender, race, and generation. The data analyzed, originating from *Disque 100*, UNICEF, and the Brazilian Public Security Forum, reveal a significant increase in the number of complaints and recorded cases between 2021 and 2024, associated with a concerning situation of underreporting, which reinforces the urgency of more effective and sustained interventions over time.

Based on these findings, the following are recommended: a) strengthening informational integration among CRAS, CREAS, the Guardianship Council, schools, health units, and the justice system through standardized intersectoral protocols and shared information systems in order to reduce the fragmentation currently observed; b) expanding continuous training for teachers and health and social assistance professionals to enable the early identification of signs of sexual violence, especially in residential environments, where most cases are concentrated; c) expanding the implementation of specialized listening and special testimony provided for under Law No. 13,431/2017 in all Brazilian municipalities, in order to reduce institutional revictimization of victims; d) investing in campaigns to confront the culture of silence, using an intersectional approach that considers gender, race, and power relations between adults and children; e) strengthening continuous psychosocial support for victims and families beyond the criminal-legal response to the perpetrator, recognizing rehabilitation as an inseparable component of comprehensive protection.

In view of all the foregoing, it is concluded that guaranteeing the right to childhood in the face of sexual violence does not result from any isolated measure but from the quality of coordination among norms, institutions, and care practices: a mechanism that, in order to function, depends both on the commitment of the State and on the active involvement of civil society and the communities in which children live.

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THE TEACHER AS A MEDIATOR OF DIGITAL INFORMATION: ESSENTIAL COMPETENCIES FOR THE 21ST CENTURY

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Abstract

This study analyzes the role of teachers as mediators of digital information and identifies the competencies required for teaching in the twenty-first century. It is a bibliographic study with a qualitative, exploratory, and descriptive approach, structured as a narrative review using thematic analysis. The final corpus comprised 12 academic publications, regulatory documents, and institutional frameworks published between 2017 and 2026, as well as a work published in 2011, which was retained because of its foundational relevance to the integration of technology and curriculum. The analysis was organized into four categories: digital competence and pedagogical integration; curation, media literacy, and the fight against misinformation; ethics, digital citizenship, and artificial intelligence; and teacher education, infrastructure, and inequalities in access. The results demonstrate that digital mediation is not limited to the technical mastery of tools, as it also involves selecting and contextualizing content,

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assessing the credibility of sources, guiding the ethical use of technologies, protecting data, and organizing learning experiences that promote authorship, critical thinking, and autonomy. Limitations related to initial and continuing teacher education, school infrastructure, and differences in access to and appropriation of technologies were also identified. It is concluded that strengthening teachers' digital competencies depends on the articulation between professional development, institutional conditions, and educational policies capable of supporting critical, inclusive, and socially responsible practices.

Keywords: Digital culture, Information mediation, Media literacy, Teacher education, Teachers' digital competence.

INTRODUCTION

Contemporary society is characterized by profound technological transformations that have redefined forms of communication, knowledge production, social interaction, and access to information. The expansion of the Internet, social media, digital platforms, and, more recently, artificial intelligence has significantly broadened opportunities for learning and social participation. Conversely, this context has intensified challenges related to information overload, misinformation, privacy, and the need to develop competencies for critically evaluating content circulating in digital environments.

In this context, the role of the teacher has also been redefined. Although teaching has historically been associated with the transmission of knowledge, the widespread availability of information has shifted the teacher's function toward mediating learning processes. Students access content on different platforms even before entering the classroom, requiring teachers to possess the competencies needed to guide the selection, interpretation, contextualization, and critical use of information. Digital information mediation has therefore become an essential dimension of contemporary pedagogical practice.

The relevance of this debate is heightened by the increasing circulation of fake news, manipulated content, and information produced without verification criteria. These phenomena reinforce the need to develop media and information literacy practices aimed at promoting critical thinking and civic

participation. At the same time, the incorporation of digital technologies into Brazilian educational policies, particularly through the Brazilian National Common Core Curriculum (Base Nacional Comum Curricular, or BNCC) (Brasil, 2018) and the National Digital Education Policy (Política Nacional de Educação Digital) (Brasil, 2023), demonstrates that teacher education must encompass competencies related to the pedagogical, critical, ethical, and responsible use of technologies.

Moreover, the rapid expansion of artificial intelligence introduces new challenges to teaching, requiring teachers to understand not only the pedagogical potential of these tools, but also issues concerning authorship, information reliability, data protection, transparency, and the ethical implications arising from their use in educational processes. In view of this context, the following guiding question is proposed: what competencies are required for teachers to effectively perform the role of mediators of digital information in the 21st century?

The general objective of this study is to analyze the role of teachers as mediators of digital information and identify the competencies required for teaching in contemporary society. Specifically, it seeks to understand the concept of digital information mediation; examine frameworks addressing teachers' digital competence; discuss issues related to information curation, media literacy, citizenship, and digital ethics; and analyze challenges associated with professional education, infrastructure, and inequalities in access to technologies.

The relevance of this research lies in the need to understand how digital transformation redefines teaching practices and expands the responsibilities assigned to teachers. By systematizing national and international frameworks on teachers' digital competencies, the study aims to contribute to strengthening pedagogical practices capable of promoting critical thinking, intellectual autonomy, and civic participation in a society increasingly shaped by digital information.

THEORETICAL FRAMEWORK

The integration of digital technologies into education should not be understood as the mere incorporation of tools into everyday school life, but as a process of reorganizing pedagogical practices and forms of knowledge production. From this perspective, Almeida and Valente (2011) argue that technology and curriculum must constitute inseparable dimensions of educational planning, linking inquiry, authorship, problem-solving, and the collaborative construction of knowledge. This approach shifts the focus away from the technological resource itself and toward the pedagogical intentionality guiding its use, assigning teachers a decisive role in mediating learning.

Moreira and Schlemmer (2020) broaden this understanding by proposing the concept of onlife digital education, grounded in overcoming the dichotomy between physical and digital environments. According to the authors, contemporary educational experiences take place in hybrid ecosystems in which different spaces, languages, and technologies are continuously interconnected. From this perspective, the use of technologies ceases to be merely instrumental and instead requires methodologies capable of fostering interaction, collaboration, authorship, problem-solving, and students' active participation. These frameworks therefore converge in recognizing that the quality of digital education depends less on the availability of technological resources than on the pedagogical ability to integrate them into educational objectives.

This paradigm shift is supported by the concept of teachers' digital competence. According to Redecker (2017), the European Framework for the Digital Competence of Educators (DigCompEdu) organizes this competence into six areas and 22 interrelated competencies, ranging from professional engagement to the development of students' digital competencies. The model demonstrates that operational mastery of technology is only one dimension of teachers' competence, which also encompasses lesson planning, assessment, accessibility, professional collaboration, and critical reflection on the educational use of technology. Digital competence is therefore understood as an integrated set of knowledge, skills, and attitudes essential to addressing the demands of contemporary education.

In the Brazilian context, Araripe and Lins (2020) reinforce this conception by arguing that initial teacher education should provide practical experiences in integrating technologies into teaching and learning processes, thereby moving beyond models focused exclusively on technical training. The authors emphasize that competencies related to digital security, ethics, critical information analysis, collaboration, inclusion, and professional development must constitute structural elements of teacher education. Consistent with this perspective, the Framework of Teachers' Digital Knowledge (Referencial de Saberes Digitais Docentes) (Brasil, 2024) systematizes the knowledge and practices required for pedagogical planning, assessment, instructional mediation, and the responsible use of digital technologies. Although developed in different contexts, both frameworks converge in recognizing that the development of digital competence depends on the integration of pedagogical knowledge, technological proficiency, and critical reflection on the social, cultural, and ethical implications of digital culture.

Digital information mediation is intrinsically related to the development of media and information literacy, understood as an indispensable condition for educating citizens who are capable of critically interpreting the information flows characteristic of digital society. According to UNESCO (2021a), this perspective extends beyond access to information and encompasses competencies for locating, selecting, evaluating, producing, and sharing content ethically, critically, and in a socially responsible manner. Under this conception, teachers and students no longer occupy merely passive positions as consumers of information, but instead assume active roles in constructing knowledge, developing the ability to recognize interests, identify evidence, analyze representations, and understand the contexts in which messages are produced.

In the school environment, these competencies can be developed through practices that encourage comparisons among different sources, verification of evidence, analysis of authorship, identification of persuasive strategies, and critical examination of the processes through which information circulates. Rather than merely teaching students to identify fake news, media literacy seeks to foster a critical understanding of how information ecosystems operate, recognizing that digital platforms, search engines,

and social media use algorithms that influence content visibility and may contribute to the formation of information bubbles. In this regard, teacher mediation plays a strategic role by promoting inquiry and reflection processes that enable students to develop their own criteria for interpreting information and making evidence-based decisions.

In the Brazilian context, this perspective is supported by the Brazilian National Common Core Curriculum, which includes digital culture among the general competencies of Basic Education and calls for the critical, meaningful, reflective, and ethical use of digital technologies (Brasil, 2018). In addition, the National Digital Education Policy broadens this understanding by establishing guidelines addressing digital literacy, content production, communication, security, problem-solving, and digital inclusion (Brasil, 2023). National and international frameworks therefore converge in recognizing that education for digital citizenship is not limited to technical mastery of technology, but instead requires the development of cognitive, ethical, and social competencies that enable responsible participation in digital environments.

This understanding becomes even more relevant in light of the expansion of artificial intelligence and the increasing automation of content production and dissemination. In addition to traditional concerns involving privacy, copyright, security, and interaction in digital environments, new challenges have emerged in relation to algorithmic bias, system transparency, the explainability of automated decisions, and the reliability of information generated by generative artificial intelligence tools. In response to this context, UNESCO (2024) proposes an international competency framework for teachers based on five complementary dimensions: a human-centered mindset, ethics of artificial intelligence, artificial intelligence foundations and applications, artificial intelligence pedagogy, and artificial intelligence for professional learning. This framework demonstrates that incorporating artificial intelligence into education should strengthen, rather than replace, teachers' professional judgment while preserving intellectual autonomy and the central role of pedagogical practice.

However, the development of these competencies does not occur independently of actual working conditions. The experience of emergency remote teaching demonstrated that merely providing equipment and connectivity does not guarantee innovative or high-quality pedagogical practices. Arruda (2020) shows that the difficulties faced during the pandemic resulted from a combination of structural inequalities, inadequate technological infrastructure, and limitations in teacher education. Similar findings are reported in the 2024 ICT in Education Survey (Pesquisa TIC Educação 2024), which identifies significant differences among Brazilian schools in terms of Internet access, equipment availability, teacher education, and the pedagogical appropriation of technologies (Brazilian Internet Steering Committee, 2025). These findings demonstrate that strengthening digital competence depends both on professional development and on public policies capable of ensuring appropriate institutional conditions for integrating technologies into educational processes.

From this perspective, teacher education must be understood as an ongoing, collaborative, and context-sensitive process capable of keeping pace with rapid technological and social transformations. The report *Reimagining Our Futures Together* reinforces that strengthening the teaching profession is essential to addressing the challenges of contemporary education, advocating the appreciation of collective work, professional autonomy, and education as a public good (UNESCO, 2021b). In conjunction with the frameworks discussed above, this understanding supports the conclusion that teachers' digital competence results from the integration of pedagogical knowledge, curricular expertise, digital culture, ethical reflection, and the ability to adapt to technological change. Digital information mediation is thus consolidated as a complex competence whose effectiveness depends simultaneously on teacher education, institutional conditions, and educational policies committed to critical, inclusive, and socially responsible education.

METHODOLOGY

This study is characterized as basic research adopting a qualitative approach and pursuing exploratory-descriptive objectives. Regarding its technical procedures, bibliographic and documentary research was conducted in the form of a narrative review using thematic analysis. This methodological strategy proved appropriate because it enabled the integration of scientific studies, regulatory documents, and institutional frameworks, allowing the different dimensions of digital information mediation in educational contexts to be understood interpretively.

The bibliographic search was completed in July 2026 and encompassed databases and repositories recognized for their academic and institutional relevance, including the Ministry of Education (MEC), the Federal Government Legislation Portal, UNESCO, the European Commission's Joint Research Centre, the Center for Innovation in Brazilian Education (Centro de Inovação para a Educação Brasileira, or CIEB), Cetic.br, Revista UFG, and EmRede. The search strategy used descriptors in Portuguese and English, both separately and in combination, including: *mediação da informação digital*, *competência digital docente*, *educação midiática*, *desinformação*, *cidadania digital*, *formação de professores*, *digital competence of educators*, *media and information literacy* and *AI competency framework for teachers*.

Inclusion and exclusion criteria were established to ensure the consistency of the documentary corpus. Publications were included when they were directly related to the research problem, had identifiable authorship or institutional responsibility, provided access to the full text, were relevant to the defined analytical categories, and had preferably been published between 2017 and 2026. As an exception, the work by Almeida and Valente (2011) was retained because of its recognized theoretical contribution to understanding the integration of digital technologies and curriculum. Duplicate documents, news reports, opinion pieces lacking scientific grounding, materials without identifiable authorship or responsible institutions, and publications focusing exclusively on the technical operation of technologies without addressing their pedagogical dimension were excluded.

The sources were selected in three successive stages. First, titles and bibliographic information were reviewed to determine their relevance to the topic under investigation. In the second stage, abstracts, institutional presentations, and publication objectives were analyzed. Finally, the documents considered relevant to the study's objectives were read in full. At the end of this process, the analytical corpus consisted of 12 publications considered central to the investigation, as presented in Table 1. As this was a narrative review, the objective was not to exhaust all available scientific literature, but to select references capable of supporting a critical and integrated analysis of the topic.

To systematize the analysis, an analytical form was created for each selected document, covering the following elements: bibliographic reference, type of publication, research problem, conception of teachers' digital competence, responsibilities assigned to teachers, identified challenges, and contributions to media literacy and digital citizenship. Comparing these forms made it possible to identify convergences, complementarities, and specific features among empirical studies, international frameworks, regulatory documents, and national studies, thereby supporting an integrated interpretation of the literature.

The thematic analysis was organized into four previously defined analytical categories: **(a)** teachers' digital competence and pedagogical integration; **(b)** curation, media literacy, and the fight against misinformation; **(c)** ethics, digital citizenship, and artificial intelligence; and **(d)** teacher education, infrastructure, and inequalities in access. These categories guided the interpretation of the data and the discussion of the results, making it possible to relate the theoretical frameworks to the actual conditions of Brazilian education and identify convergences and gaps in the literature.

Table 1*Documentary corpus used in the analysis*

Source	Type	Central focus	Contribution to the analysis
Almeida and Valente (2011)	Book	Integration of technology and curriculum	Provides a foundation for pedagogical mediation and the alignment of digital information and communication technologies with curricular objectives.
Redecker (2017)	European framework	Educators' digital competence	Organizes areas and competencies related to professional practice, resources, teaching, assessment, and students.
Brasil (2018)	Regulatory document	Digital culture in Basic Education	Establishes the critical, meaningful, reflective, and ethical use of technology as a general competence.
Arruda (2020)	Scholarly article	Emergency remote teaching	Reveals weaknesses in infrastructure, access, and teacher preparation in digital contexts.
Araripe and Lins (2020)	Technical study	Digital competencies in initial teacher education	Advocates practical, ethical, critical, inclusive education integrated into the curricula of teacher education programs.
Moreira and Schlemmer (2020)	Scholarly article	Onlife digital education	Challenges the instrumental use of platforms and emphasizes the integration of physical and digital environments.
UNESCO (2021a)	Curriculum and competency framework	Media and information literacy	Provides guidance on source analysis, combating misinformation, responsible production, and civic participation.
UNESCO (2021b)	International report	Futures of education	Values the teaching profession, cooperation, and education as a public good and collective commitment.
Brasil (2023)	Federal legislation	National Digital Education Policy	Establishes guidelines for inclusion, literacy, capacity-building, and digital education in schools.
Brasil (2024)	National framework	Teachers' digital knowledge	Systematizes pedagogical, professional, ethical, and inclusive knowledge for the use of technology.
UNESCO (2024)	International framework	Teachers' competencies in artificial intelligence	Integrates a human-centered perspective, ethics, artificial intelligence foundations, pedagogy, and professional learning.
CGI.br (2025)	National survey	Use of technology in Brazilian schools	Presents evidence concerning access, infrastructure, professional education, and the pedagogical appropriation of technology.

Source: Prepared by the authors (2026).

Because this was bibliographic and documentary research conducted exclusively using publicly available documents and without the direct participation of human subjects, submission to a Research Ethics Committee was not required, in accordance with applicable Brazilian regulations. The principles of research integrity were observed throughout all stages of the investigation through the proper identification of the sources consulted, verification of bibliographic information, and use of documents from recognized institutions and journals.

RESULTS AND DISCUSSION

DIGITAL COMPETENCE AND PEDAGOGICAL INTEGRATION

The analysis of the corpus reveals a consensus among the examined frameworks that teachers' digital competence cannot be reduced to operational mastery of technology. The studies converge in indicating that pedagogical mediation is the element that gives digital resources educational meaning, shifting the focus away from the use of tools and toward the instructional intentionality guiding their incorporation into the curriculum.

In this regard, Almeida and Valente (2011) argue that the integration of technology and curriculum should foster processes of inquiry, authorship, and knowledge construction, while Moreira and Schlemmer (2020) broaden this understanding by asserting that digital education takes place in hybrid ecosystems in which face-to-face and digital practices are continuously interconnected. Although grounded in different frameworks, both works converge in rejecting models centered on the mere digitization of traditional teaching practices, emphasizing that pedagogical innovation depends on reorganizing learning strategies and promoting student agency.

This understanding is also reflected in the digital competency frameworks analyzed. DigCompEdu (Redecker, 2017) and the Framework of Teachers' Digital Knowledge (Brasil, 2024) present structures organized into different dimensions encompassing pedagogical planning, assessment, resource selection, inclusion, collaboration, professional development, and the ethical use of technology. Despite the specific

features of each document, there is a high degree of convergence regarding the multidimensional nature of teachers' digital competence, demonstrating that its development requires the integration of technological, pedagogical, and curricular knowledge.

Another recurring aspect of the literature concerns the need to move beyond exclusively instrumental models of teacher education. Araripe and Lins (2020) argue that initial teacher education should provide practical experiences in integrating technology into teaching and learning processes, allowing future teachers to develop competencies related to problem-solving, critical reflection, inclusion, and digital ethics. This perspective is corroborated by both national and international frameworks, indicating that professional development must be continuous, context-sensitive, and aligned with the actual demands of teaching practice.

The findings support the conclusion that technical mastery remains necessary but is insufficient for effective digital mediation. Teachers' competence is demonstrated through their ability to critically select resources, align them with curricular objectives, consider student characteristics, ensure accessibility, promote active participation, and use technology ethically and responsibly. The literature analyzed thus rejects technicist conceptions of educational innovation and reinforces the understanding that the quality of pedagogical practices depends primarily on teachers' ability to transform digital resources into meaningful learning experiences.

This convergence among national studies, international frameworks, and regulatory documents demonstrates that teachers' digital competence should be understood as an ongoing process of professional development sustained by the integration of education, critical reflection, and pedagogical intentionality. This finding reinforces the conclusion that the digital transformation of education does not result from the mere incorporation of new technologies, but from the institutional and professional capacity to integrate them critically, inclusively, and in pedagogically meaningful ways.

CURATION, MEDIA LITERACY, AND THE FIGHT AGAINST MISINFORMATION

The analysis of the literature reveals that information curation constitutes one of the most relevant competencies for teacher mediation in digital culture. The examined frameworks converge in indicating that the contemporary educational challenge lies not in a scarcity of information, but in the ability to select, interpret, validate, and contextualize content produced in digital environments characterized by speed, information overload, and the increasing circulation of misinformation. In this context, teachers' role shifts from transmitting content to developing criteria that enable students to critically assess the quality and reliability of the information they access.

This understanding is strongly supported by UNESCO's Media and Information Literacy Curriculum (2021a), which defines media literacy as a set of competencies related to locating, evaluating, interpreting, producing, and responsibly sharing information. However, the analysis of the sources demonstrates that these competencies extend beyond technical verification procedures and also involve understanding the interests, representations, and discursive strategies present in digital communication. Practices such as analyzing authorship, identifying evidence, comparing sources, recognizing the context of production, and evaluating communicative purposes thus become structural components of critical learning.

Another recurring aspect concerns the functioning of digital information ecosystems. The studies analyzed indicate that digital platforms, social media, and search engines organize the circulation of information through algorithms and commercial criteria that users often do not understand. This dynamic influences content visibility, contributes to the formation of information bubbles, and increases exposure to partial or decontextualized information. The literature therefore indicates that teacher mediation should foster an understanding of these processes, encouraging students to question not only whether information is truthful, but also the mechanisms responsible for its circulation and dissemination.

Brazilian regulatory documents reinforce this perspective by incorporating media literacy as an ongoing dimension of school education. The Brazilian National Common Core Curriculum establishes

that technology should be used critically, meaningfully, reflectively, and ethically (Brasil, 2018), while the National Digital Education Policy broadens this understanding by including digital literacy, communication, content production, security, and problem-solving among the structural pillars of school-based digital education (Brasil, 2023). In addition, the Framework of Teachers' Digital Knowledge (Brasil, 2024) assigns teachers the responsibility of selecting reliable resources, providing guidance on safe practices, and promoting the ethical use of digital information.

A comparison of these documents reveals a high degree of convergence regarding the understanding that combating misinformation should not be an isolated action or one restricted to specific situations within the curriculum. Instead, the frameworks analyzed advocate its incorporation as a cross-cutting competence integrated into different fields of knowledge and everyday pedagogical practices. This perspective broadens the concept of media literacy, shifting it away from the mere identification of fake news and toward educating individuals who are capable of researching, interpreting, arguing, and participating critically in digital environments.

The findings therefore support the conclusion that information curation represents a strategic competence for teaching in the 21st century. Rather than merely teaching students how to locate content, teachers assume responsibility for guiding continuous processes of critical analysis, evidence selection, argument construction, and ethical information use. Digital information mediation thus strengthens not only school learning, but also the education of citizens capable of acting autonomously, responsibly, and critically in a society increasingly structured by digital information flows.

ETHICS, DIGITAL CITIZENSHIP, AND ARTIFICIAL INTELLIGENCE

The analysis of the corpus demonstrates that ethics and digital citizenship are inseparable dimensions of teachers' digital competence. The frameworks analyzed converge in recognizing that the educational use of technology extends beyond operational matters and involves responsibilities related to data protection, copyright, privacy, interaction in digital environments, and the critical exercise of

citizenship. In this context, teacher mediation plays a strategic role in promoting reflection on the social, cultural, and legal impacts arising from the use of digital technologies in educational processes.

In the Brazilian context, the Brazilian National Common Core Curriculum calls for students to use digital technologies critically, meaningfully, reflectively, and ethically (Brasil, 2018), while the National Digital Education Policy incorporates security, digital literacy, and the conscious use of technology as structural pillars of public educational policies (Brasil, 2023). In line with these guidelines, the Framework of Teachers' Digital Knowledge (Brasil, 2024) broadens the understanding of digital competence by including issues related to ethical responsibility, data protection, inclusion, and evidence-based decision-making in pedagogical planning. Brazilian documents therefore converge in assigning teachers responsibility for educating students who are capable of participating critically and responsibly in digital culture.

The rapid expansion of artificial intelligence significantly increases these demands. The AI Competency Framework for Teachers (UNESCO, 2024) proposes a set of competencies organized into five dimensions: a human-centered mindset, ethics of artificial intelligence, artificial intelligence foundations and applications, artificial intelligence pedagogy, and artificial intelligence for professional learning. This organization demonstrates that incorporating artificial intelligence into education must preserve teacher autonomy, transparency, accountability, and human agency. The document emphasizes that the pedagogical potential of these technologies depends on teachers' ability to understand their limitations, recognize potential algorithmic biases, and use their outputs critically and contextually.

This perspective is reinforced by recent studies from the Organisation for Economic Co-operation and Development (OECD), which argue that artificial intelligence literacy should develop the knowledge, skills, and attitudes required to understand how intelligent systems operate, critically evaluate their outputs, and use them ethically and responsibly (OECD, 2023). According to this framework, the development of artificial intelligence competence is not intended to replace human cognitive processes,

but to strengthen capabilities such as critical thinking, problem-solving, creativity, and evidence-based decision-making.

In addition, the OECD Digital Education Outlook emphasizes that integrating artificial intelligence into education systems requires policies ensuring algorithmic transparency, data protection, equity, human oversight, and the continuous professional development of teachers (OECD, 2023). The report stresses that automated decisions cannot replace pedagogical judgment because educational processes involve ethical, affective, and contextual dimensions that extend beyond the capabilities of computational systems.

A comparison of these frameworks reveals broad convergence around the understanding that artificial intelligence should be regarded as a resource supporting teachers' work rather than as a substitute for pedagogical mediation. The literature analyzed demonstrates that outputs generated by artificial intelligence systems must be continually verified, compared with reliable sources, and contextualized within students' realities. Moreover, it is essential to discuss authorship, information reliability, the use of personal data, model biases, and the social implications arising from the use of these technologies.

The findings therefore support the conclusion that teachers remain the primary reference for developing ethical criteria governing the use of artificial intelligence. Their role extends beyond teaching students how to use digital tools and consists of developing students' competencies to critically analyze automated content, evaluate evidence, recognize technological limitations, and understand that knowledge production remains a human, collaborative, and socially situated process. Ethics, digital citizenship, and artificial intelligence thus constitute complementary dimensions of the same teaching competence, whose effectiveness depends on the integration of professional education, critical reflection, and a commitment to democratic, inclusive, and socially responsible education.

TEACHER EDUCATION, INFRASTRUCTURE, AND INEQUALITIES

The analysis of the literature demonstrates that the development of teachers' digital competence does not depend exclusively on teachers' individual efforts, but on the coordination of education, institutional conditions, and public policies aimed at the digital transformation of education. The studies examined converge in showing that the pedagogical integration of technology requires ongoing investment in infrastructure, connectivity, professional development, and educational management, rejecting the assumption that innovation results solely from acquiring equipment or making digital platforms available.

The experience of emergency remote teaching during the COVID-19 pandemic made these limitations particularly evident. Arruda (2020) demonstrates that the rapid reorganization of pedagogical practices exposed inequalities in access to technology, teacher education, and working conditions, revealing structural weaknesses within education systems. The findings analyzed indicate that the incorporation of digital technologies depended significantly more on institutions' capacity to provide pedagogical and technical support than on teachers' individual initiative.

This evidence is corroborated by data from the 2024 ICT in Education Survey, which reveal substantial differences among Brazilian schools in terms of Internet connection quality, equipment availability, access to digital resources, and opportunities for continuing education (Brazilian Internet Steering Committee, 2025). The survey demonstrates that digital inequality remains a limiting factor in implementing innovative pedagogical practices, producing different effects across education systems, regions, and socioeconomic contexts. The literature analyzed therefore reinforces the conclusion that teachers' digital competence must be understood in close relation to the objective working conditions provided by educational institutions.

In the field of professional education, there is broad convergence among national and international frameworks. Araripe and Lins (2020) argue that initial teacher education should incorporate technology across the curriculum, providing preservice teachers with practical experience in planning, content

production, active methodologies, collaboration, and the critical analysis of digital resources. Similarly, the Framework of Teachers' Digital Knowledge (Brasil, 2024) proposes continuous professional development pathways aligned with the actual needs of pedagogical practice, moving beyond isolated training models or those focused exclusively on learning the operational use of tools.

This perspective is also reinforced by UNESCO (2021b), which argues that strengthening the teaching profession is indispensable to addressing the challenges posed by technological and social transformations. The report *Reimagining Our Futures Together* emphasizes that valuing teachers' work depends on building collaborative environments, ensuring professional autonomy, sharing experiences, and consolidating education as a public good. Similarly, the OECD Digital Education Outlook emphasizes that sustainable digital transformation policies require simultaneous investment in infrastructure, governance, professional development, and the continuous monitoring of pedagogical practices, thereby preventing responsibility for innovation from being placed exclusively on teachers (OECD, 2023).

The findings also demonstrate that consolidating digital mediation depends on building an institutional culture that supports pedagogical innovation. The literature shows that schools that promote collective planning, in-service education, exchanges of experience among teachers, and the establishment of protocols for the ethical use of technology tend to demonstrate a greater capacity to incorporate digital resources critically and consistently. The development of digital competencies thus ceases to be understood as an individual responsibility and becomes part of the institution's pedagogical plan.

In view of this context, the analysis supports the conclusion that teacher education policies disconnected from actual conditions of infrastructure, connectivity, technical support, and educational management have limited reach. Teachers' digital competence results from the interaction of professional development, institutional conditions, and public policies committed to reducing educational inequalities. The digital transformation of education therefore requires a systemic approach in which education,

infrastructure, pedagogical leadership, and the professional recognition of teachers constitute inseparable dimensions for promoting inclusive, critical, and socially responsible educational practices.

SYNTHESIS OF THE REQUIRED COMPETENCIES

A comparison of the sources makes it possible to identify five groups of competencies required of teachers who mediate digital information. The first encompasses pedagogical competencies, such as planning, selecting resources, assessing learning, and promoting authorship. The second comprises information and media competencies related to searching for, verifying, and contextualizing sources. The third corresponds to ethical and civic competencies, including privacy, security, copyright, and respectful interaction. The fourth encompasses critical competencies for understanding platforms, algorithms, and artificial intelligence. The fifth involves continuous professional development and collaboration. This synthesis results from the convergence among Redecker (2017), UNESCO (2021a; 2024), and Brasil (2024).

The findings also demonstrate that these competencies are interdependent. Content curation, for example, requires information competence, curricular knowledge, and ethical responsibility. The use of artificial intelligence requires a basic technical understanding, critical evaluation, and pedagogical clarity. Digital inclusion depends on accessible resources, knowledge of students' needs, and appropriate institutional conditions. The literature analyzed thus rejects any conception of digital competence based solely on operational ability (Almeida; Valente, 2011; Araripe; Lins, 2020; Moreira; Schlemmer, 2020).

In summary, teachers occupy a strategic position in the information society because they help students transform disparate content into knowledge that has been analyzed, contextualized, and used in a socially responsible manner. The mediating role does not seek to control the entire flow of information, an impossible task given the speed of digital networks, but to develop criteria that enable students to learn how to research, compare, argue, produce, and participate consciously. This role is aligned with the

guidelines of the BNCC, the National Digital Education Policy, and international frameworks on teachers' competence (Brasil, 2018; Brasil, 2023; UNESCO, 2024).

CONCLUSION

This research has shown that the teacher's role as a mediator of digital information constitutes a strategic dimension of contemporary teaching in view of the transformations brought about by digital culture and the increasing incorporation of artificial intelligence into educational processes. Broader access to information does not diminish the importance of teacher mediation. On the contrary, it reinforces the need for professionals who are capable of guiding the selection, interpretation, validation, contextualization, and ethical production of knowledge in increasingly complex digital environments.

The analysis of the literature demonstrated that teachers' digital competence extends beyond the instrumental mastery of technology and constitutes an integrated set of pedagogical, information, media, communication, ethical, and critical competencies. The national and international frameworks analyzed converge in recognizing that the educational use of technology must be subordinate to pedagogical objectives, inclusion, digital citizenship, the critical evaluation of information, and the development of students' intellectual autonomy.

The findings also demonstrated that strengthening these competencies depends on ongoing initial and continuing teacher education aligned with teachers' actual working conditions. Factors such as technological infrastructure, connectivity, technical support, planning time, school management, and public policies for professional development proved decisive in ensuring that the digital transformation of education occurs equitably and with pedagogical consistency, thereby preventing structural inequalities from compromising learning opportunities.

Regarding artificial intelligence, the literature analyzed indicates that its incorporation into educational contexts expands the possibilities for pedagogical innovation, but also requires greater attention to issues concerning authorship, transparency, privacy, data protection, algorithmic bias, and the

reliability of generated information. In this context, teacher mediation remains indispensable for contextualizing the use of these technologies, developing critical thinking, and ensuring that pedagogical decisions continue to be grounded in ethical principles and the centrality of human agency.

As a scientific contribution, this study systematizes and integrates national and international frameworks on teachers' digital competence, media literacy, digital citizenship, and artificial intelligence, demonstrating the complementarity among these fields and proposing a broader understanding of digital information mediation as a complex pedagogical competence. This synthesis provides a theoretical foundation for future research and may guide teacher education processes, the development of educational policies, and pedagogical practices aimed at critical and inclusive digital education.

A limitation of this study is its adoption of a narrative review based on a previously delimited documentary corpus, which does not encompass all available scientific literature on the topic. Future studies should conduct systematic reviews and empirical research involving different educational contexts, focusing particularly on the development of teachers' digital competencies, information curation practices, media literacy, and the effects of artificial intelligence on teaching and learning processes.

The study therefore concludes that strengthening teachers' digital competencies is indispensable to consolidating an education capable of promoting critical thinking, intellectual autonomy, civic participation, and the ethical use of technology. In a society characterized by an abundance of information and the increasing automation of knowledge production, teachers remain essential agents in transforming information into knowledge, technology into learning, and innovation into human and social development.

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**EDUCATING ALSO MEANS CARING: MENTAL HEALTH AND SOCIOEMOTIONAL
COMPETENCIES AT SCHOOL**

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Abstract

The mental health of children and adolescents has become an increasingly prominent issue in everyday school life, manifesting itself in relationships, learning processes, social interaction, and students' forms of participation. In this context, schools can play an important role in promoting well-being, strengthening bonds, and developing socioemotional competencies without assuming clinical functions that exceed their educational responsibilities. This chapter aims to analyze the contributions and limitations of school practices focused on promoting mental health and developing socioemotional competencies, considering supportive care, prevention, pedagogical relationships, and the necessary coordination among Education, Health, families, and the protection network. Methodologically, this is a qualitative, analytical-interpretive bibliographic study grounded in authors from the fields of Education, Psychology, and Collective Health, as well as three selected academic studies: Oliveira et al. (2024), Brantes and Gondim (2025), and Aguiar (2025). The analysis is based on the understanding that emotional awareness, self-regulation, empathy, communication, and conflict resolution can contribute to learning and social interaction at school. It cautions, however, that these competencies should not be used to hold students individually responsible for suffering produced by inequalities, violence, or adverse institutional conditions. It concludes that educating also means caring when schools create environments of belonging, dialogue, and protection, recognize the limits of teachers' professional roles, and establish intersectoral networks capable of appropriately addressing students' needs.

Keywords: Care, Human development, Mental health, School, Socioemotional competencies.

INTRODUCTION

School is a place of learning, but it is also an environment of social interaction in which children and adolescents form bonds, confront conflicts, develop ways of understanding themselves, and learn how to participate in collective life. Emotions, feelings, and interpersonal relationships do not remain outside the classroom; they permeate attention, motivation, communication, and opportunities for

learning. For this reason, education entails recognizing students in their entirety and acknowledging that intellectual development occurs in conjunction with social, emotional, cultural, and family experiences. The assertion that educating also means caring does not reduce the school to a social assistance setting. Rather, it recognizes that no educational practice can be truly humane when suffering, fear, exclusion, or a lack of belonging is ignored.

Mental health in the school context cannot be understood merely as the absence of disorders or as an individual responsibility assigned to students. The emotional manifestations observed at school are related to several factors, including family relationships, socioeconomic conditions, experiences of violence, prejudice, isolation, learning difficulties, and the functioning of institutions themselves. Oliveira et al. (2024) emphasize that mental health promotion practices in schools can yield significant results, but their implementation requires coordination between the Education and Health sectors, particularly among educational institutions, Primary Health Care, and psychosocial care services. This perspective prevents complex difficulties from being treated as personal weaknesses or automatically referred for diagnosis and medicalization.

Within this debate, socioemotional competencies have gained increasing prominence in educational policies, curricula, and practices. They encompass resources related to the perception and expression of emotions, self-regulation, empathy, social interaction, cooperation, and responsible decision-making. In the systematic review conducted by Brantes and Gondim (2025), 66 studies published between 2010 and 2019 were analyzed, with emotional regulation, emotion perception, and social interaction emerging as the most frequently addressed competencies. The authors also identified conceptual, methodological, and terminological diversity across the studies, demonstrating that the field still encompasses different ways of defining, developing, and assessing these competencies. Their incorporation into school practices therefore requires a sound theoretical foundation and caution so that they are not presented as fixed characteristics or universal standards of behavior.

Socioemotional development can help students recognize their emotions, express their needs, build respectful relationships, and seek help when facing difficult situations. Teaching self-regulation, resilience, or adaptation, however, must not mean preparing children and adolescents to endure violent, competitive, or exclusionary environments in silence. An approach committed to care must consider both individual resources and the collective conditions that produce well-being or suffering. It must also prevent teachers from being placed in the role of psychologists, therapists, or the sole individuals responsible for students' mental health. Schools are responsible for welcoming, observing, engaging in dialogue, developing preventive practices, and making responsible referrals, whereas situations requiring assessment or treatment must be addressed by specialized professionals and services.

The need for shared action is supported by the School Health Program (Programa Saúde na Escola—PSE), which was established as an intersectoral policy involving the Health and Education sectors. The program provides that initiatives directed toward students should be developed through networks of shared responsibility linking schools, Primary Health Care, and other local services. This integration seeks to overcome isolated interventions and promote prevention, care, and comprehensive support while preserving the specific responsibilities of each sector. In the field of socioemotional competencies, Aguiar's dissertation (2025) adds a practical dimension by developing a school-based health promotion program and demonstrating that planned interventions can foster emotional expression, communication, and social interaction when they are connected to the real needs of the school community.

Against this background, this chapter aims to analyze the contributions and limitations of school practices designed to promote mental health and develop socioemotional competencies, seeking to determine how schools can care for students without individualizing their suffering or assigning clinical responsibilities to teachers. In addition to this introduction, the chapter is organized into four sections. The first discusses the relationships among education, care, mental health, and socioemotional development in the school context. The next presents the methodological approach adopted to select and

analyze the academic studies. Subsequently, the findings of Oliveira et al. (2024), Brantes and Gondim (2025), and Aguiar (2025) are brought into dialogue to identify the possibilities, limitations, and challenges of practices implemented in schools. Finally, the concluding remarks revisit the main arguments and advocate preventive, collective, and intersectoral action.

EDUCATING ALSO MEANS CARING: MENTAL HEALTH AND SOCIOEMOTIONAL COMPETENCIES

Recognizing that education also entails care does not mean replacing the school's pedagogical function with clinical or social assistance activities. Care is manifested in the concrete conditions that enable students to learn, participate, and interact with dignity: being heard, feeling safe, finding support when facing difficulties, and establishing relationships grounded in respect. Teaching academic content and caring for relationships are not opposing tasks, because all learning takes place in a human environment permeated by expectations, affection, conflicts, fears, and experiences of belonging.

For a long time, educational tradition treated reason and emotion as separate dimensions. Cognition was associated with intellectual work, whereas feelings were viewed as interferences that should remain outside the classroom. The contributions of Wallon and Vygotsky help overcome this dualistic understanding by demonstrating that affectivity, thought, and development are constituted through social relationships. Leite and Tassoni (2002) summarize this perspective by stating that thought and feeling merge, making it no longer possible to analyze these dimensions in isolation (Leite; Tassoni, 2002, p. 113).

Under this understanding, affectivity is not limited to expressions of affection, praise, or physical closeness. It involves how students are affected by pedagogical decisions, forms of communication, assessments, and the expectations formed about them. The way a teacher presents an activity, responds to an error, or welcomes a question can bring a student closer to knowledge or create insecurity and disengagement. Leite and Tassoni (2002, p. 114) argue that “affection is indispensable to the activity of

teaching,” precisely because relationships with objects of knowledge are also mediated by students’ experiences with their teachers.

In Wallon’s work, affectivity plays a part in shaping identity and in children’s access to the symbolic universe. Cognition, emotion, and movement alternate in predominance throughout development, but remain integrated. Vygotsky, in turn, criticizes the separation of thought and feeling, emphasizing that psychological processes develop through cultural and social interactions. These contributions demonstrate that the emotional dimension is not additional content to be artificially inserted into the curriculum. It is already present in relationships, teaching practices, methods of assessment, and experiences of success or failure constructed in everyday school life.

Paulo Freire (1996) also provides important foundations for a pedagogy of care by advocating an educational practice based on dialogue, respect for autonomy, and recognition of students as subjects. For Freire, the necessary seriousness of teaching does not exclude affectivity. On the contrary, a commitment to learning requires a willingness to listen, engage in dialogue, and build relationships in which authority is not confused with authoritarianism. Caring, therefore, does not mean lowering pedagogical expectations, avoiding conflicts, or accepting any behavior. It means establishing conditions in which rules, responsibilities, and knowledge can be constructed through respectful relationships.

This understanding is particularly relevant when discussing mental health at school. The term should not be used solely to designate diagnosed disorders or classify students according to behaviors considered inappropriate. Mental health relates to individuals’ ability to establish bonds, participate in social life, cope with adversity, express needs, and find support. It is also shaped by economic, family, cultural, territorial, and institutional conditions, which may function as protective factors or intensify experiences of suffering.

Schools occupy a complex position in this process. Because children and adolescents spend a significant portion of their lives there, schools can identify behavioral changes, isolation, sudden declines in performance, frequent conflicts, or manifestations of suffering. At the same time, certain school

practices can produce or exacerbate distress, particularly when humiliation, discrimination, bullying, excessive competition, violence, silencing, or exclusion are present. Promoting mental health therefore requires institutions not only to observe individuals, but also to examine the quality of the relationships and experiences they provide.

This perspective moves away from an interpretation in which suffering is invariably regarded as the result of personal weakness, lack of effort, or an inability to adapt. A student displaying anxiety, irritability, or lack of motivation may be reacting to different situations that must be understood cautiously. This does not mean denying the existence of mental disorders or dispensing with specialized assessments when necessary. It means avoiding hasty conclusions and recognizing that similar behaviors may have different origins and meanings.

At this point, the critique of medicalization becomes indispensable. Meira (2012) uses this concept to describe the relocation of social, political, and educational problems into a predominantly medical framework: the process through which problems that are part of individuals' everyday lives are transferred into the medical field (Meira, 2012, p. 136).

When learning difficulties, conflicts, or restless behaviors are automatically interpreted as symptoms of illness, pedagogical practices, institutional relationships, and social conditions cease to be investigated. Responsibility for the problem then becomes concentrated on the student and the student's body. Meira (2012) does not propose denying biological foundations or rejecting necessary treatments; rather, she questions the transformation of complex phenomena into exclusively individual problems.

The contributions of Maria Helena Souza Patto, Maria Aparecida Affonso Moysés, and Cecília Azevedo Lima Collares also help explain how school failure may be attributed to a student's presumed inability, thereby concealing inequalities and limitations within the educational system itself. This logic tends to transform differences in learning pace, pedagogical difficulties, or reactions to living conditions into individual deficiencies. A care policy must break with this practice of assigning blame without failing

to recognize that some students genuinely require psychological, psychiatric, or other specialized professional support.

When confronted with situations of suffering, schools are responsible for welcoming students, documenting the situation, communicating with parents or guardians when necessary, developing pedagogical strategies, and activating the protection network. Teachers are not responsible for diagnosing, prescribing treatment, or providing psychotherapy. Maurice Tardif (2014) reminds us that teaching is composed of specific forms of professional knowledge related to instruction, the curriculum, experience, and an understanding of students. Expanding teachers' responsibilities without providing training, adequate working conditions, and institutional support can lead to overload and reinforce the mistaken idea that they must single-handedly resolve problems whose complexity extends beyond the classroom.

Brazilian legislation itself recognizes the need for multidisciplinary teams. Law No. 13,935/2019 stipulates that public Basic Education systems must have Psychology and Social Work services guided by educational needs and coordinated with the political-pedagogical project (*projeto político-pedagógico*—PPP). The law provides that these teams should work to improve teaching and learning processes, with community participation and attention to social and institutional relationships. This is an educational and collective form of action, not an attempt to establish clinical offices within schools.

In addition to providing support and coordinating with specialized professionals, schools can develop initiatives focused on socioemotional competencies. Brantes and Gondim (2025) understand these competencies as an articulation among knowledge, skills, attitudes, and motivations mobilized in emotional and social situations. Their systematic review identified a greater prevalence of studies on emotional regulation, emotion perception, and social interaction, as well as associations with well-being, academic performance, and relationship quality.

Competencies that can be developed include recognizing one's own emotions, communication, empathy, cooperation, conflict resolution, responsible decision-making, and the ability to ask for help. This development does not occur only through specific activities about feelings. It takes place in

discussion circles, collective projects, sports activities, literature, problem-solving, and real situations of social interaction. The way an institution addresses a conflict may teach more about dialogue and respect than an isolated activity on empathy.

Brantes and Gondim (2025) also show that the field is conceptually diverse. Socioemotional competencies, emotional intelligence, social skills, and social and emotional learning are related concepts, but they are not entirely equivalent. This multiplicity requires care in designing pedagogical proposals and cautions against adopting ready-made programs as though they could be applied identically to all schools and students. Context, age group, cultural relationships, and community needs must be considered.

Further caution is required regarding how self-regulation and resilience are presented. Learning to recognize emotions and develop coping strategies can increase students' autonomy. These competencies, however, must not be used to teach students to tolerate inequalities, prejudice, or violence in silence. It is not enough to advise students to control their anxiety when the school environment remains marked by humiliation, disproportionate demands, or an absence of attentive listening. Interventions must address both personal development and the transformation of collective conditions.

Empathy cannot be reduced to an individual willingness to understand others. It must be linked to responsibility, respect, and the construction of fair relationships. Likewise, conflict resolution does not mean requiring students to reach an agreement quickly while ignoring unequal power relationships. In cases of bullying, discrimination, or violence, schools must protect those involved, stop the aggression, and assume institutional responsibility rather than treating the situation merely as a communication difficulty between individuals.

Socioemotional programs can help systematize objectives, activities, and forms of monitoring, provided they are integrated into the curriculum and the political-pedagogical project. They should not constitute a set of decontextualized exercises or a subject intended to teach standardized behaviors. A coherent intervention must involve teachers, consider students' voices, and engage with real situations in

the community. It must also be continuously assessed by examining not only individual changes but also its effects on social interaction, participation, and the sense of belonging.

Promoting mental health also requires an intersectoral approach. Schools, families, Primary Health Care, psychosocial care services, social assistance services, and protection councils have distinct but complementary responsibilities. Intersectorality does not consist merely of referring a student and transferring responsibility to another service. It entails communication, the shared development of strategies, and case monitoring, while respecting ethics, privacy, and the limits of each professional's role. Oliveira et al. (2024) emphasize that weak coordination between schools and psychosocial care services is one of the obstacles to implementing mental health promotion practices.

Thus, affirming that educating also means caring entails recognizing the affective dimension of pedagogical relationships, promoting safe environments, strengthening bonds, and not ignoring manifestations of suffering. It also entails recognizing limits: teachers are not substitutes for psychologists, schools do not provide clinical treatment, and socioemotional competencies cannot independently solve social and institutional problems. Educational care derives its strength from integrating listening, knowledge, protection, participation, and network-based collaboration without abandoning the school's central function of ensuring access to knowledge and comprehensive human development.

METHODOLOGICAL APPROACH

This chapter is characterized as a qualitative, analytical-interpretive bibliographic study. Bibliographic research makes it possible to compile existing knowledge on a given topic, identify convergences and divergences among studies, and construct a well-founded understanding of the subject under investigation. In this case, the objective is not limited to describing concepts related to mental health and socioemotional competencies. It also seeks to interpret how these issues relate to everyday school life, pedagogical relationships, and schools' responsibilities.

Three recent academic studies directly related to the topic were selected to compose the analytical corpus: the article by Oliveira et al. (2024), which addresses mental health promotion in the school context and intersectoral collaboration; the systematic review by Brantes and Gondim (2025), which focuses on socioemotional competencies in Elementary Education; and Aguiar's dissertation (2025), which presents the development of a socioemotional program to promote health at school. These studies were selected because they make it possible to combine different perspectives: psychosocial care, the systematization of scientific evidence, and the development of an educational intervention proposal.

Using a focus group, Oliveira et al. (2024) investigated the perceptions of professionals at a public school in Rio de Janeiro regarding the main challenges and existing potential within the school environment for developing mental health promotion initiatives. The results were organized around situations involving violence and conflict, the factors involved in these occurrences, and possible approaches to addressing them, with an emphasis on the need for greater coordination between the school and psychosocial care services.

Brantes and Gondim (2025) conducted a systematic review of socioemotional competencies and related concepts in Elementary Education. The initial search identified 2,834 articles published between 2010 and 2019, of which 66 were included in the analysis following the selection stages recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol (PRISMA). The competencies investigated most frequently were emotional regulation, emotion perception, and social interaction, which were associated with well-being, academic performance, and the quality of interpersonal relationships.

Aguiar's dissertation (2025), developed in the Master's Program in Psychology at the University of Fortaleza, focused on designing a socioemotional competency program to promote health at a municipal Basic Education school in Fortaleza. The study resulted in a free proposal adaptable to different school contexts, called the Bem Viver Program, which brings together foundations from Psychology, health promotion, and socioemotional education.

The studies were examined according to five analytical axes: conceptions of mental health and socioemotional competencies; supportive care and prevention in everyday school life; conflicts, violence, and interpersonal relationships; the limits of teachers' professional roles; and coordination among schools, families, Health services, and the protection network. The studies are not treated as equivalent experiences because they have different objectives, methodologies, and contexts. Bringing them together is intended to develop a discussion encompassing both the educational possibilities of care and the risks of individualization, medicalization, and overburdening school professionals.

MENTAL HEALTH AND SOCIOEMOTIONAL COMPETENCIES AT SCHOOL: A DIALOGUE WITH THE RESEARCH

An integrated analysis of the studies by Oliveira et al. (2024), Brantes and Gondim (2025), and Aguiar, Melo, and Magalhães (2025) demonstrates that promoting mental health in the school context cannot be reduced to identifying disorders, referring students, or conducting occasional activities about emotions. Although the three studies were developed with different objectives and methodologies, they converge in recognizing that care must integrate school relationships, the development of socioemotional resources, community participation, and coordination with other sectors responsible for protecting children and adolescents.

This convergence also reveals the complementary nature of the studies. Oliveira et al. (2024) analyze the social and institutional conditions related to mental health, drawing attention to conflicts, violence, and the need for intersectoral collaboration. Brantes and Gondim (2025) systematize research on socioemotional competencies and demonstrate which abilities have been studied most extensively in Elementary Education. Aguiar, Melo, and Magalhães (2025), in turn, present a concrete intervention proposal, showing how self-knowledge and empathy can be developed through pedagogical experiences adapted to the school context.

Taken together, the studies avoid two common reductions. The first consists of treating mental health as an exclusively individual matter, assigning students sole responsibility for managing their difficulties. The second is the belief that implementing a socioemotional program would be sufficient to resolve conflict, violence, and suffering produced by family, social, or institutional conditions. Developing competencies can contribute to care, but it must be linked to transforming relationships and building support networks.

Oliveira et al. (2024) adopt a health promotion perspective that considers the political, social, and institutional factors involved in processes of health and illness. Under this approach, emotional manifestations cannot be analyzed separately from individuals' living conditions and relationships. Students do not arrive at school as isolated individuals; their ways of acting, relating to others, and expressing suffering are shaped by family, community, economic, and cultural experiences.

This understanding shifts the focus from individual behavior to the dynamics within which that behavior develops. Irritability, isolation, lack of motivation, aggressiveness, or declining performance may indicate different needs, but they do not justify hasty diagnoses. Schools must observe students while simultaneously analyzing the relationships experienced in daily life: how conflicts are mediated, how rules are applied, which groups are given opportunities to participate, and which individuals remain silenced.

The study by Oliveira et al. (2024) identified violence and school conflicts as the main psychosocial challenges reported by the participating professionals. These occurrences were not interpreted solely as consequences of inappropriate student behavior. The authors relate conflicts to weakened bonds, barriers among the different cultures present within the institution, limited student and family participation, and difficulties in coordinating the school with the psychosocial care network.

In this respect, the contributions of Brantes and Gondim (2025) align with the problems identified by Oliveira et al. (2024). Their systematic review shows that emotion perception, emotional regulation, and social interaction are among the competencies studied most extensively in Elementary Education.

These abilities can help students recognize how they feel, communicate their needs, understand different perspectives, and find less violent ways to address disagreements.

Brantes and Gondim (2025, p. 3) define socioemotional competencies as the result of the “articulation among knowledge, skills, and motivations for dealing with emotional content.” This definition is important because it prevents such competencies from being understood as fixed personality traits. They involve learning, ongoing development, and the mobilization of different resources in concrete situations.

Contextualization is indispensable. The ability to regulate emotions cannot mean obeying in silence, concealing anger, or remaining calm in the face of injustice. Regulation involves recognizing an emotion, understanding its possible causes, assessing its consequences, and choosing responsible forms of expression. Anger in response to humiliation, for example, should not automatically be treated as an emotional failing; it may communicate that a right or boundary has been violated.

Similarly, developing empathy does not mean requiring victims to quickly understand and forgive those who committed an act of aggression. Situations involving bullying, discrimination, racism, ableism, or harassment entail unequal power relationships that must be recognized. Schools are responsible for stopping the violence, protecting those affected, holding those involved accountable, and implementing educational initiatives with the community. Socioemotional competencies can contribute to this process, but they do not replace institutional responsibility.

The dialogue between Oliveira et al. (2024) and Brantes and Gondim (2025) thus reveals that teaching individual skills is insufficient if the school’s organization continues to produce fear, exclusion, or a lack of belonging. An institution may conduct activities on empathy while publicly displaying grades, embarrassing students for their mistakes, or ignoring reports of violence. In such cases, there is a contradiction between the formal curriculum and the curriculum as experienced in practice.

Socioemotional practices must be accompanied by an analysis of institutional relationships. The ways teachers and administrators respond to questions, intervene in conflicts, organize group work, and

welcome differences continually convey lessons about respect, authority, cooperation, and participation. Socioemotional education does not occur only during activities expressly intended to discuss feelings; it is present in the way the school itself operates.

Aguiar, Melo, and Magalhães (2025) contribute to this discussion by presenting the B.E.M. V.I.V.E.R. Program, created to strengthen self-knowledge and empathy and promote students' mental health. The proposal was implemented with 61 children from two third-grade Elementary Education classes through 15 sessions structured around pedagogical experiences. The activities addressed the identification and expression of emotions, listening, empathy, kindness, bonds, emotional regulation, and responsible decision-making.

The program offers a practical response to the issues raised by the other studies. While Brantes and Gondim (2025) demonstrate that socioemotional competencies can be learned, Aguiar, Melo, and Magalhães (2025) present a way to organize this learning in everyday school life. At the same time, the intervention acknowledges the argument advanced by Oliveira et al. (2024): mental health and emotional development cannot be separated from students' social and cultural conditions.

The sessions were not designed as rigid activities to be applied identically to every class. The authors report that "all content and procedures were adjusted to account for the class's language, writing ability, culture, and routine" (Aguiar; Melo; Magalhães, 2025, p. 341). This adaptation considered that the participants were experiencing greater vulnerability and were exposed to different social determinants of health.

This aspect directly aligns the program with the perspective of Oliveira et al. (2024). The intervention did not impose on students the obligation to overcome every adversity individually. Instead, it recognized that socioemotional resources develop within concrete social contexts. Adapting the language, procedures, and activities demonstrates that a care proposal must begin with the characteristics of the community rather than an abstract model of the student.

The experience also shows that student participation can extend beyond performing the proposed activities. The program's name was chosen through suggestions and a vote involving students, families, teachers, and school administrators. Although simple, this procedure indicates an attempt to build belonging and collective participation. This outcome aligns with Oliveira et al. (2024), for whom democratizing student and family participation constitutes one possible means of addressing school conflicts.

Participation, however, cannot be reduced to occasional consultation. Spaces must be established in which students can express their perceptions, discuss rules, assess projects, and contribute to decisions affecting their experience. Oliveira et al. (2024) demonstrate that a lack of belonging can distance students and families from decision-making spaces. A mental health policy must therefore treat participation as a dimension of care and citizenship, rather than merely as a strategy for reducing undesirable behavior.

The studies also converge in emphasizing the importance of continuity. The interventions identified by Brantes and Gondim (2025) yielded promising results, such as increased emotional awareness and reductions in certain behavioral problems. The review, however, reveals considerable variety in models, methodologies, and assessment methods, as well as a limited number of studies including subsequent follow-up. This warrants caution regarding promises of rapid and universal results.

The authors themselves also acknowledge the limitations of the B.E.M. V.I.V.E.R. Program. It is a brief intervention implemented with one grade level and focused primarily on self-knowledge and empathy. The researchers recommend that future studies extend its duration, include other grade levels, and address different competencies. Explicitly acknowledging these limitations strengthens the study because it prevents the proposal from being presented as a complete solution to mental health needs.

The integrated analysis indicates that socioemotional programs must be understood as part of a broader effort. They can provide language, activities, and opportunities for students to recognize emotions and develop constructive forms of social interaction. They do not, however, replace policies addressing

protection, inclusion, social assistance, violence prevention, and access to Health services. Nor can they depend solely on individual teachers' willingness.

This issue is particularly important because educators frequently encounter complex manifestations of suffering without sufficient training or institutional support. Oliveira et al. (2024, p. 15) state that "this entire complex process will not be possible without intersectoral collaboration." The authors observe that school professionals may feel isolated when occupying the position through which social policies reach children and families, even though they lack the resources to address every need.

Intersectorality does not merely mean referring a student to another service. Referring the student and ending the school's involvement constitutes a transfer, not a sharing, of responsibility. Building a network requires communication among Education, Health, Social Assistance, and other sectors, the definition of responsibilities, joint planning, and monitoring of the strategies adopted. Specialized services perform clinical assessments and interventions when necessary, while schools remain responsible for the pedagogical, relational, and institutional conditions they provide to students.

This distinction protects both students and professionals. Teachers can respond supportively to manifestations of suffering, listen without judgment, document significant changes, notify the administrative team, and participate in developing pedagogical strategies. They are not, however, responsible for making diagnoses, prescribing treatment, or conducting therapeutic processes. Educating also means caring, but pedagogical care does not mean assuming the role of psychologists, psychiatrists, or social workers.

The study by Aguiar, Melo, and Magalhães (2025) reinforces the importance of institutional organization. The program was designed by researchers affiliated with Psychology and Health and implemented by a professional trained in Psychopedagogy and Educational Guidance. Guidelines were established regarding respect for differences, confidentiality of information, and preservation of the children's identities. These precautions demonstrate that socioemotional practices address sensitive content and require ethical and methodological preparation.

Discussion circles and activities addressing emotions must not become spaces in which students' private lives are publicly exposed. Students must have the right to speak, but also the right not to disclose personal experiences before the class. When accounts of violence, abuse, self-harm, or threats to life emerge, the situation requires protective procedures and activation of the appropriate network, not an improvised group discussion.

Assessing these proposals also requires caution. Socioemotional competencies are influenced by context and should not readily be converted into grades, rankings, or personality classifications. A more reserved student may demonstrate empathy and responsibility differently from another student who speaks during every activity. Rigid assessments can create new labels and transform personal differences into presumed emotional deficiencies.

Instead of measuring how resilient, empathetic, or cooperative each student is, assessments can examine changes in relationships and social conditions. Relevant indicators include increased help-seeking, stronger participation, reduced aggression, the development of more respectful strategies for managing conflicts, and a greater sense of belonging. It is also necessary to determine whether professionals have received support and whether the external network is capable of responding to referrals.

The three studies therefore converge in demonstrating that school-based care must combine three dimensions. The first is institutional and intersectoral: it encompasses relationships, participation, violence prevention, and the coordination of public policies, as discussed by Oliveira et al. (2024). The second is formative: it corresponds to the continuous development of socioemotional knowledge, skills, attitudes, and motivations, as systematized by Brantes and Gondim (2025). The third is pedagogical and practical: it translates these foundations into planned, contextualized, and assessed interventions, as exemplified by the B.E.M. V.I.V.E.R. Program.

Integrating these dimensions prevents socioemotional competencies from being used to adapt students to unjust conditions. Teaching resilience cannot mean normalizing poverty, racism, domestic

violence, ableism, or a lack of specialized care. Likewise, teaching self-regulation does not remove the school’s responsibility to review practices that produce anxiety, excessive competition, exposure, and fear.

The dialogue among the studies supports the conclusion that mental health promotion cannot be achieved through a single activity, professional, or policy. It depends on the quality of relationships, consistency between discourse and practice, participation by the individuals involved, and the existence of networks capable of responding to different needs. Socioemotional programs can make a significant contribution, provided that they do not individualize suffering, standardize personalities, or substitute for adequate conditions of teaching, protection, and care.

In this sense, educating also means caring when schools recognize emotions without immediately turning them into diagnoses; develop competencies without transforming behaviors into universal standards; welcome without intruding; refer without abandoning; and promote autonomy without holding children and adolescents responsible for collectively produced problems. Mental health and learning are not separate fields, but dimensions of human development that must ensure knowledge, safety, participation, respect, and belonging.

Figure 1

Articulation between the three materials.

Articulation between the three materials

The studies will form a very balanced dialogue:

Material	Central axis	Function in the chapter
Oliveira et al. (2024)	Mental health and psychosocial care	Discuss care, support, and articulation between Education and Health
Brantes and Gondim (2025)	Socio-emotional competencies	Present evidence, concepts, and limits of the field
Aguiar (2025)	School intervention program	Approach the foundation of pedagogical practices

Source: Prepared by the authors, 2026.

CONCLUDING REMARKS

The discussion developed in this chapter has demonstrated that mental health, socioemotional development, and learning are deeply connected to students' experiences in everyday school life. Schools are not merely places for transmitting systematized knowledge; they are also environments of social interaction, bond-building, identity formation, and collective participation. In this sense, educating also means caring when pedagogical practices consider individuals in their entirety and provide conditions of safety, respect, belonging, and expression.

The dialogue among the selected studies made it possible to understand that promoting mental health cannot be reduced to identifying disorders or referring students considered problematic. Oliveira et al. (2024) demonstrate that the conflicts, violence, and suffering manifested in schools are shaped by social, family, and institutional relationships. Exclusively individual or clinical responses are therefore insufficient when addressing phenomena that also have collective dimensions. Schools must welcome, observe, document, and activate the protection network when necessary, without assuming responsibilities that exceed their educational function.

The contributions of Brantes and Gondim (2025) demonstrate that competencies such as emotion perception, self-regulation, empathy, social interaction, cooperation, and responsible decision-making can foster positive social interaction and create better conditions for learning. Their development, however, must not result in the standardization of behavior or the classification of students according to personal characteristics. Emotions do not need to be controlled or eliminated, but rather recognized, understood, and expressed responsibly. It is also necessary to prevent resilience and adaptation from being used to teach children and adolescents to endure violence, exclusion, or inequality in silence.

The experience presented by Aguiar (2025) shows that socioemotional programs can help organize preventive and continuous initiatives by bringing health promotion, social interaction, and educational practices together. Any proposal, however, must be adapted to the characteristics of the community, integrated with the political-pedagogical project, and supported by training, planning, and assessment.

Isolated activities, ready-made materials, or occasional lectures have limited reach when institutional relationships themselves remain marked by authoritarianism, humiliation, excessive competition, or an absence of attentive listening.

Another essential consideration is recognizing the limits of teachers' professional roles. Teachers are not psychologists or therapists and should not be held individually responsible for resolving every manifestation of suffering present at school. Mental health promotion requires the involvement of administrators, families, multidisciplinary teams, Health services, Social Assistance services, and other members of the protection network. This coordination must go beyond simply referring students by establishing communication, shared responsibility, and follow-up while respecting the responsibilities and ethical principles of each field.

In conclusion, a school committed to mental health is not one that promises to eliminate conflict, sadness, fear, or difficulty. It is one that does not ignore these experiences, does not immediately transform them into illnesses, and does not hold students responsible for collectively produced suffering. Educating also means caring when the institution protects students from violence, welcomes without intruding, listens without judgment, refers without abandoning, and develops socioemotional competencies without standardizing personalities. Educational care strengthens the school's pedagogical function when it promotes more humane relationships and ensures that learning can also be an experience of participation, dignity, and belonging.

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CONTEMPORARY CHALLENGES IN IMPLEMENTING PUBLIC EDUCATION POLICIES

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Abstract

This study aims to identify the challenges involved in implementing sectoral education policies as essential tools for ensuring that society's educational needs are met and that education serves as an instrument for promoting social and economic development. This research is justified by the fact that public policies in the educational sphere constitute an area of high demand and are an important means of advancing rights, universalizing access, promoting quality student retention, reinforcing the State's responsibility for education, and addressing social demands. Such policies contribute to the democratization of free, high-quality public education and foster equal conditions for students to enter, remain in, and complete their studies. As its methodological approach, this study employed a literature review involving searches of digital databases and virtual libraries. The results indicate that the challenges involved in implementing public education policies are enduring and closely associated with the particular circumstances of each historical period. The search for solutions is therefore increasingly urgent. Accordingly, the expansion of initiatives designed to mitigate the problems that prevent educational demands from being met has gained ground, creating new possibilities for disseminating and implementing social policies aimed at expanding rights and emancipating society.

Keywords: Challenges, Education, Implementation, Public Education Policies, Sectoral Education Policies.

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INTRODUCTION

Education, as a fundamental social right and a cornerstone of a nation's human and sustainable development, occupies a central place in contemporary government agendas and academic debates. Nevertheless, the promise of high-quality, equitable, and inclusive education, enshrined in legal frameworks such as the 1988 Federal Constitution and the National Education Guidelines and Framework Law (Lei de Diretrizes e Bases da Educação Nacional—LDB), often encounters a troubling gulf between the normative ideal and the reality experienced in schools and communities.

It is at this juncture that the core of the current problem lies: the implementation of public education policies, understood not as a merely bureaucratic or technical act, but as a political, social, and profoundly human process, replete with tensions, contradictions, and challenges that extend beyond the mere allocation of resources.

In the contemporary world, marked by rapid technological change, persistent structural social inequalities, and crises of various kinds, including public health, climate, and political crises, the role of education policy has become even more complex and strategic. The challenges involved in its implementation therefore cannot be reduced to management shortcomings or insufficient investment, although these are major factors. They emerge from a web of interdependencies involving teacher education and well-being, the alignment of curricula with the new demands of the twenty-first century, the physical and digital infrastructure of educational institutions, the effective participation of the school community, and, crucially, the State's capacity to coordinate different levels of government and social sectors around a common project.

In this context, the present study aims to provide a comprehensive analysis of the multiple obstacles hindering the implementation of public education policies in Brazil today. Rather than adopting a purely critical or pessimistic approach, it seeks to understand the roots of these challenges and how they manifest in everyday school life, recognizing that beyond statistical data and management reports lie the stories of students, teachers, and administrators who experience the effects of these policies in practice.

The study is justified by the premise underlying its analysis: a public education policy becomes firmly established only when it engages with local realities, embraces diversity, values educational stakeholders, and continually reinvents itself in the face of adversity. This study addresses historical and structural barriers, such as the fragmentation of the education system and insufficient professional recognition, as well as emerging obstacles, including digital inclusion and the promotion of education for ethnic-racial relations and global citizenship.

Finally, it is believed that shedding light on these complexities makes it possible not only to understand why these difficulties arise, but also to envision possible paths toward more effective, democratic, and, above all, humane implementation of education policies. Ultimately, the success of any public policy is measured not by the number of documents produced or bureaucratic targets achieved, but by its capacity to transform, meaningfully and enduringly, the life of every citizen who regards education as the key to realizing their plans for the future.

DEVELOPMENT

EDUCATION IN BRAZIL AND SOCIAL ISSUES

Education in Brazil is a complex subject fraught with challenges, particularly regarding social issues. An analysis of the country's educational landscape reveals a profound relationship between education and social conditions, as social inequality and exclusion directly affect educational access, quality, and equity. According to Bastos (2016), the challenges facing Brazilian education are intrinsically linked to the social disparities that characterize the country.

One of the main social issues affecting education in Brazil is socioeconomic inequality. The country is marked by profound disparities among regions, states, and municipalities. While some have access to high-quality educational resources, others face structural deficiencies and insufficient investment. This results in an unequal education system that reproduces and perpetuates social inequalities, thereby limiting students' opportunities for development. In this regard, the universalization

of access to education encounters structural problems that undermine equity, as indicated by studies of the challenges facing Brazilian education (Bastos, 2016).

In addition to socioeconomic inequality, education in Brazil also faces the challenge of social exclusion. Marginalized groups, such as Black people, Indigenous peoples, persons with disabilities, LGBTQIA+ individuals, and people experiencing social vulnerability, are often neglected by the education system. The lack of inclusive policies and the absence of effective measures to combat prejudice and discrimination contribute to the exclusion of these groups, hindering their access to high-quality education. Their effective inclusion requires specific public policies that take into account the diversity present in Brazilian society (Bastos, 2016).

Another social issue affecting education is violence in schools and communities. Violence undermines the school environment and interferes with students' learning processes. Inadequate security, the presence of conflict, and exposure to violence can create an atmosphere of fear and insecurity, impairing students' academic performance and well-being. Studies have shown that school dropout is directly related to factors external to the school, including violence and social vulnerability, which drive students away from the educational environment (Oliveira; Nóbrega, 2021).

It is important to emphasize that overcoming these social issues in education requires integrated initiatives and effective public policies. Investment in school infrastructure, teacher education, recognition of the teaching profession, the implementation of inclusion programs, and initiatives to combat violence are among the measures needed to address the social challenges affecting education in Brazil. According to Tartuce et al. (2018), initiatives undertaken by education departments have proved essential in addressing educational challenges, particularly those related to keeping students in school.

Furthermore, promoting the participation and engagement of civil society, families, and communities is essential to the pursuit of a fairer and more inclusive education system. Dialogue among different social stakeholders, the coordination of intersectoral policies, and the establishment of democratic forums for discussion are vital to addressing and transforming the social issues affecting

education. The development of democratic education depends on the involvement of all segments of society, as emphasized by studies on education policies (Tartuce et al., 2018).

Overcoming these challenges requires an integrated approach involving effective public policies, adequate investment, and the participation of society as a whole. Only by confronting social issues can a fairer, more inclusive, and more equitable education system be built, ensuring that all students can fully develop their potential and enjoy opportunities for growth. Education must be recognized as a fundamental human right and an essential pillar of a country's social, economic, and cultural development. This understanding is consistent with discussions of the structural challenges facing Brazilian education (Bastos, 2016).

In this regard, the State must assume responsibility for ensuring high-quality education for all, regardless of socioeconomic background, race, gender, sexual orientation, or any other form of difference. This entails implementing public policies that promote equal opportunities, reduce social inequalities, and provide suitable conditions for students to access, remain in, and succeed within the school environment. According to Oliveira and Nóbrega (2021), keeping students in school is a persistent challenge in Brazilian education and requires continuous, coordinated action.

Addressing the social issues permeating education in Brazil requires investment in the education and professional recognition of educational personnel, ensuring appropriate working conditions, decent salaries, and professional development programs. It is also essential to strengthen the participation of the school community by encouraging parents, guardians, students, and other social stakeholders to become involved in building a more inclusive and democratic education system. Teacher education policies are essential to improving educational quality (Tartuce et al., 2018).

SECTORAL EDUCATION POLICIES

Public education policies are fundamental to ensuring universal, equitable access to high-quality education. They establish guidelines, programs, and initiatives aimed at safeguarding the right to

education, as provided for in the Federal Constitution, while promoting the country's social, economic, and cultural development. In this context, sectoral policies play a crucial role in organizing the education system (Tartuce et al., 2018).

The implementation of public education policies is intended to address historical inequalities, including the exclusion of groups experiencing vulnerability due to socioeconomic, racial, regional, or gender-related factors. These policies seek to ensure the inclusion of all individuals and provide them with equal learning opportunities, regardless of their circumstances. Inclusion policies are fundamental to reducing educational disparities (Bastos, 2016).

Another crucial aspect is improving the quality of education. Public policies focused on continuing teacher education, the modernization of school infrastructure, investment in educational technologies, and curricular reform are examples of initiatives designed to raise educational standards and make education more effective and responsive to contemporary needs. In this context, the introduction of educational technologies into the public school system through programs such as the National Educational Technology Program (Programa Nacional de Tecnologia Educacional—ProInfo) represents significant progress in modernizing education, although it faces implementation challenges (Martins; Flores, 2025). Expanding and democratizing access to technologies in the public school system are fundamental aspects of educational modernization.

Public education policies also play an important role in promoting citizenship. They contribute to educating critical individuals who are aware of their rights and duties and are prepared to act responsibly and ethically within society. By incorporating subjects such as environmental education, ethics, diversity, and inclusion into the school curriculum, public policies help build a fairer and more supportive society (Souza, 2026).

Finally, the economic impact of public education policies is undeniable. An effective education system contributes to the development of a skilled workforce, stimulating economic growth and reducing

social inequality. Investing in education therefore means investing in the country's future, ensuring sustainable development and better living conditions for the entire population (Silva; Casagrande, 2020).

Public policies therefore provide the foundation for an education system that promotes equity, quality, and social transformation, making them indispensable to building a fairer, more inclusive, and more developed society. Sectoral education policies are government initiatives intended to improve the accessibility, quality, and effectiveness of the education system in a given country or region (Silva; Casagrande, 2020).

These policies seek to ensure that society's educational needs are met and that education serves as a tool for promoting social and economic development. Sectoral policies must be planned in coordination with other areas of government (Silva; Casagrande, 2020).

Funding is one of the most important sectoral policies in education. Most countries have public funding systems that ensure access to education for all citizens. These systems, however, are often insufficient and fail to meet society's educational needs. Public funding for education must therefore be expanded to ensure that all students have access to high-quality education. Adequate funding is essential to the effectiveness of education policies (Souza, 2026).

Teacher education is another important sectoral policy. Teacher education is essential to ensuring educational quality and must continually be updated and improved to meet society's demands. This requires investment in teacher education programs and incentives for teachers to participate in professional development and training courses. Recognition of the teaching profession is a key factor in improving education (Tartuce et al., 2018).

The assessment and monitoring of educational quality are also important sectoral policies. Assessing student and school performance makes it possible to identify problems and areas requiring improvement. Continuous monitoring of educational quality is essential to ensure that implemented policies and strategies are meeting the needs of students and society (Silva; Casagrande, 2020).

Sectoral education policies must also take cultural diversity and the specific needs of marginalized groups, such as Indigenous peoples, Afro-descendant populations, and persons with disabilities, into account. Investment in inclusion policies is necessary to ensure that all students have access to high-quality education. The inclusion of these groups requires affirmative action and targeted policies (Souza, 2026).

Furthermore, sectoral education policies must be integrated with other social policies, including those related to health, housing, and employment. High-quality education is fundamental to human and economic development and must be treated as a priority across all government policies. Intersectoral coordination is essential to the success of education policies (Tartuce et al., 2018).

Sectoral education policies are therefore fundamental to ensuring the accessibility, quality, and effectiveness of the education system in a country or region. Adequate funding, teacher education, the assessment and monitoring of educational quality, the inclusion of marginalized groups, the use of educational technologies, and integration with other social policies are among the most important sectoral policies that must be implemented to promote high-quality education (Silva; Casagrande, 2020).

In this regard, programs such as ProInfo and the Connected Education Program (Programa Educação Conectada) represent efforts by public authorities to integrate digital technologies into everyday school life, thereby expanding access to and improving the quality of education (Basniak; Soares, 2016; Silva; Casagrande, 2020). Mapping these policies demonstrates the importance of innovation and connectivity within the educational environment.

GENERAL CONSIDERATIONS REGARDING PUBLIC EDUCATION POLICIES

The Brazilian education system has undergone numerous transformations in recent decades. An examination of the statistics reveals substantial growth in the pursuit of education as a whole. Illiteracy rates have declined, the population's average educational attainment has increased, and the length of time students remain in school falls within normal parameters. In this context, schools appear to be fulfilling

their primary role in society, namely ensuring that citizens receive a formal education. These transformations have resulted from public policies implemented over the years (Bastos, 2016).

Any reflection on public education policies within the context considered here must be epistemologically grounded. A discussion of such policies must begin with an understanding of the concept itself: a set of specific government actions established to give effect to education and thereby produce a series of outcomes particular to this sphere. Governments at different levels consequently seek to intervene in education either directly or through delegated authority and, in doing so, exert a profound influence on each citizen's reality (Oliveira; Nóbrega, 2021).

By understanding public policy as a consequence of social practice, it is necessary to examine both its historical developments and the system of meanings that permeates social relations and distinguishes its implementation within a particular context. A historical analysis of education policies reveals the influence of different pedagogical conceptions over time (Silveira, 2022).

These actions demonstrably affect this reality, but so do the evident consequences of the omissions associated with them. In this context, the breadth of the concept of education must be recognized. At the same time, a specific dimension within this broader field must be defined when addressing education policies, which often requires focusing on school-related issues (Costa, 2019).

Accordingly, a preliminary analysis suggests that public policy in the sphere of education is what connects legal provisions and objectives to the circumstances inherent in each particular situation. Omissions by public authorities often undermine the effectiveness of education policies (Oliveira; Nóbrega, 2021).

When considering the relevant questions that may arise regarding the importance of public education policies to contemporary society, it becomes evident that these policies are of substantial and demonstrable value to the development of a fairer and more equitable society, as their primary aim is to address inequalities and disparities in education. To be established and implemented effectively, public

education policies take into account the circumstances of each location or specific educational program or project. Contextualization is fundamental to the success of education policies (Tartuce et al., 2018).

This perspective proceeds from the premise that, when properly designed, carefully planned, and effectively implemented, education policies make a significant contribution to the pursuit and realization of citizenship, as well as to the education and awareness of individuals who are prepared for the future and for participation in society. Appropriate planning is essential to policy effectiveness (Bastos, 2016).

As can be observed, this is not merely a proposed methodological approach to research on education policies, but a perspective that envisions a different direction for discussions of the subject, moving beyond the limits of denunciation toward a reality transformed by knowledge and learning as a whole (Silva; Casagrande, 2020).

Public education policies are understood to be present in the daily life of institutions within a context in which society as a whole participates in improving and realizing the school experience. Social participation is a key element in the democratization of education (Oliveira; Nóbrega, 2021).

Within the school context, the interests of the school community are interrelated from a comprehensive perspective, including benefits to students, teachers, families, and the school's entire organizational system. Public education policies are present in practice wherever efforts are made to reduce disparities and problems, ensure high-quality education for all, and realize citizenship by safeguarding each individual's rights and duties. They are also reflected in the regulatory system that ensures the proper functioning of teaching and learning processes. Democratic governance is fundamental to the effectiveness of education policies (Tartuce et al., 2018).

Policies emerge within a context that seeks to optimize and improve outcomes in the teaching and learning process, including, as previously noted, access to school and efforts to combat common problems such as school dropout and grade repetition. According to Oliveira and Nóbrega (2021), school dropout is a persistent problem in Brazilian education and requires effective public policies focused on both

prevention and the reintegration of students who have left school. Keeping students in school is a challenge that requires integrated action.

PUBLIC EDUCATION POLICIES AND TEACHER EDUCATION

With regard to teacher education, public policies seek, or at least should seek, to bring about effective improvements in the teacher education process and thereby benefit the education system as a whole. This concern has existed since the second half of the last century and has gained prominence in recent decades. A considerable increase in government investment in education and significant changes in teacher education have consequently been observed, bringing a new perspective to Brazilian education (Costa, 2019).

Considerable attention has been devoted to basic education and the improvements associated with this educational area. According to Tartuce et al. (2018), initiatives undertaken by education departments have faced significant challenges in improving the quality of upper secondary education, which directly underscores the need for teachers' continuing education.

It is important to understand that improvements in teacher education arose not only from the intention to provide high-quality education to future teachers, but also from the recognition that changing methodologies and ideologies and making academic education more critical and innovative would automatically constitute an investment in the education of the future. This subject, however, involves extensive debate and a sustained commitment to addressing the demands arising from the adaptations required by new social realities. Pedagogical innovation is a recurring theme in discussions of teacher education (Silveira, 2022).

Within this context, teacher education must be understood not merely as an undiminished demand, but above all as a reality that constitutes an ongoing challenge and requires public policies that encourage, facilitate access to, and provide for teacher education, particularly given that many such policies have not

even been implemented. Continuing education is essential to teachers' professional development and the updating of their knowledge and skills (Tartuce et al., 2018).

This study concurs with the need to rethink and, above all, continuously restructure the education of teaching professionals to ensure their full development. Teachers' professional development must be a priority in education policies (Bastos, 2016).

The implementation of public teacher education policies must therefore seek, above all, to support future teachers by enabling continuous reflection on their professional practice and fostering intellectual autonomy, thereby providing the means to develop their pedagogical practice. Reflection on practice is fundamental to improving teaching (Silveira, 2022).

In this context, pedagogical policies, whether established through laws regulating education, affirmative action, or appropriate support for constructing knowledge, are expected not only to foster adequate education but also to provide the conditions necessary to put learning into practice. Such policies should facilitate activities rich in possibilities and opportunities, thereby enabling both the creation and development of knowledge and supporting the teaching and learning process. Teacher education policies must be coordinated with other education policies (Tartuce et al., 2018).

FINAL CONSIDERATIONS

This study has demonstrated that transforming education in Brazil also requires inclusion policies that take into account the specific characteristics and diversity present in our society. Equitable access and appropriate support must be ensured for historically marginalized groups by promoting affirmative action and programs to combat inequality. These initiatives must be planned in light of the circumstances of each school community.

By overcoming the social issues affecting education, Brazil can achieve significant benefits for society as a whole. High-quality, inclusive education makes it possible to educate critical citizens who are aware of their rights and duties and capable of contributing actively to the country's development.

Furthermore, an education system that promotes equal opportunities and combats social exclusion has the potential to reduce inequality, foster social mobility, and strengthen social cohesion.

The relationship between education in Brazil and social issues is intrinsic and complex. Overcoming these challenges requires a comprehensive approach involving effective public policies, adequate investment, social participation, and recognition of educational personnel. Only in this way can we build a fairer and more inclusive education system that contributes to the development of a more equitable and advanced society. This integrated perspective is advocated by several authors who study the realities of Brazilian education.

A change can be observed in contemporary practices of educational planning across the various levels of government. This perspective has broadened through the implementation of public policies in the form of structural initiatives integrated into schools' daily routines. Contemporary educational planning takes into account the participation of all school stakeholders.

The overriding objective must always be to achieve high-quality, results-oriented education, which requires recognizing each school's identity. This recognition is fundamental. To this end, the aforementioned practice is essential and must encompass every dimension of a democratic school and the consolidation of equality within its pedagogical environment. This represents one of the paths toward effective democracy in the development of human values in everyday school life. School democracy is built through the participation of everyone involved.

Finally, when addressing public education policies, it must be remembered that any change is, in reality, a process strongly influenced by numerous factors. Education is no exception, as countless factors of different kinds affect the entire process of change.

It is therefore of paramount importance to value education policies and promote those that are most appropriate and seek to improve the overall quality of basic education. Such policies must also shape the teacher education process so that teachers prioritize quality at this level of education. Valuing education policies is essential to improving educational quality.

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SCHOOL INCLUSION IN THE DIGITAL AGE: TECHNOLOGICAL RESOURCES FOR STUDENTS WHO ARE THE TARGET AUDIENCE OF SPECIAL EDUCATION

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Abstract

This study aims to analyze the contributions of technological resources to the school inclusion of students eligible for Special Education services, discussing their legal, pedagogical, and technological foundations, as well as the challenges associated with their implementation across education systems. This is a narrative literature review based on scientific articles, books, official documents, and national and international legislation, published primarily between 2020 and 2026. The results show that digital technologies support personalized learning, increase student autonomy, and strengthen inclusive pedagogical practices, provided that they are combined with teacher education, pedagogical planning, and guaranteed digital accessibility. It is concluded that school inclusion in the digital age requires sustained

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investment in technological infrastructure, the development of digital competencies, stronger public policies, and the ethical use of educational technologies to ensure quality education for all.

Keywords: Accessibility, Assistive Technology, Digital Inclusion, Inclusive Education, Special Education.

INTRODUCTION

The expansion of digital technologies has brought about profound changes in education systems, transforming how teaching, learning, assessment, and pedagogical processes are conducted and organized (Kenski, 2012; UNESCO, 2023). In the context of Special Education, these advances take on even greater significance because they enable the development of resources capable of reducing barriers to learning, expanding communication, encouraging participation, and strengthening the autonomy of students eligible for Special Education services (Galvão Filho, 2009; Bersch, 2017). Technology thus ceases to be merely a supplementary tool and becomes an important element in fulfilling the right to inclusive education (Sonza et al., 2013).

The Federal Constitution of 1988 establishes education as a fundamental right for all and requires equal conditions for access to and continued attendance at school. This commitment was expanded by the National Education Guidelines and Framework Law (Law No. 9,394/1996), the National Policy on Special Education from the Perspective of Inclusive Education (2008), the Brazilian Law on the Inclusion of Persons with Disabilities (Law No. 13,146/2015), Law No. 14,533/2023, which established the National Digital Education Policy, and the National Common Curricular Base (*Base Nacional Comum Curricular*—BNCC), which recognizes digital culture as an essential competency in basic education (Brasil, 1988, 1996, 2008, 2015, 2018, 2023). These regulatory instruments reinforce the need to use accessible technologies to ensure equal opportunities for students (Brasil, 2015; UNESCO, 2023).

Inclusive education is grounded in the understanding that everyone has the right to participate fully in educational processes, regardless of physical, sensory, intellectual, or social circumstances

(Mantoan, 2015; Sassaki, 2009). From this perspective, assistive technologies, accessible educational software, screen readers, speech synthesizers, augmentative and alternative communication applications, adapted digital platforms, and artificial intelligence-based resources are important instruments for promoting autonomy, participation, and learning (Bersch, 2017; Galvão Filho, 2009; Pereira; Braz; Gonçalves, 2024).

The COVID-19 pandemic significantly intensified the use of digital technologies in education, revealing both their potential and the inequalities associated with access to technological infrastructure (Pagame et al., 2022; Bueno et al., 2022). The adoption of remote instruction showed that students eligible for Special Education services often encountered difficulties resulting from the absence of accessible resources, insufficient teacher preparation for using assistive technologies, and limitations in public policies aimed at digital inclusion (Pagame et al., 2022). These challenges prompted new discussions concerning digital accessibility, Universal Design for Learning, and pedagogical innovation (CAST, 2024; Gottschalk; Weise, 2023).

At the same time, the development of tools based on artificial intelligence, augmented reality, virtual reality, adaptive learning, and intelligent educational support systems has expanded opportunities for personalized instruction (Molenaar, 2021; Gottschalk; Weise, 2023). However, the specialized literature cautions that merely making technological resources available does not guarantee school inclusion (UNESCO, 2023). The effectiveness of these technologies depends on pedagogical planning, continuing teacher education, school management committed to innovation, and the implementation of public policies capable of ensuring that educational institutions have adequate infrastructure (Borges; Tartuci, 2017; Gottschalk; Weise, 2023).

Internationally, organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Organisation for Economic Co-operation and Development (OECD), and the United Nations Children's Fund (UNICEF) recognize digital inclusion as an indispensable component of inclusive education (UNESCO, 2023; Gottschalk; Weise, 2023; UNICEF, 2023). These organizations

maintain that accessible technologies should be used to reduce educational inequalities, expand learning opportunities, and promote greater student participation in democratic school environments (UNESCO, 2023; UNICEF, 2023).

In Brazil, despite regulatory advances, significant challenges remain in implementing inclusive educational technologies (Borges; Tartuci, 2017; Pagaine et al., 2022). Insufficient investment, inequality among education systems, limited technological infrastructure, shortages of adapted equipment, and difficulties in teacher education undermine the effectiveness of inclusive practices mediated by digital resources (Bueno et al., 2022; Pereira; Braz; Gonçalves, 2024). It is therefore necessary to develop a critical understanding of the potential and limitations of using technologies to promote school inclusion (UNESCO, 2023; Gottschalk; Weise, 2023).

In light of this issue, the following research question was formulated: How can technological resources contribute to the school inclusion of students eligible for Special Education services, considering the challenges associated with accessibility, teacher education, technological infrastructure, and the implementation of public policies across education systems?

Within this context, the present study aims to analyze the contributions of technological resources to the school inclusion of students eligible for Special Education services, discussing the legal foundations of digitally inclusive education, the assistive technologies available, the challenges of implementation in public education systems, and prospects for strengthening public policies aimed at inclusion in the digital age.

THEORETICAL FRAMEWORK

School inclusion is a fundamental principle of democratic education systems and is directly related to safeguarding human rights and equal opportunities and valuing diversity. From a contemporary perspective, the use of digital technologies significantly expands opportunities to build accessible educational environments, supporting teaching and learning processes compatible with students' differing

needs. According to Mantoan (2015), school inclusion requires the transformation of pedagogical practices and the reorganization of educational institutions to ensure the effective participation of all students, regardless of their individual circumstances.

This understanding is also advocated by Glat and Nogueira (2002), who emphasize that inclusion is not limited to the physical presence of students with special educational needs in mainstream schools but requires broader changes in the organization of the education system:

[...] The inclusion of individuals with special educational needs in mainstream education is not merely a matter of their remaining alongside other students, nor does it entail denying specialized services to those who require them. On the contrary, it entails reorganizing the education system, which requires reviewing long-standing educational conceptions and paradigms in an effort to make the cognitive, cultural, and social development of these students possible while respecting their differences and meeting their needs (Glat; Nogueira, 2002, p. 26).

Similarly, Santos (2019) emphasizes that an inclusive school must embrace the diversity present in its daily life by recognizing and respecting students' individual characteristics:

[...] An inclusive school is a mainstream school, since any educational environment is expected to welcome all types of students. Various situations and different realities converge in this environment, and each student's individuality is expected to be respected, promoting well-being throughout the student's entire context. This is essential if healthy relationships are to exist both within and beyond the school environment (Santos, 2019, p. 7).

In Brazil, the legal foundations of inclusive education are supported by the Federal Constitution of 1988, the National Education Guidelines and Framework Law (Law No. 9,394/1996), the National Policy on Special Education from the Perspective of Inclusive Education (2008), the Brazilian Law on the Inclusion of Persons with Disabilities (Law No. 13,146/2015), the National Common Curricular Base (BNCC), and Law No. 14,533/2023, which established the National Digital Education Policy. These regulatory instruments recognize the use of accessible technological resources as an indispensable strategy for ensuring equal opportunities and eliminating barriers to learning.

Within this context, educational technology should not be understood merely as the presence of equipment or tools in the school environment, but rather as a body of knowledge, processes, and strategies intended to address educational needs. Brito and Purificação (2012) state:

The use of educational technologies has been characterized from two perspectives: the first is linked to the use of media for their own sake, while the second is associated with the “family” of resources used to address educational problems. The second perspective was widely disseminated in Brazil until the mid-1980s, when educational technology was understood primarily as the relationship between technology and education, embodied in a dynamic and open set of principles and processes for educational action resulting from the application of scientific knowledge and organized to solve or propose solutions to educational problems (Bruto; Purificação, 2012, p. 39).

Assistive technologies occupy a central position in this process. According to the Brazilian Law on the Inclusion of Persons with Disabilities, assistive technologies encompass products, equipment, methodologies, resources, strategies, practices, and services intended to promote the functioning, autonomy, independence, and social inclusion of persons with disabilities. In the school environment, these resources include screen readers, screen magnifiers, adapted keyboards, speech synthesizers, augmentative and alternative communication applications, speech recognition software, mobility devices, and digital platforms developed in accordance with universal accessibility principles.

Bersch (2006) explains that Assistive Technology encompasses both the resources used by students and the services responsible for identifying and implementing solutions to their functional difficulties:

Assistive Technology (AT) consists of resources and services. A resource is the equipment used by the student that enables or facilitates the performance of a task. An AT service at school is one that seeks to resolve the student’s “functional problems” by finding alternatives that allow the student to participate and engage positively in the various activities found within the school context (Bersch, 2006, p. 283).

The selection of resources should take each student's characteristics, needs, and potential into consideration. In discussing services for students with cognitive disabilities, Oliveira (2021) provides examples of how assistive technologies can be applied:

For students with cognitive disabilities, assistive technology plays an essential role in supporting the development of reading, writing, and logical reasoning skills. Tools such as cognitive stimulation software and adapted educational games enable these students to develop their competencies progressively while respecting their specific needs. These technologies also contribute to autonomy by providing opportunities to perform activities independently and in a personalized manner, which supports their inclusion in the school environment and enables active participation in the proposed activities (Oliveira, 2021, p. 45).

The development of digital resources has also contributed to expanding accessibility for students with sensory disabilities. According to Alves Guimarães et al. (2022, p. 4):

Adaptive platforms are intelligent platforms that use software to assign different and personalized exercises to each student based on their responses and reactions to tasks. They also maintain a knowledge profile for each student, containing elements that indicate how each part of the teaching experience can be individualized. This personalized teaching methodology greatly supports learning, particularly when it is continuously adjusted and developed.

These resources allow content and activities to be accessed through different means, reducing barriers related to communication, perception, and participation in school practices.

The specialized literature also emphasizes the importance of Universal Design for Learning (UDL), a pedagogical approach that proposes designing flexible educational experiences capable of accommodating different forms of information representation, expression of knowledge, and student engagement. This perspective reduces pedagogical barriers by integrating technological resources into curriculum planning from the outset, benefiting not only students eligible for Special Education services but the entire school community.

Another widely discussed issue concerns the development of teachers' digital competencies. Almeida and Valente (2011) assert that the integration of technology and curriculum depends on teachers'

ability to use digital resources critically in meaningful pedagogical practices. In addition, Araripe and Lins (2020) emphasize that initial and continuing teacher education should address competencies related to digital accessibility, assistive technologies, active methodologies, and the ethical use of digital tools, thereby fostering more inclusive educational environments.

In recent years, advances in artificial intelligence have significantly expanded opportunities for personalized learning. Intelligent tools can adapt content, provide immediate feedback, convert text into audio, perform automatic translation into Brazilian Sign Language (*Língua Brasileira de Sinais*—Libras), support augmentative and alternative communication systems, and identify specific learning difficulties. Nevertheless, UNESCO (2023) emphasizes that artificial intelligence in education must be used in accordance with ethical principles relating to data protection, transparency, equity, inclusion, and respect for human rights.

Despite technological advances, several studies indicate that significant inequalities in access to educational technologies remain. Economic barriers, inadequate infrastructure, limited connectivity, a lack of adapted equipment, and insufficient teacher education hinder the implementation of digital inclusion policies, particularly in public education systems. These challenges demonstrate that the digital transformation of education depends on coordination among public investment, institutional planning, and stronger educational policies.

Internationally, UNESCO (2023; 2024), OECD (2023), and UNICEF (2022) recognize digital inclusion as an essential dimension of quality in contemporary education. These organizations advocate using technologies as instruments to reduce inequalities, strengthen collaborative learning processes, and expand student participation in accessible educational environments. They emphasize, however, that technological innovation produces positive outcomes only when integrated with pedagogical practices, professional education, and public inclusion policies.

The use of technological resources in Special Education is therefore not an end in itself, but an instrument for ensuring student participation, learning, autonomy, and comprehensive development. The

literature converges in recognizing that achieving school inclusion in the digital age requires the integration of accessibility, pedagogical innovation, teacher education, democratic school management, and a lasting commitment to the principles of inclusive education.

METHODOLOGY

This study is characterized as a **narrative literature review** employing a qualitative, descriptive, and exploratory approach. It was conducted to analyze the contributions of technological resources to the school inclusion of students eligible for Special Education services, taking pedagogical, technological, legal, and institutional aspects into consideration.

The narrative review was selected because it allows knowledge produced in the fields of Special Education, Educational Technology, Inclusive Education, Educational Psychology, Computer Science, Public Policy, and Teacher Education to be integrated. According to Rother (2007), this type of review makes it possible to identify scientific trends, discuss different theoretical perspectives, and construct interpretive syntheses of emerging and interdisciplinary topics.

The literature search was conducted between May and July 2026 in Scopus, Web of Science, the Education Resources Information Center (ERIC), SciELO, Google Scholar, ScienceDirect, the Virtual Health Library (*Biblioteca Virtual em Saúde*—BVS), and the CAPES Journals Portal. It was supplemented by a consultation of official documents published by the Ministry of Education (*Ministério da Educação*—MEC), the Anísio Teixeira National Institute for Educational Studies and Research (*Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira*—INEP), UNESCO, OECD, UNICEF, and the United Nations (UN).

The descriptors used were "educação inclusiva", "educação especial", "tecnologias assistivas", "tecnologias digitais", "acessibilidade digital", "inteligência artificial na educação", "desenho universal para aprendizagem", "inclusive education", "assistive technology", "digital accessibility", "educational

technology" and "artificial intelligence in education", combined using the Boolean operators AND and OR.

The inclusion criteria encompassed scientific articles, books, book chapters, master's dissertations, doctoral theses, technical documents, legislation, and institutional publications available in full in Portuguese, English, or Spanish and published primarily between 2020 and 2026. The selected works addressed technological resources applied to Special Education, digital inclusion, accessibility, teacher education, public policy, and educational innovation. Classic works considered fundamental to understanding the integration of technology and curriculum were also included.

Duplicate studies, publications that had not undergone peer review, abstracts from scientific events, opinion documents without a methodological basis, and studies focusing exclusively on the technical aspects of technology without an interface with inclusive education were excluded.

RESULTS AND DISCUSSION

The literature analysis shows that incorporating digital technologies into educational settings has produced significant advances in consolidating inclusive education, particularly by expanding opportunities for participation, communication, autonomy, and learning among students eligible for Special Education services (Kenski, 2012; Sonza et al., 2013; UNESCO, 2023). Nevertheless, the studies consistently affirm that merely making technological equipment available does not guarantee school inclusion. The effectiveness of these resources depends on coordination among adequate infrastructure, teacher education, pedagogical planning, school management committed to innovation, and public policies capable of guaranteeing digital accessibility (Mantoan, 2015; Gottschalk; Weise, 2023; UNESCO, 2023).

This understanding is aligned with Mantoan (2015), according to whom inclusion cannot be reduced to a student's physical presence in a mainstream school because it requires changes in pedagogical practices, curriculum organization, and institutional culture itself. From this perspective,

technologies must be linked to pedagogical proposals that recognize diversity and eliminate barriers capable of restricting student participation and learning. Sassaki (2009) adds that accessibility must be understood in its various dimensions, encompassing not only architectural aspects but also communicational, methodological, instrumental, programmatic, and attitudinal conditions.

The results demonstrate that assistive technologies are among the main instruments for eliminating barriers to learning. Bersch (2017) defines Assistive Technology as an interdisciplinary field encompassing resources, services, strategies, and practices intended to enhance the functioning, independence, autonomy, and participation of persons with disabilities. In the school environment, these resources include screen readers, speech synthesizers, screen magnifiers, adapted keyboards, augmentative and alternative communication software, eye-tracking devices, augmentative communication applications, and accessible digital platforms.

These resources significantly enhance the autonomy of students with visual, hearing, physical, or intellectual disabilities and those with autism spectrum disorder. Galvão Filho (2009) emphasizes that Assistive Technology can facilitate students' effective participation in school activities, provided that it is selected according to their individual needs, abilities, and characteristics. Sonza et al. (2013) also emphasize that accessibility and Assistive Technology resources contribute to the social and digital inclusion of persons with disabilities by providing more equitable access to information, communication, and knowledge.

The literature shows that these resources foster greater independence in school activities and expand opportunities for participation in classroom pedagogical practices. Pereira, Braz, and Gonçalves (2024) find that assistive technologies can contribute to the inclusion of students eligible for Special Education services, particularly when the resources are aligned with pedagogical planning and each student's specific needs. However, Borges and Tartuci (2017) caution that conceptual imprecision concerning Assistive Technology can make it difficult for teachers to select and use appropriate resources, thereby undermining their inclusive function.

Another widely identified issue concerns the potential of digital educational platforms to promote personalized learning. Adaptive systems allow content to be presented in different formats, respecting individual learning rates, styles, and needs (Molenaar, 2021; Gottschalk; Weise, 2023). Multimedia tools, audiovisual resources, automatic captions, audio description, translation into Brazilian Sign Language (Libras), and accessible interfaces help expand access to information and strengthen student participation in curricular activities (Sonza et al., 2013; UNICEF, 2022).

Molenaar (2021) emphasizes that artificial intelligence-supported education systems can provide personalized learning pathways by combining teachers' work with tools capable of identifying needs and adapting activities. Personalization, however, should not lead to isolation or fragmentation of the educational process. Its use must be guided by the teacher and integrated with social interactions, curricular objectives, and collective learning experiences.

The studies also reveal the increasing use of artificial intelligence as a tool for supporting inclusive education. Artificial intelligence-based applications enable the automatic adaptation of content, production of accessible materials, speech recognition, machine translation, generation of simplified texts, identification of learning difficulties, and development of personalized learning environments (Molenaar, 2021; UNESCO, 2023). These resources can support students who experience difficulties with communication, reading, writing, mobility, or information processing.

UNESCO (2023), however, emphasizes that these technologies must be used ethically, transparently, and responsibly, in accordance with principles relating to data protection, equity, inclusion, and nondiscrimination. The use of intelligent tools without pedagogical oversight and ethical criteria may reproduce inequalities, create technological dependence, or expose students' personal information. Artificial intelligence should therefore serve as a resource supporting teachers' work rather than replacing pedagogical mediation.

The literature demonstrates that teacher education remains one of the principal challenges to the effective use of inclusive digital technologies. Many teachers still experience difficulties with the

pedagogical use of assistive technologies, the adaptation of digital teaching materials, the planning of accessible activities, and the use of inclusive educational platforms (Borges; Tartuci, 2017; Bueno et al., 2022). These difficulties show that technical proficiency with equipment, although necessary, is insufficient to transform pedagogical practices.

Kenski (2012) states that integrating technologies into education requires changes in how teaching, learning, and pedagogical work are organized. From this perspective, teacher education must enable teachers to understand the potential, limitations, and pedagogical implications of digital tools. Borges and Tartuci (2017) reinforce that professional education should encompass conceptual and practical knowledge of Assistive Technology, preventing resources from being used out of context or without alignment with students' needs.

Another recurring finding concerns inequalities in access to technological infrastructure. Several studies indicate that public schools still face constraints related to the availability of equipment, connectivity, technological maintenance, and the acquisition of assistive technologies (Gottschalk; Weise, 2023; UNESCO, 2023). These inequalities undermine the continuity of digital pedagogical practices and more severely affect students experiencing social vulnerability or requiring specialized resources.

These difficulties intensified during the period of emergency remote instruction resulting from the COVID-19 pandemic, when many students eligible for Special Education services were unable to participate adequately in school activities because accessible digital resources were unavailable. Pagaime et al. (2022) identified obstacles related to access to technologies, adaptation of activities, pedagogical support, and communication among teachers, students, and families. Bueno et al. (2022) likewise demonstrated that serving these students during remote instruction required replanning, curricular flexibility, and coordination between mainstream classroom teachers and Special Education professionals.

The findings of these studies indicate that digital inequality is not limited to a lack of internet access or equipment. It also encompasses connection quality, platform accessibility, the availability of adapted resources, and the competencies necessary to use them. Gottschalk and Weise (2023) note that

digital equity requires effective conditions for access, participation, and learning, taking into account the social, economic, territorial, and educational differences among students.

The research also shows that Universal Design for Learning (UDL) is an important strategy for integrating technologies into pedagogical processes. This approach proposes that curricula be designed from the outset to accommodate different forms of content presentation, expression of knowledge, and student participation, thereby reducing the need for later adaptations. According to CAST (2024), UDL is structured around three fundamental principles: providing multiple means of engagement, multiple means of representation, and multiple means of action and expression.

The studies demonstrate that the coordinated use of UDL and digital technologies expands learning opportunities for all students and supports more inclusive pedagogical practices. Resources such as adjustable digital texts, audio materials, captioned videos, audio description, tactile materials, images, graphs, and interactive activities allow the same content to be accessed and understood through different means. Planning therefore ceases to focus on individual limitations and instead considers the barriers present in curricula, materials, and methodologies (CAST, 2024; UNESCO, 2023).

Another issue identified concerns the strategic role of school management in implementing inclusive educational technologies. School leaders committed to pedagogical innovation promote investment in technological infrastructure, school staff education, institutional planning, and the acquisition of accessible resources. Educational leadership directly influences the consolidation of a school culture conducive to digital inclusion by encouraging collaborative practices among teachers, Specialized Educational Support (*Atendimento Educacional Especializado*—AEE) professionals, families, and the community (Mantoan, 2015; UNESCO, 2023).

School management is also responsible for identifying existing barriers and organizing the human, pedagogical, and technological resources necessary to address them. Inclusion requires shared institutional work and cannot be attributed exclusively to mainstream classroom teachers or AEE professionals. This understanding is present in the National Policy on Special Education from the

Perspective of Inclusive Education, which provides guidance on coordination among mainstream education, Specialized Educational Support, and other support services (Brasil, 2008).

The results also indicate that family participation is a relevant factor in the success of inclusive practices mediated by digital technologies. Family involvement facilitates the appropriate use of technological resources outside the school environment, strengthens communication between schools and students' legal guardians, and expands support for students' academic development. UNICEF (2022) emphasizes that implementing Assistive Technology should involve teachers, specialized professionals, students, and family members so that resources are used continuously and in a manner compatible with the different contexts of students' lives.

Coordination among schools, families, and public policies is therefore essential to enhance the benefits provided by assistive technologies. Family participation, however, must not entail transferring the school's educational responsibilities to students' legal guardians. Educational institutions are responsible for providing guidance, monitoring, and technical-pedagogical support so that families can participate collaboratively in the process.

At the public policy level, the literature shows that achieving school inclusion in the digital age depends on continuous investment in connectivity, technological infrastructure, teacher education, and the development of accessible pedagogical materials. The Federal Constitution of 1988 and the National Education Guidelines and Framework Law establish education as a right for all and mandate equal conditions for access to and continued attendance at school (Brasil, 1988, 1996).

The National Policy on Special Education from the Perspective of Inclusive Education reinforces the right of students eligible for Special Education services to attend mainstream classes in conjunction with access to Specialized Educational Support (Brasil, 2008). The Brazilian Law on the Inclusion of Persons with Disabilities requires the elimination of barriers and the adoption of Assistive Technology and accessibility resources, while the National Common Curricular Base recognizes digital culture as a fundamental competency in basic education (Brasil, 2015, 2018).

The National Digital Education Policy, established by Law No. 14,533/2023, represents another advance toward building more inclusive education systems by establishing guidelines concerning digital inclusion, digital education in schools, professional development, and research and development in information and communication technologies (Brasil, 2023). Its implementation, however, still faces challenges related to funding, regional inequalities, and the capacity of public education systems to incorporate technological innovations into everyday school life.

The analyses also demonstrate that advances in digital technologies expand opportunities to build personalized and accessible educational environments but require constant attention to ethical issues. The use of artificial intelligence, educational data analytics, and digital platforms must respect student privacy, prevent discriminatory bias, and ensure transparency in the use of information produced by technological systems (Molenaar, 2021; Gottschalk; Weise, 2023; UNESCO, 2023).

Data protection becomes even more important when technologies are used with children, adolescents, and students with disabilities, as these groups may be more exposed to risks associated with collecting, storing, and sharing personal information. Innovation must therefore remain subordinate to the principles of human dignity, safety, accessibility, equity, and nondiscrimination.

Overall, the literature converges in recognizing technological resources as important instruments for strengthening contemporary inclusive education (Bersch, 2017; Sonza et al., 2013; UNESCO, 2023). Their potential is fully realized, however, only when they are integrated into pedagogical practices grounded in inclusion, accessibility, teacher education, democratic management, and the implementation of public policies capable of ensuring equal opportunities and meaningful learning for all students (Mantoan, 2015; Gottschalk; Weise, 2023).

To systematize the review's principal findings, Table 1 presents the categories that appeared most frequently in the studies analyzed, relating each dimension to the contributions identified and the authors underpinning the discussion.

Table 1

Summary of the principal findings concerning digital technologies and school inclusion

Category of analysis	Summary of findings	Reference authors and documents
Assistive technologies	Screen readers, speech synthesizers, adapted keyboards, augmentative and alternative communication, and other resources enhance the functioning, autonomy, and participation of students eligible for Special Education services.	Bersch (2017); Galvão Filho (2009); Sonza et al. (2013); Pereira, Braz, and Gonçalves (2024)
Personalized learning	Adaptive platforms and multimodal resources enable content to be presented in different formats, taking different learning rates, needs, and approaches into consideration.	Molenaar (2021); Gottschalk and Weise (2023); UNICEF (2022)
Artificial intelligence	Intelligent tools can adapt content, simplify texts, recognize speech, and support the identification of difficulties, but they require teacher mediation and ethical use.	Molenaar (2021); UNESCO (2023)
Teacher education	The inclusive use of technology depends on pedagogical, digital, and conceptual knowledge concerning accessibility and Assistive Technology and is not limited to technical proficiency with equipment.	Kenski (2012); Borges and Tartuci (2017); UNESCO (2023)
Infrastructure and digital equity	A lack of equipment, connectivity, maintenance, and accessible resources limits student participation and deepens inequalities among education systems and regions.	Bueno et al. (2022); Pagaime et al. (2022); Gottschalk and Weise (2023)
Universal Design for Learning	Planning multiple means of engagement, representation, action, and expression reduces curricular barriers and benefits all students.	CAST (2024); UNESCO (2023)
School management and collaborative work	Implementing inclusive technologies requires leadership, institutional planning, and collaboration among teachers, AEE professionals, specialized professionals, and the school community.	Mantoan (2015); Brasil (2008); UNESCO (2023)
Family participation	Coordination between schools and families supports continued use of resources, the monitoring of activities, and the identification of student needs.	UNICEF (2022); Mantoan (2015)
Public policies and legislation	Guaranteeing digital inclusion depends on giving effect to educational rights, accessibility, specialized support, and sustained public investment.	Brasil (1988, 1996, 2008, 2015, 2018, 2023)
Ethics, privacy, and data protection	The use of artificial intelligence and digital platforms must respect transparency, safety, privacy, equity, and nondiscrimination.	Molenaar (2021); Gottschalk and Weise (2023); UNESCO (2023)

Source: Prepared by the authors (2026), based on the studies analyzed.

The organization of the categories in Table 1 demonstrates that the contributions of technology to school inclusion extend beyond the provision of equipment or digital platforms. Their outcomes encompass dimensions related to student autonomy, personalized learning, curricular accessibility, teacher education, collaborative work, and the consolidation of inclusive public policies.

At the same time, the challenges identified indicate that the effectiveness of these resources depends on adequate infrastructure, connectivity, professional education, pedagogical planning, participatory school management, and ethical oversight of technological innovation. Digital technologies therefore contribute effectively to inclusion only when incorporated into an educational project committed to eliminating barriers and guaranteeing the participation and learning of all students.

CONCLUSION

This narrative review made it possible to analyze the contributions of technological resources to the school inclusion of students eligible for Special Education services, showing that digital technologies are important instruments for promoting accessibility, autonomy, participation, and learning. The literature demonstrates that incorporating assistive technologies, accessible digital platforms, artificial intelligence, and the principles of Universal Design for Learning significantly expands educational opportunities, supporting more equitable and personalized pedagogical practices.

The results showed that the use of technology in inclusive education extends beyond the technical dimension and requires the integration of pedagogical innovation, curriculum planning, teacher education, school management, and public policy. Merely making equipment or software available does not guarantee effective inclusion. These resources must be aligned with pedagogical practices grounded in human rights, the valuing of diversity, and a commitment to every student's learning.

Another relevant aspect identified concerns the initial and continuing education of education professionals. Developing digital competencies related to accessibility, the use of assistive technologies, and the preparation of inclusive teaching materials is essential if teachers and school leaders are to use technological resources critically, ethically, and in pedagogically meaningful ways. Valuing professional education strengthens teacher autonomy and expands schools' capacity to respond to the demands of inclusive education in a digital society.

The research also demonstrated that significant challenges remain in relation to the technological infrastructure of public education systems. Unequal internet access, insufficient adapted equipment, limited financial resources, and regional differences undermine the effectiveness of digital inclusion policies. These factors reinforce the need for continuous public investment in connectivity, assistive technologies, digital accessibility, and stronger infrastructure in educational institutions.

Another relevant finding concerns the strategic role of school management in implementing inclusive technologies. School leaders committed to educational innovation support the creation of collaborative environments, encourage continuing education for school staff, and promote institutional processes aimed at integrating technologies into the curriculum. Similarly, family participation and coordination among education, health care, and social assistance enhance the effectiveness of initiatives intended to include students eligible for Special Education services.

The discussions analyzed also show that advances in artificial intelligence, adaptive learning, and accessible digital platforms expand opportunities for personalized instruction. These technologies, however, must be used in accordance with ethical principles concerning data protection, transparency, equity, and the prevention of discriminatory practices. Technological innovation must remain subordinate to educational objectives and students' fundamental rights, strengthening inclusive education without replacing the indispensable role of human mediation.

A limitation of this study is that the investigation was conducted through a narrative literature review and did not include empirical analysis of the use of assistive technologies in specific school contexts. Future research should conduct field studies involving public and private schools to investigate the effects of digital technologies on indicators of learning, development of autonomy, accessibility, and school inclusion.

It is therefore concluded that school inclusion in the digital age depends on coordination among technological innovation, teacher education, democratic school management, public inclusion policies, and guaranteed digital accessibility. Educational technologies are fundamental tools for expanding

opportunities for learning and participation, provided that they are used ethically, intentionally, and in accordance with the principles of inclusive education. Strengthening these initiatives will contribute to building more democratic and equitable education systems that are better prepared to address the challenges of contemporary society.

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CONTINUING TEACHER EDUCATION: ONGOING PROFESSIONAL DEVELOPMENT TO INNOVATE, REFLECT, AND TRANSFORM TEACHING PRACTICE

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Abstract

This study analyzes the contributions of continuing teacher education to teachers' professional development, highlighting its role in pedagogical innovation, critical reflection, and the transformation of teaching practice. This qualitative bibliographic study is based on Brazilian and international scientific publications, as well as official documents concerning teacher education and educational policies. The literature reviewed indicates that continuing teacher education programs improve pedagogical practices, strengthen professional autonomy, expand teachers' ability to use innovative methodologies, and contribute to building more inclusive, collaborative, and student-centered educational environments. The studies also show that professional development processes grounded in collective reflection, inquiry into

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one's own practice, and collaboration among teachers produce more consistent outcomes than isolated training initiatives. Nevertheless, challenges remain concerning discontinuities in public policies, time constraints, teachers' working conditions, and the need to consolidate institutional cultures focused on ongoing professional learning. It is concluded that continuing teacher education is a strategic means of strengthening teachers' professional identity and promoting education committed to innovation, teaching quality, and students' holistic development.

Keywords: Continuing teacher education, Educational innovation, Pedagogical practice, Teacher professional development.

INTRODUCTION

The profound social, technological, cultural, and educational transformations that have occurred in recent decades have significantly increased the demands associated with teaching, making continuing teacher education an essential component of teachers' professional development. Growing classroom diversity, the incorporation of digital technologies into educational processes, the consolidation of inclusive education, curricular changes, and the need to develop competencies suited to contemporary society require teachers to continually update their knowledge, reflect critically on their practices, and devise new teaching strategies. As António Nóvoa (2022) states, teacher professional development is not limited to acquiring new knowledge but entails an ongoing process of reflection, collaboration, and reconstruction of professional identity throughout one's career.

In this context, continuing teacher education is no longer understood as a set of occasional courses intended to provide technical updates, but as an ongoing process of professional learning. This perspective recognizes that teachers produce knowledge through their own experience, inquiry into their practice, and dialogue with other education professionals. According to Imbernón (2023), continuing teacher education should create opportunities for critical reflection, collaborative research, and the

collective construction of knowledge, thereby fostering effective changes in pedagogical practices and strengthening teacher autonomy.

The importance attributed to continuing teacher education is supported by Brazilian educational policies. The National Education Guidelines and Framework Law (*Lei de Diretrizes e Bases da Educação Nacional—LDB*), Law No. 9,394/1996, establishes that education systems must ensure opportunities for teachers' professional improvement. In addition, the National Common Framework for the Continuing Education of Basic Education Teachers (*Base Nacional Comum para a Formação Continuada de Professores da Educação Básica—BNC-Formação Continuada*) (Brazil, 2020) stipulates that teacher professional development should be grounded in ongoing educational processes aligned with the needs of pedagogical practice, the demands of schools, and the development of the professional competencies required for teaching.

In addition to updating scientific knowledge, continuing teacher education helps strengthen teachers' capacity to innovate, investigate, and transform their pedagogical practices. The incorporation of active methodologies, digital technologies, inclusive strategies, formative assessment, and interdisciplinary practices requires professional development processes that extend beyond the technical dimension and promote ongoing reflection on the profession's everyday challenges. As Tardif (2014) emphasizes, teacher knowledge is continually constructed through the intersection of academic education, professional experience, and interaction with different professional contexts, making professional learning an ongoing and dynamic process.

Nevertheless, despite recognition of the importance of continuing teacher education, challenges remain concerning fragmented public policies, insufficient time allocated for study, teachers' working conditions, and professional development programs that are disconnected from schools' actual needs. As Gatti (2021) argues, teacher education policies produce more consistent results when they are aligned with the pedagogical practices developed in schools and grounded in critical reflection on teaching and learning processes.

Against this background, the following guiding question emerges: How does continuing teacher education contribute to teachers' professional development and to the innovation, reflection, and transformation of teaching practice?

To address this question, the general objective of this study is to analyze the contributions of continuing teacher education to teacher professional development, highlighting its role in pedagogical innovation, critical reflection, and the transformation of educational practices.

The specific objectives are to:

- (i) understand the theoretical foundations of continuing teacher education;
- (ii) discuss the relationships among professional development, reflection on practice, and pedagogical innovation;
- (iii) identify the challenges associated with implementing continuing teacher education policies; and
- (iv) analyze the contributions of professional development processes to improving the quality of teaching and learning.

This study is justified by the need to strengthen teacher education policies and practices capable of responding to the challenges of contemporary education. In a society characterized by rapid transformations and the growing complexity of educational processes, investing in continuing teacher education means promoting teachers' professional development, improving the quality of pedagogical practices, and contributing to a more democratic and inclusive education committed to meaningful student learning.

THEORETICAL FRAMEWORK

Continuing teacher education is one of the principal structural pillars of teacher professional development and is understood as an ongoing process of constructing, updating, and reinterpreting the knowledge required for teaching. Rather than being limited to isolated professional development activities

or technical training, continuing teacher education should be understood as an ongoing process pursued throughout a teacher's professional career. This trajectory combines scientific knowledge, experiences developed in everyday school life, critical reflection, and collaborative learning, helping teachers expand their knowledge and continually improve their pedagogical practices (Augusto et al., 2026). As Nóvoa (2022) states, teacher education does not end with initial teacher preparation but is consolidated throughout one's professional life through ongoing processes of inquiry, collaboration, and reconstruction of teacher identity. This perspective shifts the focus from content transmission to the collective construction of professional knowledge.

The continuity of this professional development process is reinforced by Rosemberg (2002, p. 138), who states:

“Continuing education is a requirement of the present day. It may therefore be stated that teacher education occurs along a continuum, beginning with basic education and subsequently supplemented by initial teacher education programs, which equip teachers to act in social practice and participate in the world and the labor market.”

Teacher education is therefore understood not as an isolated stage, but as a trajectory that begins even before entry into the profession and remains under construction throughout one's career. In addition to accompanying teachers throughout their professional trajectories, continuing teacher education helps overcome limitations arising from initial teacher preparation and address concrete problems experienced in everyday school life. Curricular changes, new technological resources, social transformations, and differing learning needs require continual updating and a willingness to reconstruct knowledge. In this regard, Camilotti and Gobara (2021, p. 18) emphasize that “continuing and ongoing education is an essential instrument for the collective emancipation of pedagogical practices.”

The understanding of teaching as a reflective profession is strongly supported by Schön's contributions (2000). According to the author, professionals face complex and unpredictable situations that cannot be resolved solely through the mechanical application of previously acquired knowledge.

Teaching practice therefore requires continuous processes of reflection-in-action and reflection-on-action, enabling teachers to critically analyze their experiences and continually reorganize their pedagogical strategies. Although this is a classic work, its approach remains widely used in contemporary teacher education research because it provides a sound basis for understanding professional practice as an ongoing space for learning.

Maurice Tardif's contributions (2014) are also fundamental to this discussion. The author understands teacher knowledge as the result of integrating academic knowledge, professional experience, pedagogical practices, and interactions established in everyday school life. According to Tardif (2014), teachers produce knowledge through their professional activities, making experience a constitutive element of teacher professionalism. This understanding reinforces the need for professional development processes that recognize everyday school life as a privileged space for knowledge production, inquiry, and professional development.

Continuing teacher education is also supported by Brazilian educational policies. The National Education Guidelines and Framework Law, Law No. 9,394/1996, establishes that education systems must ensure teachers ongoing opportunities for professional improvement. In addition, the National Common Framework for the Continuing Education of Basic Education Teachers (Brazil, 2020) stipulates that professional development should be grounded in the integration of theory and practice, pedagogical inquiry, collaboration among teachers, and the development of professional competencies suited to the contemporary challenges of education. These documents reinforce the principle that continuing teacher education is essential to ensuring the quality of the educational process.

The relationship between continuing teacher education and pedagogical innovation is also significant. Constant technological, scientific, and social transformations require teachers to develop competencies related to the use of active methodologies, digital technologies, inclusive practices, formative assessment, and interdisciplinary teaching. As Francisco Imbernón (2023) emphasizes, continuing teacher education should foster effective changes in pedagogical practices through critical

reflection, collaborative research, and collective efforts to solve problems experienced in everyday school life. From this perspective, innovation results not merely from introducing new technologies or methodologies, but from teachers' ability to critically reinterpret their practice and construct contextualized pedagogical alternatives.

Collaborative learning among teachers is one of the principal drivers of professional development. Learning communities, study groups, action research, peer observation, and collaborative projects promote the exchange of experiences, the collective construction of knowledge, and the strengthening of teachers' professional identity. Fullan (2020) emphasizes that collaborative processes strengthen schools' capacity to promote innovation and continuous improvement by enabling teachers to share challenges, develop joint solutions, and consolidate institutional cultures focused on ongoing professional learning.

Preparing teachers to address the challenges of contemporary education broadens this discussion. Classroom diversity, inclusive education, digital culture, the use of artificial intelligence, active methodologies, and new curricular demands require teachers who are capable of learning continuously and adapting their practices to constant changes in the educational context. Bernadete Gatti (2021) states that teacher education policies have more consistent impacts when they are aligned with schools' actual needs and foster ongoing professional development processes grounded in critical reflection, inquiry, and the improvement of pedagogical practices.

Taken together, the studies reviewed indicate that continuing teacher education is an ongoing process of professional learning that is indispensable to strengthening the quality of education and promoting pedagogical innovation. By integrating critical reflection, the collective production of knowledge, inquiry into practice, and professional development, this approach helps prepare teachers who are more autonomous, critical, and capable of responding to contemporary educational challenges, thereby contributing to the transformation of schools into ongoing spaces for learning, innovation, and human development.

Teacher professional development extends beyond the acquisition of technical knowledge, constituting an ongoing process of constructing professional identity, strengthening autonomy, and improving pedagogical practices. This perspective recognizes teaching as a complex profession characterized by the need to interpret different contexts, make decisions in unpredictable situations, and respond to constant social and educational transformations. In this regard, continuing teacher education plays a strategic role by fostering systematic processes of reflection on practice and the reconstruction of professional knowledge. Marcelo García (2021) emphasizes that teacher professional development is a continuous process of learning throughout one's career, in which experiences, knowledge, values, and institutional contexts converge in the construction of teacher professionalism.

Teacher autonomy occupies an important place in this process because it allows teachers to move beyond acting merely as recipients of predetermined professional development initiatives and begin participating in decisions concerning their own development. Santos (2024, p. 97) argues that “continuing education should empower teachers as agents of their own learning, capable of identifying their professional development needs and pursuing pathways for their professional growth.” Such active participation enables the construction of more meaningful professional development trajectories because it considers each professional's challenges, interests, and concrete experiences.

Critical reflection on practice is one of the most important foundations of continuing teacher education. Teachers cease to be mere implementers of curricular prescriptions and become researchers of their own pedagogical actions by analyzing results, identifying challenges, and continually reorganizing their teaching strategies. This perspective strengthens professional autonomy and expands teachers' capacity to respond to students' needs and transformations in the educational context. Paulo Freire (2021) states that teaching practice requires ongoing reflection because teaching entails conducting research, learning continuously, and reconstructing knowledge from lived experience. Continuing teacher education thus becomes a space for producing knowledge rather than merely updating content.

In discussing the relationship among teaching, learning, and knowledge production, Freire (1998, p. 25) states: “Teaching is not the transfer of knowledge, but the creation of possibilities for its production or construction [...] There is no teaching without learning; the two explain one another, and their participants, despite the differences that distinguish them, are not reduced to the status of objects of one another. Those who teach learn by teaching, and those who learn teach by learning. Whoever teaches, teaches something to someone.”

The integration of theory and practice is another foundation of continuing teacher education. Professional development programs based exclusively on the transmission of theoretical knowledge yield limited results when disconnected from the concrete situations teachers face. Conversely, initiatives grounded in inquiry into everyday school life foster more consistent changes in pedagogical practices. Pimenta (2020) emphasizes that teacher identity is constructed through the ongoing integration of scientific knowledge, professional experience, and critical reflection on educational action. Schools thus cease to be merely places where theories produced at universities are applied and become environments in which new pedagogical knowledge is produced.

Throughout this process, collaborative professional development plays a strategic role in professional growth. Study groups, learning communities, action research, peer observation, and institutional projects foster the exchange of experiences, the sharing of challenges, and the collective construction of solutions to problems encountered in everyday school life. Fullan (2020) states that collaborative cultures significantly strengthen educational institutions’ capacity to innovate and continually improve teaching quality because they promote ongoing professional learning based on cooperation among teachers.

Pedagogical innovation also depends on ongoing teacher education processes. Incorporating active methodologies, digital technologies, inclusive education, formative assessment, and blended learning requires teachers to develop new professional competencies capable of addressing the demands of contemporary society. Innovation, however, does not merely mean using new tools or technological

resources; it entails transforming how teaching and learning processes are understood. José Moran (2023) emphasizes that educational innovation depends on teachers' ability to reorganize their pedagogical practices, place students at the center of the educational process, and foster more participatory, collaborative, and meaningful learning experiences.

The consolidation of continuing teacher education also depends on support from public policies. The effectiveness of professional development programs depends on permanent policies aligned with the needs of education systems and committed to recognizing and supporting teachers as professionals. The National Common Framework for the Continuing Education of Basic Education Teachers (Brazil, 2020) establishes that professional development processes must address professional competencies, reflection on practice, collaboration among teachers, and improvements in student learning. This guidance demonstrates that continuing teacher education should be a structural policy of education systems rather than merely an isolated professional updating initiative.

Based on these contributions, continuing teacher education is understood as an ongoing process of professional learning grounded in critical reflection, collaboration, inquiry into practice, and pedagogical innovation. By strengthening teacher autonomy, expanding professional knowledge, and fostering the collective construction of knowledge, this approach helps transform educational practice and promote consistent improvements in the quality of education. Investing in continuing teacher education therefore means strengthening teachers' professional development and consolidating schools committed to learning, innovation, and students' holistic development.

Continuing teacher education also plays a decisive role in consolidating inclusive education and constructing pedagogical practices capable of responding to classroom diversity. Expanded access to education, the implementation of inclusive policies, and growing student heterogeneity require teachers to develop competencies related to curricular flexibility, collaborative planning, the use of diversified methodologies, and the adoption of strategies that promote learning for all. In this context, continuing teacher education enables teachers to continually update their knowledge of inclusion, human

development, and accessible pedagogical practices. Maria Teresa Eglér Mantoan (2022) states that building an inclusive school depends on educating teachers who are capable of understanding diversity as a constitutive element of education and continually reorganizing their practices to eliminate barriers to learning and participation.

Incorporating digital technologies into professional development processes expands the possibilities for professional growth. The digital transformation of education has substantially increased the demands associated with developing teachers' digital competencies, making it essential for teachers to learn how to use technologies critically, ethically, and on a sound pedagogical basis. Virtual platforms, collaborative environments, multimedia resources, artificial intelligence, and digital tools have become part of everyday school life, requiring education professionals to remain continually updated. Valente and Almeida (2021) emphasize that continuing teacher education should prepare teachers to integrate digital technologies into the curriculum in a contextualized manner, fostering methodological innovation, personalized learning, and the strengthening of digital culture in educational institutions.

Inquiry into one's own practice is one of the principal instruments of teacher professional development. By investigating challenges experienced in everyday school life, analyzing results, producing knowledge, and sharing experiences, teachers strengthen their intellectual autonomy and expand their capacity to change pedagogical practices. This perspective brings teaching closer to research by recognizing that knowledge is also produced in schools. André (2020) emphasizes that teacher-researchers develop a greater capacity to understand educational phenomena critically, devise evidence-based interventions, and construct contextualized solutions to problems encountered in everyday practice.

Strengthening teachers' professional identity is an integral part of this process. Continuing teacher education contributes to recognizing the value of the profession by broadening teachers' understanding of the social role of teaching, fostering an ethical commitment to learning, and strengthening their sense of belonging to the profession. Professional development involves not only the acquisition of technical competencies but also the construction of values, responsibilities, and a commitment to transforming

educational realities. Tardif (2014) states that teacher identity is continually constructed through the integration of professional knowledge, lived experience, and relationships established in the school context, making continuing education indispensable to strengthening teacher professionalism.

The evaluation of continuing teacher education programs must also be considered. Recent studies show that professional development produces more consistent impacts when it is ongoing, contextualized, and aligned with schools' concrete needs. Programs centered exclusively on lectures, short courses, or decontextualized training tend to produce limited changes in pedagogical practices. By contrast, initiatives grounded in collaborative learning, action research, peer observation, and the resolution of problems from everyday school life have greater transformative potential. Darling-Hammond, Hyler, and Gardner (2017) demonstrate that effective professional development programs share such characteristics as continuity, collaboration, a focus on pedagogical practice, the use of evidence, and ongoing monitoring of the changes implemented by teachers.

Despite these contributions, the consolidation of continuing teacher education still faces major challenges. These include excessive teacher workloads, insufficient time allocated for study, discontinuities in public policies, financial constraints, and an insufficient number of programs aligned with schools' actual needs. Moreover, many initiatives remain disconnected from the everyday pedagogical context, reducing their potential to transform educational practices. Gatti (2021) emphasizes that teacher education policies must constitute ongoing processes integrated into the development of educational institutions and committed to improving student learning.

In light of these contributions, continuing teacher education constitutes an ongoing process of professional development capable of strengthening teacher autonomy, promoting pedagogical innovation, consolidating inclusive practices, and improving the quality of education. By integrating critical reflection, inquiry into practice, collaboration among teachers, and scientific updating, this approach helps transform everyday school life and strengthen teachers' professional identity. Investing in continuing teacher education therefore means investing directly in the quality of learning, the recognition

of teaching as a profession, and the construction of schools capable of responding to the educational challenges of the twenty-first century.

METHODOLOGY

This research is characterized as a qualitative study developed to analyze the contributions of continuing teacher education to teacher professional development, emphasizing its role in pedagogical innovation, critical reflection, and the transformation of educational practice. The qualitative approach was selected because it enables an in-depth understanding of educational phenomena while considering the pedagogical, social, institutional, and professional aspects that influence teacher education. According to Prodanov and Freitas (2013, p. 70), qualitative research: “[...] considers that there is a dynamic relationship between the real world and the subject, that is, an inseparable connection between the objective world and the subject’s subjectivity that cannot be translated into numbers.”

In terms of its objectives, this research is classified as exploratory and descriptive. Its exploratory nature stems from the need to deepen knowledge of continuing teacher education, teacher professional development, and strategies that foster innovation and improve pedagogical practices. At the same time, it is descriptive because it organizes, systematizes, and interprets scientific evidence concerning teacher education policies, professional learning processes, and transformations in educational practice. According to Gil (2022), exploratory and descriptive research contributes to broadening the understanding of the phenomena under investigation and providing a foundation for future pedagogical interventions.

Regarding technical procedures, bibliographic research was conducted based on the analysis of books, scientific articles, master’s theses, doctoral dissertations, and official documents concerning continuing teacher education, teacher professional development, professional identity, pedagogical innovation, and educational public policies. Bibliographic research is:

“[...] prepared from previously published material, consisting primarily of books, magazines, journal publications and scientific articles, newspapers, bulletins, monographs, master’s theses, doctoral dissertations, cartographic materials, and Internet sources, with the objective of bringing researchers into direct contact with all material already written on the research topic. In bibliographic research, it is important for researchers to verify the accuracy of the data obtained, noting any inconsistencies or contradictions that the works may contain” (Prodanov; Freitas, 2013, p. 54).

The selection of references prioritized publications produced between 2020 and 2025, supplemented by classic works considered fundamental to understanding teacher professionalism, continuing teacher education, and reflection on practice. Searches were performed in the Scientific Electronic Library Online (SciELO), the CAPES Periodicals Portal (Portal de Periódicos da CAPES), Google Scholar, the Education Resources Information Center (ERIC), and ScienceDirect, using descriptors in Portuguese and English, including *formação continuada de professores*, *desenvolvimento profissional docente*, *teacher professional development*, *continuing teacher education*, *teacher learning*, *reflective practice*, and *teacher education*. Official documents were also analyzed, including the National Education Guidelines and Framework Law, Law No. 9,394/1996; the National Common Framework for the Continuing Education of Basic Education Teachers (Brazil, 2020); and UNESCO publications concerning teacher professional development.

The inclusion criteria encompassed studies that directly addressed continuing teacher education, professional development, pedagogical innovation, reflection on practice, collaborative learning, teacher education policies, and improvements in educational quality. Duplicate publications, texts without a scientific foundation, opinion-based materials, and studies unrelated to the research objectives were excluded.

RESULTS AND DISCUSSION

The literature analysis shows that continuing teacher education is one of the most relevant factors in teacher professional development and in improving the quality of teaching and learning processes. Teachers participating in ongoing professional development programs develop a greater capacity to reflect

critically on their practices, reorganize pedagogical strategies, and respond to the social, technological, and curricular transformations that characterize contemporary education. According to Nóvoa (2022), teacher professional development depends on constructing ongoing processes of learning, reflection, and collaboration that move beyond professional development models centered solely on content transmission.

The strengthening of reflective practice emerged as a recurring outcome. Teachers who systematically analyze their work, investigate the results of pedagogical interventions, and share experiences with other professionals demonstrate a greater capacity to innovate and promote meaningful learning. Critical reflection makes it possible to identify difficulties, reinterpret situations experienced in the classroom, and construct alternatives suited to students' needs. Schön (2000) emphasizes that reflective professionals develop greater competence in addressing complex and unpredictable situations by transforming their own experience into an ongoing source of learning.

Continuing teacher education programs grounded in collaborative learning produce more consistent results than isolated professional development activities. Learning communities, study groups, action research, peer observation, and institutional projects promote the exchange of experiences, the collective construction of knowledge, and the strengthening of a collaborative culture in schools. Fullan (2020) states that collaborative environments significantly expand educational institutions' capacity to promote innovation, strengthen teachers' professional identity, and improve the quality of student learning.

The contribution of continuing teacher education to pedagogical innovation is another dimension identified in the literature. The incorporation of active methodologies, digital technologies, inclusive practices, formative assessment, and blended learning depends directly on teachers' ongoing professional learning and the development of professional competencies suited to the demands of contemporary education. Imbernón (2023) emphasizes that contextualized professional development processes foster

effective changes in pedagogical practices by stimulating inquiry, creativity, autonomy, and adaptability in response to educational transformations.

Continuing teacher education strengthens inclusive education by preparing teachers to address classroom diversity. Studies show that programs focused on developing inclusive practices expand teachers' capacity to plan accessible activities, adapt teaching strategies, and use diversified pedagogical resources. The National Common Framework for the Continuing Education of Basic Education Teachers (Brazil, 2020) reinforces the principle that professional development must encompass competencies related to inclusion, equity, and respect for diversity, thereby promoting pedagogical practices committed to the learning of all students.

Despite the contributions identified, the bibliographic research indicates major challenges to consolidating continuing teacher education. These include excessive teacher workloads, limited time allocated for study, discontinuities in public policies, insufficient investment, and programs that are poorly aligned with schools' concrete needs. Gatti (2021) emphasizes that professional development policies produce more significant impacts when implemented continuously, contextually, and in an integrated manner within the daily activities of schools, thereby fostering effective changes in pedagogical practices.

To systematize the principal findings of the review, Table 1 presents the categories that recurred most frequently in the studies analyzed, relating each dimension to the contributions identified and the authors who provide the foundation for the discussion.

Table 1

Summary of the principal findings on continuing teacher education

Category of analysis	Summary of results	Reference authors
Ongoing professional development	Continuing teacher education accompanies teachers throughout their careers, expands their professional knowledge, and enables more effective responses to social, curricular, and technological changes.	Nóvoa (2022)
Reflective practice	Systematically analyzing one’s own work makes it possible to identify difficulties, evaluate interventions, and reorganize pedagogical strategies based on students’ needs.	Schön (2000)
Collaborative learning	Learning communities, study groups, action research, and peer observation strengthen the exchange of experiences and the collective construction of knowledge.	Fullan (2020)
Pedagogical innovation	Professional updating fosters the contextualized adoption of active methodologies, digital technologies, formative assessment, and blended learning.	Imbernón (2023)
Inclusive education	Professional development expands teachers’ capacity to plan accessible activities, adapt strategies, and use diverse resources to address classroom heterogeneity.	Brasil (2020)
Implementation challenges	Excessive workloads, lack of time, policy discontinuities, insufficient investment, and initiatives disconnected from school realities reduce program effectiveness.	Gatti (2021)

Source: Prepared by the authors (2026), based on the studies analyzed.

The organization of the categories in Table 1 demonstrates that the effects of continuing teacher education extend beyond content updating. Its outcomes encompass dimensions related to reflection on practice, professional collaboration, pedagogical innovation, and educational inclusion. At the same time, the challenges identified indicate that the quality of professional development initiatives depends on continuity, contextualization, suitable working conditions, and alignment with schools’ concrete needs.

A critical analysis of the evidence demonstrates that continuing teacher education is a strategic process for strengthening teacher professionalism, promoting pedagogical innovation, and improving educational quality. Its effectiveness, however, depends on integrating consistent public policies, recognition of the teaching career, suitable working conditions, a collaborative institutional culture, and professional development programs committed to inquiry into practice and ongoing professional growth.

CONCLUSION

This study demonstrated that continuing teacher education is essential to teachers' professional development and the transformation of pedagogical practices. The literature analysis showed that ongoing professional learning strengthens teacher autonomy, expands scientific knowledge, fosters critical reflection on practice, and contributes to implementing innovative methodologies suited to the demands of contemporary education.

The studies analyzed demonstrated that continuing teacher education programs grounded in collaboration, inquiry into practice, peer learning, and pedagogical investigation have greater potential to produce effective changes in teachers' work. The findings also showed that ongoing professional development promotes the incorporation of inclusive practices, digital technologies, active methodologies, and more formative assessment processes, thereby helping improve the quality of teaching and learning.

The research also demonstrated that teacher professional development depends on coordination among public policies, recognition of the teaching career, suitable working conditions, and the strengthening of an institutional culture focused on ongoing learning. Continuing teacher education should not be understood as an isolated activity, but as a structural component of educational policies and teacher professionalization.

Nevertheless, challenges remain concerning discontinuities in professional development programs, insufficient resources, excessive workloads, and the need for greater integration among universities, education systems, and schools. Overcoming these obstacles requires continuous investment in recognizing and supporting teachers and in constructing contextualized, collaborative professional development programs aligned with the actual needs of pedagogical practice.

It is therefore concluded that continuing teacher education is indispensable to strengthening teachers' professional identity, promoting educational innovation, and transforming teaching practice. By fostering critical reflection, collaborative learning, and ongoing knowledge development, it contributes to

building a more democratic, inclusive, and innovative education committed to students' holistic development. Future research should empirically investigate the effects of different continuing teacher education models on pedagogical practice and learning outcomes in basic education.

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ARTIFICIAL INTELLIGENCE IN BASIC EDUCATION: TEACHER REPLACEMENT OR RECONFIGURATION OF TEACHING PRACTICE?

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Abstract

This study aims to analyze national and international scientific evidence on the role of artificial intelligence in Basic Education, discussing whether this technology constitutes a mechanism for replacing teachers or for reconfiguring their professional practice. This is a narrative literature review based on scientific articles, official documents, and reports published primarily between 2020 and 2026, supplemented by seminal references on educational technologies and teacher education. The findings show that artificial intelligence does not replace teachers but redefines their roles, shifting the focus from content transmission to pedagogical mediation, the development of critical thinking, personalized

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learning, information curation, and the promotion of social-emotional competencies. The literature also identifies challenges related to teacher education, digital inclusion, data protection, algorithmic transparency, and the ethical use of these technologies in school settings. It is concluded that the effectiveness of artificial intelligence in Basic Education depends on the coordination of technological innovation, continuing teacher education, adequate infrastructure, and stronger teacher autonomy, recognizing teachers as key agents in educational processes within a society increasingly shaped by intelligent technologies.

Keywords: Artificial Intelligence, Basic Education, Educational Technologies, Pedagogical Innovation, Teaching Profession.

INTRODUCTION

Artificial intelligence (AI) has become established as one of the leading disruptive technologies of the twenty-first century, driving significant transformations across different sectors of society, including health care, the economy, industry, communication, and education. Advances in systems capable of processing large volumes of data, recognizing patterns, generating texts, images, and videos, and providing complex responses in natural language have expanded the possibilities for applying AI in school settings, redefining pedagogical practices, modes of learning, and educational management processes.

In Basic Education, the incorporation of artificial intelligence-based tools intensified particularly after the COVID-19 pandemic, a period during which the digitalization of educational processes accelerated the adoption of virtual platforms, intelligent learning environments, and automated teaching-support systems. Resources such as intelligent tutors, virtual assistants, adaptive platforms, automated grading of assignments, predictive analysis of academic performance, and generative models have become part of teachers' and students' daily routines, expanding opportunities for instructional personalization, the production of teaching materials, and the monitoring of learning.

However, the rapid dissemination of these technologies has also prompted intense debate about the future of the teaching profession. The development of generative models capable of answering questions, preparing lesson plans, creating assessments, correcting texts, and providing detailed explanations has raised questions about whether teachers might be replaced by intelligent systems. This discussion extends beyond technological considerations and encompasses ethical, pedagogical, legal, and social dimensions related to the role of schools in human development, the cultivation of critical thinking, and the preservation of the interpersonal relationships that characterize the educational process.

Contemporary literature demonstrates that artificial intelligence significantly changes teachers' work but does not eliminate the need for human involvement. According to Luckin (2018), AI has considerable potential to support pedagogical decision-making, provided that it is used as a technology that complements teachers' work. From a similar perspective, Holmes, Bialik, and Fadel (2019) argue that intelligent systems enhance the capacity to personalize learning, yet remain incapable of replacing distinctly human competencies such as empathy, ethical judgment, conflict mediation, cultural sensitivity, and the building of affective bonds. Selwyn (2019), in turn, cautions that the indiscriminate use of these technologies may exacerbate educational inequalities, reinforce algorithmic biases, and diminish teachers' professional autonomy when implementation occurs without critical reflection.

Internationally, organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) have emphasized that artificial intelligence must be guided by ethical principles, transparency, inclusion, and a human-centered approach. The Recommendation on the Ethics of Artificial Intelligence (UNESCO, 2021) and the Guidance for Generative AI in Education and Research (UNESCO, 2023) maintain that these technologies should strengthen, rather than replace, educators' work. Similarly, the Organisation for Economic Co-operation and Development (OECD, 2024) emphasizes that integrating AI into education systems requires investment in digital infrastructure, artificial intelligence literacy, and continuing teacher education for the critical and responsible use of these tools.

In Brazil, the expansion of artificial intelligence is occurring alongside the implementation of the National Common Curricular Base (Base Nacional Comum Curricular—BNCC), the National Digital Education Policy (Law No. 14,533/2023), and growing discussions concerning teachers' digital competencies. These regulatory frameworks recognize the importance of using digital technologies critically in education while reinforcing the need for teachers' continuing education to address the challenges arising from society's digital transformation.

Despite technological advances, schools continue to perform functions that extend beyond content transmission. Students' comprehensive development involves processes of socialization, social-emotional development, citizenship building, ethical education, and cultural mediation, all of which depend on teachers' conscious, reflective, and context-sensitive involvement. In this sense, artificial intelligence tends to reconfigure teaching practice by shifting the focus away from repetitive tasks and toward functions of greater intellectual, pedagogical, and relational complexity, without eliminating the educator's central role in the teaching and learning process.

Against this backdrop, the following research question is posed: How has artificial intelligence reconfigured the role of teachers in Basic Education, and to what extent can its applications replace or complement functions traditionally performed by teachers?

Based on this problem, the study aims to analyze national and international scientific evidence concerning the impacts of artificial intelligence on Basic Education, discussing whether this technology constitutes a mechanism for replacing teachers or for reconfiguring teaching practice. It seeks to understand the potential, limitations, ethical challenges, and pedagogical implications of AI, thereby contributing to the debate on teacher education, educational innovation, and the role of teachers in a society marked by the growing presence of intelligent systems.

THEORETICAL FRAMEWORK

ARTIFICIAL INTELLIGENCE: CONCEPTS, DEVELOPMENT, AND APPLICATIONS IN EDUCATION

Artificial intelligence (AI) is an interdisciplinary field of computer science devoted to developing systems capable of performing tasks that traditionally require human intelligence, such as learning, reasoning, decision-making, pattern recognition, and natural language processing. Russell and Norvig (2021) define AI as the construction of intelligent agents capable of perceiving their environment, interpreting information, and acting rationally to achieve specific objectives. Kaplan and Haenlein (2019) add that recent advances in machine learning and deep learning have significantly expanded the capabilities of intelligent systems, enabling applications in different fields of knowledge, including education.

In the educational context, artificial intelligence has assumed a strategic role in transforming teaching and learning processes. Luckin (2018) states that AI provides resources for personalizing instruction, continuously monitoring student performance, identifying learning difficulties at an early stage, and supporting pedagogical decision-making. Holmes, Bialik, and Fadel (2019) emphasize that intelligent systems make it possible to adapt content to students' individual needs, fostering more flexible and student-centered learning experiences. Selwyn (2019), however, cautions that incorporating these technologies requires critical analysis that considers ethical, social, and pedagogical issues related to teacher autonomy, data privacy, and potential algorithmic biases.

International organizations also recognize the transformative potential of artificial intelligence in education. UNESCO (2021) establishes that the use of AI must respect ethical principles, human rights, inclusion, and transparency, preventing technology from exacerbating educational inequalities. Subsequently, UNESCO (2023) reinforces the view that generative artificial intelligence represents an opportunity for pedagogical innovation, provided that it is used as a complementary tool in teachers' work and is accompanied by teacher professional development and technology governance policies.

ARTIFICIAL INTELLIGENCE AND THE RECONFIGURATION OF TEACHING PRACTICE

The expansion of artificial intelligence has significantly changed the role of teachers, shifting their work away from the mere transmission of content and toward functions related to pedagogical mediation, information curation, the development of critical thinking, and the personalized monitoring of learning. Nóvoa (2022) states that twenty-first-century teachers are assuming an increasingly strategic role in creating learning experiences, acting as mediators in knowledge production within environments permeated by digital technologies.

According to Tardif (2014), teachers' work is grounded in professional knowledge built through experience, education, and human interactions, dimensions that cannot be fully reproduced by automated systems. From a similar perspective, Imbernón (2017) argues that contemporary teacher education must include digital competencies that allow technologies to be integrated critically and on a sound pedagogical basis into curricula.

Holmes et al. (2022) emphasize that artificial intelligence-based tools automate repetitive activities, such as grading exercises, organizing data, and preparing reports, allowing teachers to focus their efforts on activities of greater cognitive complexity, including pedagogical planning, problem-solving, individualized support, and the development of social-emotional competencies. According to Luckin (2018), artificial intelligence should be understood as a technology that supports teachers rather than as a mechanism designed to replace human involvement.

Similarly, the OECD (2023) emphasizes that the future of the teaching profession will depend on education systems' ability to integrate intelligent technologies while preserving professional autonomy, pedagogical judgment, and the centrality of human relationships in educational processes.

LIMITS TO THE REPLACEMENT OF TEACHERS BY ARTIFICIAL INTELLIGENCE

Although technological advances have expanded the capabilities of intelligent systems, the literature reflects broad agreement that artificial intelligence is not capable of fully replacing teachers.

Freire (2021) understands education as a dialogical practice grounded in interaction among individuals, a process incompatible with exclusively automated models of instruction. For the author, teaching involves dialogue, listening, problematizing reality, and collectively constructing knowledge, all of which transcend algorithmic processing.

Biesta (2022) argues that education cannot be reduced to the efficient transmission of information because it involves ethical development, emancipation, citizenship building, and the development of students' intellectual autonomy. From this perspective, artificial intelligence can support pedagogical activities but remains incapable of reproducing aspects related to moral judgment, cultural sensitivity, context-sensitive creativity, and the mediation of interpersonal relationships.

Selwyn (2019) further emphasizes that algorithms reflect human choices embedded in computer systems and may therefore reproduce prejudices, discrimination, and inequalities present in the data used for their training. Consequently, the use of AI in education requires continuous teacher supervision to ensure that pedagogical decisions are not delegated exclusively to automated systems.

UNESCO (2023) reinforces that the ethical use of artificial intelligence presupposes transparency, algorithmic explainability, personal data protection, human oversight, and respect for the rights of children and adolescents, all of which are essential principles for its responsible use in school settings.

TEACHER EDUCATION, ETHICS, AND CHALLENGES IN INTEGRATING AI INTO BASIC EDUCATION

The consolidation of artificial intelligence in Basic Education presents new challenges for initial and continuing teacher education. Through the Technological Pedagogical Content Knowledge (TPACK) framework, Mishra and Koehler (2006) demonstrate that the effective integration of technology depends on connecting pedagogical, technological, and subject-specific knowledge. Almeida and Valente (2011) add that the educational use of technology produces innovation only when it is critically incorporated into curricula and pedagogical practices.

In the Brazilian context, Law No. 14,533/2023, which establishes the National Digital Education Policy, sets forth guidelines for developing digital competencies, technological literacy, and the ethical use of educational technologies. In parallel, the National Common Curricular Base (Brazil, 2018) recognizes digital culture as a general competency essential to students' education, increasing the responsibility of educational institutions to prepare learners for a society shaped by data and intelligent technologies.

Araripe and Lins (2020), however, show that many teachers still experience difficulties in developing advanced digital competencies, particularly regarding the critical use of artificial intelligence in pedagogical contexts. According to Fullan (2020), sustainable educational reforms require continuous investment in technological infrastructure, continuing education, a collaborative culture, and educational leadership, thereby preventing innovation from being limited to the mere acquisition of equipment.

Based on the contributions of Luckin (2018), Selwyn (2019), Nóvoa (2022), UNESCO (2023), and the OECD (2023), it can be observed that artificial intelligence does not represent the replacement of teachers but rather a profound reconfiguration of pedagogical practices. Teachers remain central agents in the educational process, responsible for interpreting contexts, promoting meaningful human interaction, developing social-emotional competencies, and ensuring that technologies are used ethically, critically, and in alignment with the objectives of comprehensive education.

METHODOLOGY

This study is characterized as a qualitative, descriptive, and exploratory narrative literature review developed to analyze scientific evidence concerning the use of artificial intelligence in Basic Education and its impacts on teaching practice, discussing whether this technology constitutes a process of replacing teachers or reconfiguring their professional work. According to Gil (2022), bibliographic research makes it possible to gather and critically interpret knowledge produced about a given phenomenon, while

Lakatos and Marconi (2021) emphasize its relevance to constructing scientific syntheses grounded in different theoretical perspectives.

The choice of a narrative review is based on its capacity to integrate findings from national and international studies, institutional documents, and seminal references in the field, enabling a broad discussion of the transformations brought about by artificial intelligence in educational contexts. According to Rother (2007), this type of review supports interpretive analyses of emerging topics, particularly when scientific production is expanding rapidly. The bibliographic search was guided by predefined criteria intended to broaden the scope and consistency of the selected sources, without claiming the exhaustiveness characteristic of systematic reviews.

The bibliographic survey was conducted between May and July 2026 in Scopus, Web of Science, the Education Resources Information Center (ERIC), SciELO, the Virtual Health Library (Biblioteca Virtual em Saúde—BVS), IEEE Xplore, the ACM Digital Library, and Google Scholar. It also included documents published by UNESCO, the Organisation for Economic Co-operation and Development (OECD), the European Commission, the Ministry of Education (Ministério da Educação—MEC), and other organizations concerned with education and digital technologies.

The following descriptors were used: “inteligência artificial,” “educação básica,” “educação digital,” “inteligência artificial generativa,” “prática docente,” “formação de professores,” “artificial intelligence,” “generative AI,” “AI in education,” “educational technology,” and “teacher professional development.” These terms were combined using the Boolean operators AND and OR to enhance the sensitivity and specificity of the search strategies.

The inclusion criteria encompassed scientific articles, books, book chapters, technical documents, legislation, and reports published primarily between 2020 and 2026; available in full in Portuguese, English, or Spanish; and directly addressing the use of artificial intelligence in Basic Education, its impacts on teachers’ work and teacher education, and ethical issues related to the implementation of these

technologies. Seminal works considered essential to understanding educational technologies, teacher education, and the integration of technology and pedagogy were also included.

Duplicate studies, non-peer-reviewed works, abstracts from scientific events, opinion pieces, materials without access to the full text, and studies focused exclusively on technical applications of artificial intelligence unrelated to pedagogical processes or Basic Education were excluded.

Following the selection of the literature, an exploratory reading was conducted, followed by an analytical and interpretive reading of the selected studies. The evidence was systematized through thematic content analysis, as proposed by Bardin (2016), which made it possible to organize the findings into four analytical categories: (a) foundations of artificial intelligence applied to education; (b) reconfiguration of teaching practice; (c) limits to the replacement of teachers by intelligent systems; and (d) ethical, educational, and policy challenges involved in integrating AI into Basic Education.

RESULTS AND DISCUSSION

Luckin (2018), Holmes, Bialik, and Fadel (2019), and UNESCO (2023) indicate that AI has been changing teaching, learning, assessment, and management processes in Basic Education. These transformations, however, do not constitute the replacement of teachers but rather a reconfiguration of their professional practice. AI-based technologies can perform functions related to automating operational tasks, processing large volumes of data, and personalizing learning, while pedagogical mediation, the building of human relationships, the development of critical thinking, and students' ethical education remain the responsibility of teachers.

Holmes et al. (2022) identify the personalization of teaching and learning processes as one of the primary possibilities offered by artificial intelligence. Intelligent systems can continuously analyze student performance, identify specific difficulties, and suggest learning pathways adapted to individual needs. This capacity expands the possibilities for pedagogical monitoring, particularly in large classes, enabling faster and more data-informed interventions. Kaplan and Haenlein (2019) add that advances in

machine learning and, subsequently, in AI applications have enhanced support for content production, problem-solving, and the organization of pedagogical activities.

Personalization mediated by artificial intelligence, however, depends on teachers' interpretation and intervention. Luckin (2018) argues that algorithms can identify learning patterns but cannot fully understand the emotional, cultural, and social factors affecting student performance. Tardif (2014), in turn, emphasizes that teachers' work is grounded in experiential, relational, and ethical knowledge developed throughout professional practice. AI therefore increases the availability of information for decision-making but does not replace pedagogical judgment or teachers' ability to interpret complex educational contexts.

Holmes et al. (2022) and the OECD (2023) also identify possibilities for automating administrative and pedagogical activities, such as the preliminary preparation of materials, organization of records, performance analysis, and report generation. Reducing the time devoted to repetitive tasks may increase teachers' availability for more complex activities, including instructional planning, individualized support, the development of interdisciplinary projects, and the strengthening of social-emotional competencies.

Selwyn (2019), however, warns that algorithms are not neutral because they may reproduce values, interests, and limitations present in the data used in their development and training, including prejudices and inequalities found in society. UNESCO (2021; 2023) reinforces the need for algorithmic transparency, human oversight, personal data protection, and respect for the rights of children and adolescents, while also maintaining that significant educational decisions must remain under human responsibility.

The expansion of generative artificial intelligence has introduced new challenges into teaching and assessment processes. The ability to generate texts, solve problems, produce code, and answer complex questions requires a review of assessment practices based predominantly on content reproduction. The OECD (2023) draws attention to the need to develop practices that value problem-

solving, authorship, argumentation, creativity, and critical thinking. In this context, methodologies based on projects, inquiry, and students' active participation become increasingly relevant.

The incorporation of artificial intelligence also requires new professional competencies. Almeida and Valente (2011) argue that integrating digital technologies must connect technological innovation with pedagogical foundations, as merely providing equipment or platforms is insufficient. Araripe and Lins (2020) identify difficulties among teachers in developing more advanced digital competencies, particularly those related to the critical use of technologies. Through the TPACK framework, Mishra and Koehler (2006) reinforce that technological knowledge makes a greater pedagogical contribution when combined with pedagogical knowledge and subject-specific expertise.

Inequalities in access constitute another barrier to integrating AI into Basic Education. UNESCO (2023) draws attention to disparities in infrastructure, connectivity, equipment availability, and professional development that may deepen inequalities among schools, education systems, and social groups. In Brazil, the National Digital Education Policy (Brazil, 2023) establishes guidelines to expand digital culture, but its implementation requires continuous investment in connectivity, technological infrastructure, technical support, and the professional development of education professionals.

Nóvoa (2022) emphasizes that competencies such as empathy, communication, pedagogical leadership, conflict mediation, creativity, and support for student development remain directly associated with the human dimension of teaching. Biesta (2022) broadens this discussion by arguing that the purpose of education extends beyond the efficient transmission of knowledge and encompasses ethical development, social participation, responsibility, and the construction of autonomy. These dimensions reinforce the teacher's continuing centrality in organizing educational experiences.

In this context, artificial intelligence does not necessarily represent the elimination of the teaching profession but does change some of its responsibilities. Teachers are likely to assume expanded functions related to knowledge curation, learning mediation, the planning of educational experiences, guidance on the critical use of technologies, and students' comprehensive development. This reconfiguration requires

continuing education, the development of digital competencies, the preservation of professional autonomy, and public policies capable of guiding the ethical, inclusive, and pedagogically grounded use of AI.

The main findings are summarized in Table 1.

Table 1
Summary of the Main Findings on Artificial Intelligence and Teaching Practice

Dimension	Main finding	References
Personalization	AI makes it possible to adapt learning pathways and monitor student performance.	Holmes et al. (2022); Luckin (2018)
Automation	AI can reduce repetitive tasks, record-keeping, and administrative activities.	Holmes et al. (2022); OECD (2023)
Teacher mediation	The interpretation of contexts and pedagogical judgment remain under human responsibility.	Luckin (2018); Tardif (2014)
Teacher education	Integrating AI requires technological, pedagogical, and critical competencies.	Mishra and Koehler (2006); Almeida and Valente (2011)
Ethics and security	The use of AI requires transparency, data protection, and human oversight.	Selwyn (2019); UNESCO (2021; 2023)
Role of the teacher	AI reconfigures teachers' responsibilities but does not eliminate their centrality in the educational process.	Nóvoa (2022); Biesta (2022)

Source: Prepared by the authors based on the references analyzed (2026).

Thus, from different perspectives, Luckin (2018), Holmes et al. (2022), Nóvoa (2022), Biesta (2022), UNESCO (2021; 2023), and the OECD (2023) support a convergent understanding: artificial intelligence's contribution to Basic Education depends on its coordination with human pedagogical action. Technology can expand possibilities for teaching, analysis, and personalization, while the interpretation of contexts, the construction of intellectual autonomy, citizenship education, and the relational dimension of the educational process remain linked to teachers' professional work.

CONCLUSION

The incorporation of artificial intelligence into Basic Education represents a reconfiguration of teaching practice rather than the replacement of teachers. AI-based technologies broaden the possibilities

for personalized learning, task automation, educational data analysis, and the production of teaching resources, but they do not fully reproduce the human competencies essential to the educational process.

In this context, teachers assume new responsibilities. Pedagogical mediation, the building of interpersonal relationships, the promotion of critical thinking, social-emotional development, ethical education, and the interpretation of different sociocultural realities remain dependent on human intervention. Technology therefore tends to shift some teachers' work away from repetitive activities and toward functions related to planning, information curation, learning guidance, and students' comprehensive development.

The use of artificial intelligence also requires continuing education, the development of digital competencies, adequate infrastructure, personal data protection, algorithmic transparency, and ethical guidelines governing its use. Its implementation must remain subordinate to pedagogical objectives, thereby preventing significant educational decisions from being transferred exclusively to automated systems.

In the field of public policy, the National Digital Education Policy constitutes an important framework for expanding digital culture in Brazil. Its effective implementation, however, requires coordination among infrastructure, connectivity, teacher education, digital educational resources, and the development of competencies for the critical and responsible use of technology. These conditions are particularly relevant to preventing the deepening of inequalities in access and promoting greater digital inclusion.

Generative artificial intelligence also necessitates a review of assessment practices and teaching methodologies. Assessments focused solely on memorization and the reproduction of information become less suitable in the face of systems capable of producing complex responses in real time. It is therefore necessary to expand practices that value authorship, creativity, problem-solving, argumentation, collaboration, critical thinking, and the contextualized application of knowledge, while maintaining teacher mediation as a central component of this process.

The bibliographic nature of the study and the rapid evolution of artificial intelligence technologies constitute its principal limitations. Future research should conduct empirical and longitudinal investigations into the impacts of these technologies on learning, teacher education, social-emotional development, educational inequalities, and algorithmic governance.

It is concluded that artificial intelligence does not represent the end of the teaching profession but changes teachers' responsibilities and creates additional professional obligations. Teachers remain the leading agents in the educational process, particularly in pedagogical mediation, citizenship education, the development of critical thinking, and ethical guidance concerning the use of technology. The future of Basic Education will therefore depend on the ability to integrate human and artificial intelligence critically, inclusively, ethically, and in pedagogically meaningful ways.

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LABIA BLOCKS: BLOCK-BASED PROGRAMMING, ARTIFICIAL INTELLIGENCE AND GAMIFICATION IN INTRODUCTORY WEB GAME EDUCATION

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Abstract

This study presents and analyzes LabIA Blocks, an educational platform developed to support introductory programming and digital game creation by integrating block-based programming, HTML, CSS, JavaScript, gamification, and artificial intelligence. This is an applied, descriptive, and technological development study whose objective is to describe the construction of the tool, its features, and its potential pedagogical applications for teachers and students. The methodology comprised a functional and documentary analysis of the final version of the system, an examination of the block catalog and the teacher and student areas, and the association of the platform's features with the principles of active methodologies, computational thinking, and project-based learning. The analysis revealed an environment that combines a visual editor with code generation, a contextual AI Tutor, planning in Portugol, progressive challenges, ready-made games, original game creation, and teaching resources for organizing classes, registering students, publishing activities, and monitoring submissions. The expected outcomes of its pedagogical use include fostering a gradual understanding of programming logic, experimentation, debugging, autonomy, and student agency by connecting introductory web development concepts with practical game-creation scenarios. The study concludes that LabIA Blocks has potential as an integrated teaching resource for active and gamified programming learning experiences.

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Keywords: Active methodologies, Artificial intelligence in education, Block-based programming, Game development, Gamification.

INTRODUCTION

Learning to program during the initial stages of contact with computing involves a twofold challenge: understanding abstract concepts such as variables, events, conditions, repetition, and problem decomposition while simultaneously mastering the syntax of a language. This combination may increase the cognitive load placed on novice students and shift their attention away from the logic of the problem toward the formal details of writing code. In this context, visual block-based programming environments offer an alternative that makes program structure more visible and manipulable without eliminating the need to understand relationships involving cause, sequence, condition, and state. The literature on computational thinking specifically emphasizes the importance of problem-solving, modeling, and solution-building practices as part of computing education (Grover; Pea, 2013, pp. 38–43).

Visual environments designed for creating stories, animations, and games have helped establish block-based programming as an introductory strategy. Scratch, for example, was designed to encourage the creation, experimentation, and remixing of projects, bringing programming closer to meaningful forms of original creation (Resnick et al., 2009, pp. 60–67). In a comparative study involving high school students, Weintrop and Wilensky (2018, pp. 1–25) observed learning gains in both text-based and block-based environments, with the block-based environment yielding favorable results for certain indicators of learning and future interest in computing. Such evidence does not support the claim that blocks are universally superior, but it does support their use as an initial form of mediation and as a bridge to text-based languages.

In web development, introductory learning can be enriched when students understand the distinct yet complementary roles of HTML, CSS, and JavaScript. HTML organizes the structure and elements of a page; CSS defines its appearance, positioning, and responsiveness; and JavaScript introduces behaviors,

events, variables, conditions, and game rules. This separation promotes a modular understanding of the system and makes it possible to relate each visual block to an equivalent segment of textual code. When creating a game, students move beyond manipulating isolated commands and begin integrating objectives, characters, rules, states, scoring, collisions, victory, and defeat into an executable artifact.

Game creation also provides opportunities to integrate programming with active methodologies. Rather than merely receiving expository instruction, students can formulate a problem, design a solution, test hypotheses, debug errors, revise their projects, and share a product. The literature on active learning shows that strategies in which students participate cognitively in solving tasks may produce better outcomes than exclusively expository approaches in science, technology, engineering, and mathematics contexts (Freeman et al., 2014, pp. 8410–8415). At the same time, game elements applied in nongame contexts, such as challenges, progression, feedback, achievements, and goals, correspond to the concept of gamification proposed by Deterding et al. (2011, pp. 9–15).

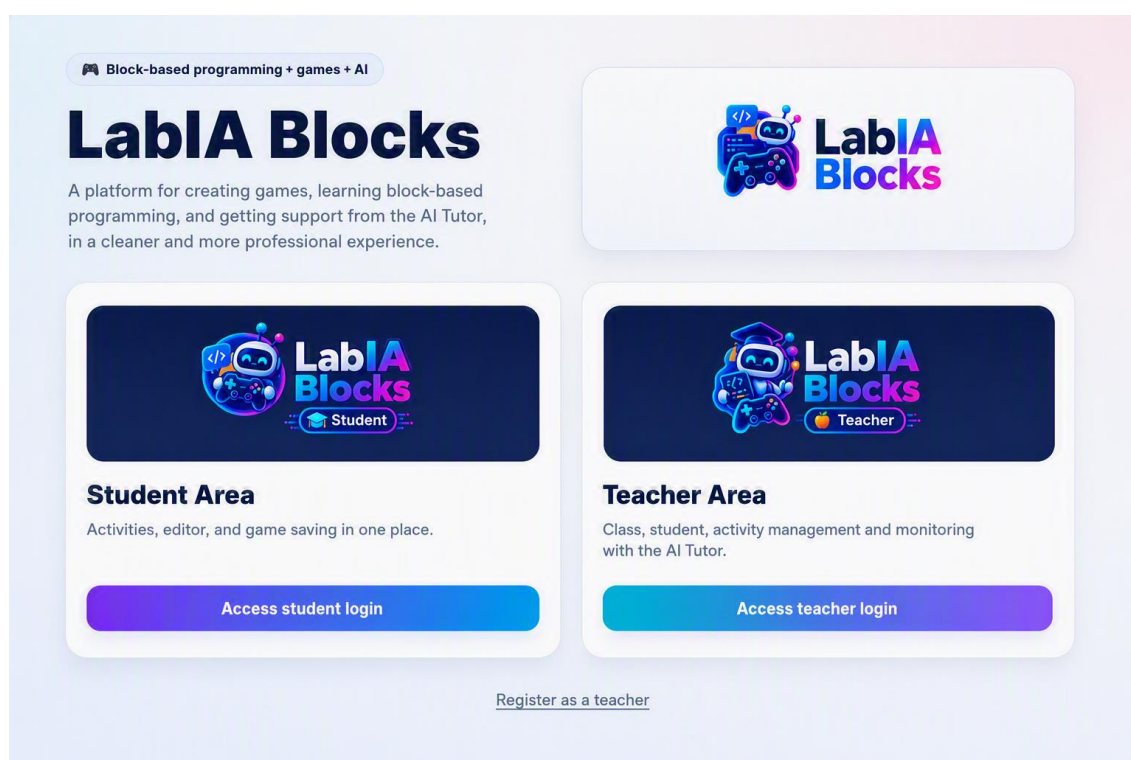
The recent incorporation of generative artificial intelligence expands the possibilities for individualized support during programming activities, but it also introduces risks related to dependency, inaccurate responses, and the replacement of students' reasoning. In a review of generative AI in computing education, Humble (2024) identifies opportunities related to instructional support, personalization, motivation, and knowledge expansion, alongside risks involving inaccuracy, overreliance, and loss of skills. UNESCO (2024) recommends that the educational adoption of AI be guided by human, ethical, and pedagogical criteria, with particular attention to privacy, system suitability, and the development of learner autonomy.

LabIA Blocks is situated within this context. The platform was developed as an integrated educational environment for creating web games through blocks, combining a visual editor, textual code, game execution, planning resources, structured activities, and an AI Tutor. The research problem guiding this study may be formulated as follows: How can a platform that integrates block-based programming, game development, gamification, and AI support organize introductory learning experiences involving

HTML, CSS, and JavaScript? The general objective is to describe the construction process and features of LabIA Blocks and analyze its pedagogical potential for introductory programming and game development education. The specific objectives are to characterize its architecture, identify resources intended for teachers and students, map the types of activities supported by the tool, and discuss the qualities, potential benefits, and limitations of its educational use.

Figure 1

LabIA Blocks home screen providing access to the student and teacher areas



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026); Interface text translated and image adapted.

METHODOLOGY

NATURE AND RESEARCH DESIGN

This study is characterized as applied, descriptive, and technological development research. The object of analysis is LabIA Blocks itself, considered as a digital educational artifact. At this stage, no classroom experiment, questionnaire administration, or data collection involving human participants was conducted. The results presented therefore refer to the functional and pedagogical analysis of the system

rather than to evidence of learning effectiveness within a specific population. An empirical evaluation involving students and teachers is recommended as a subsequent stage and, when conducted, must comply with the applicable ethical procedures.

DEVELOPMENT PROCESS AND ARCHITECTURE

The analyzed version was structured as a web application using PHP 8 or later, MySQL/MariaDB, Bootstrap, CSS, and JavaScript. The system is organized around two primary user profiles: teacher and student. Teachers administer classes, students, activities, submissions, and AI Tutor settings. Students access published activities, open the creation environment, save projects, and interact with the AI Tutor within the context of the work underway. The game editor is embedded in the student area and operates locally for assembling and executing blocks, while services such as authentication, projects, activities, and submissions use the database.

The programming library is organized through a block catalog used by both the editor and the AI Tutor's validation mechanism. In the version examined, 108 blocks were identified: 16 HTML blocks, 15 CSS blocks, and 77 JavaScript blocks. The HTML blocks encompass structure, text, buttons, fields, images, scoreboards, messages, canvas elements, lists, and footers. The CSS blocks cover pages, Flexbox, Grid, panels, text, buttons, fields, scoreboards, canvas elements, positioning, shadows, effects, animations, media queries, and custom CSS. The JavaScript set includes events, movement, appearance, sound, control, variables, lists, interface updates, scoring, lives, victory, and defeat, in addition to specific mechanics for platform games and castle settings.

The AI Tutor runs on the server. The API key configured by the teacher is not exposed in the student's HTML and is stored in encrypted form in the teacher's settings. The Tutor's logic uses the platform's actual block catalog to avoid inventing block names. It was structured to interpret the student's request; associate entities, events, conditions, actions, and variables; verify causal order; and produce a sequence of blocks indicating the fields to be completed and how the blocks should be connected. When a

mechanic cannot be verified using the available blocks, the system is designed to indicate this limitation rather than present an assembly as correct.

FUNCTIONAL ANALYSIS PROCEDURES

The analysis was conducted using the update package made available on August 13, 2026. The configuration files, block catalog, teacher and student area pages, visual editor, activity, project, submission, and AI Tutor modules, as well as the Portugol planning routines, challenges, and ready-made games, were examined. The principal interfaces were subsequently run locally to capture screen images and verify the options visible to users. The features were classified according to four dimensions: introduction to programming, game creation, pedagogical management, and support/gamification. The pedagogical discussion was developed by establishing connections between the features actually present in the system and the literature on computational thinking, block-based programming, active learning, gamification, and generative AI in education. Because this was not a user evaluation, terms such as benefit, quality, and potential are used to denote pedagogical possibilities supported by the tool’s design rather than causal effects that have already been demonstrated.

Table 1
Technical Components and Educational Functions of LabIA Blocks

Component	Function within the Tool	Potential Pedagogical Contribution
Block editor	Visual assembly of HTML, CSS, and JavaScript	Reduce initial syntactic barriers and make logic manipulable.
Generated code	Display the textual code corresponding to the blocks	Support the transition between visual representation and textual language.
Game preview	Run and test the project within the environment	Promote a build-test-debug-revise cycle.
AI Tutor	Answer questions, explain concepts, provide hints, and analyze logic	Offer contextual support and feedback during problem-solving.
Portugol	Plan algorithms and relate them to blocks	Encourage decomposition and logical organization before implementation.
Challenges	Provide a progressive sequence with verifiable objectives	Structure progression, feedback, and learning goals.
Ready-made games	Provide complete models that can be loaded and modified	Enable analysis, remixing, and learning from examples.
Teacher/student portal	Manage activities, projects, submissions, and feedback	Integrate student authorship with teacher monitoring.

Source: Prepared by the authors (2026).

RESULTS AND DISCUSSION

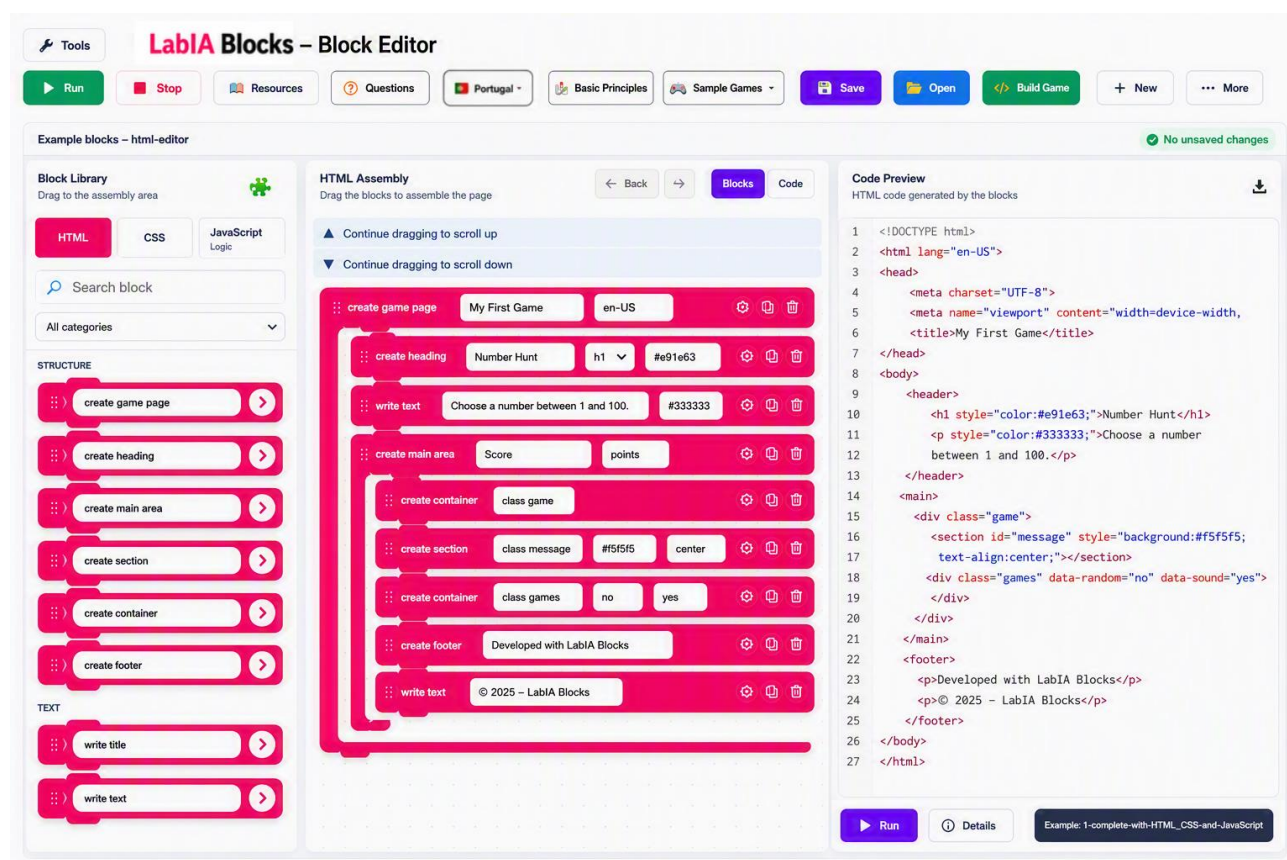
CREATION ENVIRONMENT AND ORGANIZATION OF LANGUAGES

The creation area consists of three complementary spaces: the block library, the assembly area, and the game preview. Students select HTML, CSS, or JavaScript and work with blocks differentiated by language and category. This visual separation reinforces the function of each layer of a web game: structure in HTML, appearance in CSS, and behavior in JavaScript. The ability to switch between the block view and textual code creates a particularly relevant pedagogical bridge for introductory classes because students can observe how a visually implemented decision is translated into syntax.

The blocks contain editable fields for values such as identifiers, classes, text, keys, coordinates, sizes, colors, variable names, operators, and quantities. This characteristic prevents block-based programming from being reduced to the mechanical connection of pieces. To obtain the expected behavior, students must understand the meaning of the parameters. In a movement activity, for example, a keyboard event must be associated with a coherent change in the X or Y coordinate. In a collection activity, character names, variables, and collision conditions must be interconnected. The system also provides undo and redo functions, block search, category filters, execution and restart functions, generation of the game as HTML, and the saving and opening of projects in JSON format.

Figure 2

Block-based programming and visualization of the corresponding HTML, CSS, and JavaScript code



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026); Interface text translated and image adapted.

The simultaneous presence of blocks, code, and visual output may support an experimental learning approach. Students modify a value, run the game again, and observe the consequence. This cycle resembles the construction and debugging practices discussed in relation to creative programming environments (Resnick et al., 2009, pp. 60–67) and prevents code from being presented merely as an abstract sequence of commands. The tool does not eliminate the complexity of programming; rather, it reorganizes that complexity into more visible and manipulable stages.

THE AI TUTOR AS CONTEXTUAL PEDAGOGICAL SUPPORT

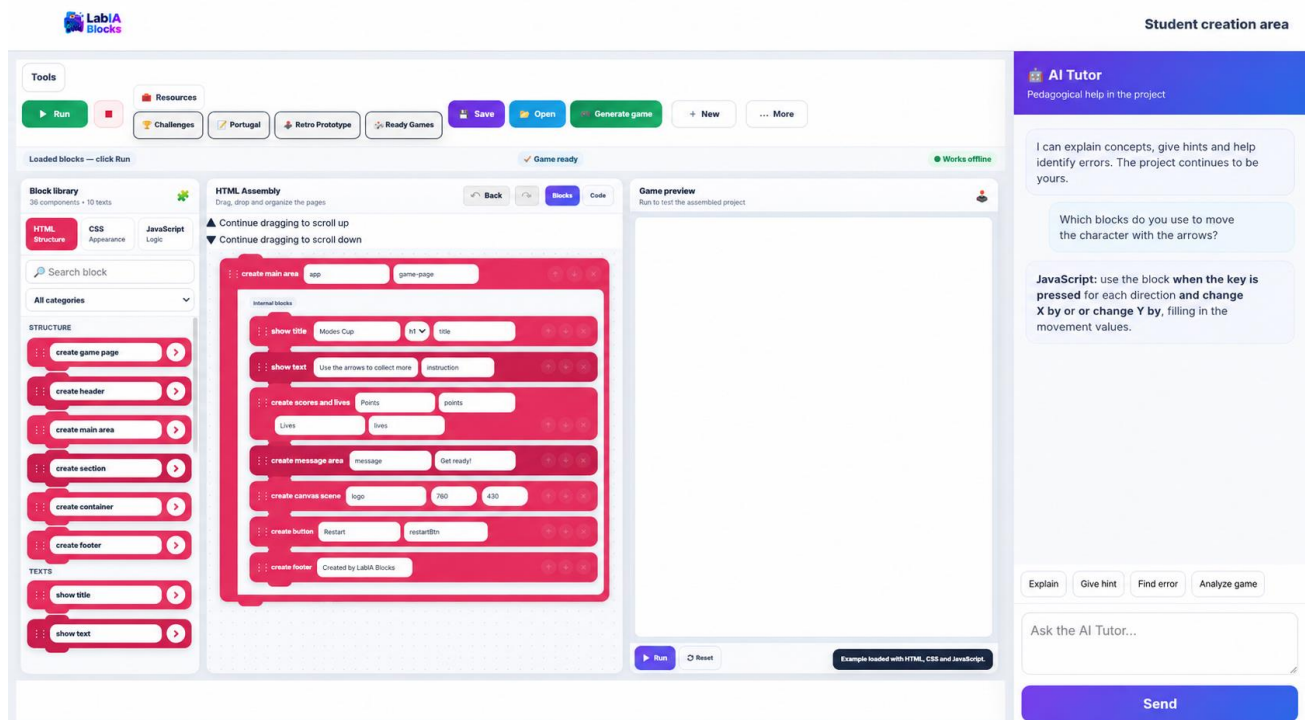
The AI Tutor is one of the platform's distinguishing features. It is integrated into the creation area and offers quick actions for explaining the project, providing hints, identifying possible errors, and

analyzing gameplay. Students may also ask open-ended questions. The pedagogical objective stated in the interface is to help students understand concepts and identify problems without depriving them of authorship. This design is consistent with a view of AI as a mediator rather than a substitute for learners' intellectual activity.

For questions concerning game construction, the Tutor uses the platform's block catalog. The expected response is not limited to a general recommendation to use HTML, CSS, or JavaScript. It must present the actual names of the blocks, the order in which they should be used, the fields that must be completed, suggested values, and the relationships among block connections. The validation mechanism attempts to relate phrases from the request to a logical contract by identifying entities, triggers, conditions, actions, states, victory, and defeat. This approach is important in school settings because it reduces the discrepancy between the AI's textual guidance and what students can actually find in the interface.

Figure 3

Example of the creation area with the AI Tutor integrated into the student's project



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

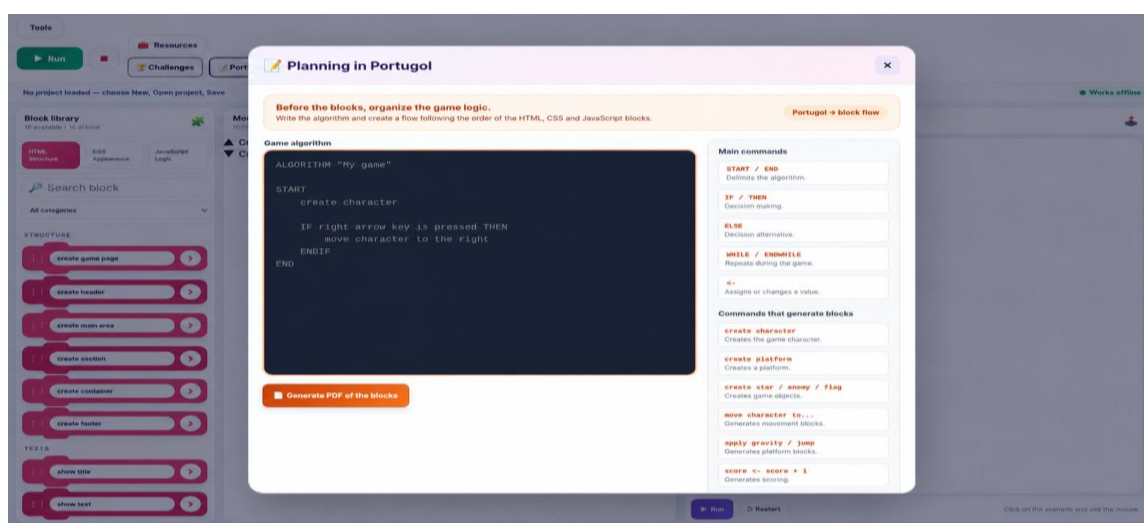
Recent literature recommends caution in this integration. Humble (2024) identifies generative AI as a potential teaching and learning assistant and as a resource for personalization and motivation, while also drawing attention to inaccuracy, overreliance, difficulty with complex tasks, and loss of skills. UNESCO (2024) emphasizes pedagogical validation, data protection, and human-centeredness. In LabIA Blocks, two design decisions address these concerns: the API key remains on the server, and teachers can control the availability and level of AI assistance for each activity. Nevertheless, the quality of the responses must continue to be monitored, particularly because generative systems cannot guarantee absolute accuracy in every situation.

PLANNING IN PORTUGOL AND TRANSITIONING TO BLOCKS

The Portugol module introduces a stage that precedes game assembly. Students can write an algorithm in a structured language, validate commands, view relationships with the blocks, and generate an outline. The resource includes examples of commands such as start/end, create character, create platform, create star, apply gravity, move character, and win the game. It also allows students to generate a PDF containing the related blocks and convert recognized commands into block trees within the project.

Figure 4

LabIA Blocks Portugol planning module

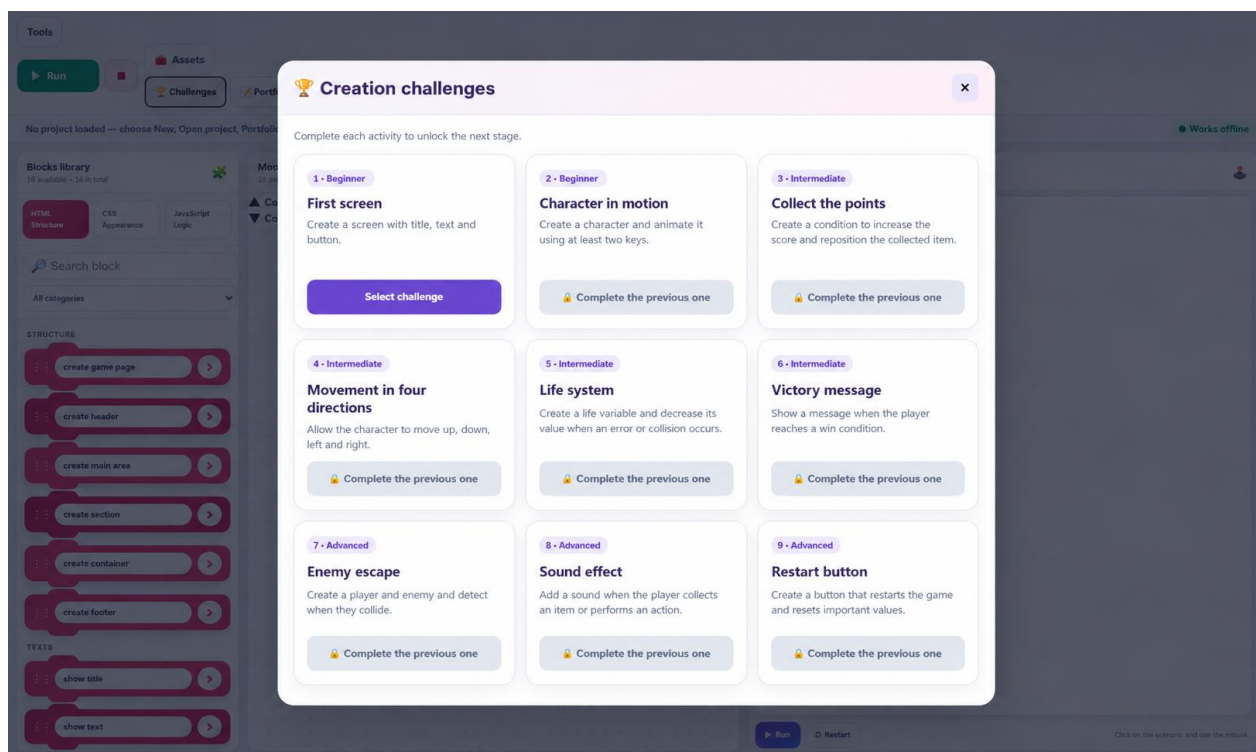


Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

From a pedagogical perspective, Portugol can function as an intermediate layer between the problem narrative and visual implementation. Instead of beginning directly in the interface, students are invited to set out a logical sequence explicitly. This practice encourages problem decomposition and the anticipation of conditions before implementation. When combined with the ability to alternate between blocks and code, the tool offers three representations of the same reasoning: algorithmic description, visual assembly, and textual code. Teachers can use this multiplicity to compare different ways of representing a solution and discuss their equivalences and limitations.

CHALLENGES, PROGRESSION, AND GAMIFICATION

LabIA Blocks provides a sequence of gradually progressing challenges. In the analyzed version, the identified activities included First Screen, Moving Character, Point Hunt, Movement in Four Directions, Life System, Victory Message, Escape the Enemy, Sound Effect, Restart Button, Complete Game, and Star Adventure. Each challenge contains verifiable objectives, and access to the next challenge may depend on completing the preceding one. The platform records completion and execution, provides feedback on objectives that have been met or remain pending, and offers achievements associated with use of the environment.

Figure 5*Progressive challenge screen for game creation*

Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

These elements constitute an application of gamification because they incorporate progression, goals, feedback, and achievements into an educational activity whose purpose is not simply to play but to learn programming. According to the definition provided by Deterding et al. (2011, pp. 9–15), gamification involves the use of game design elements in nongame contexts. Its pedagogical value, however, depends on how these elements are integrated with the learning objective. In LabIA Blocks, a challenge is considered complete based on the presence and execution of programming elements. This makes it possible to link the reward to the actual construction of a solution rather than merely to superficial participation.

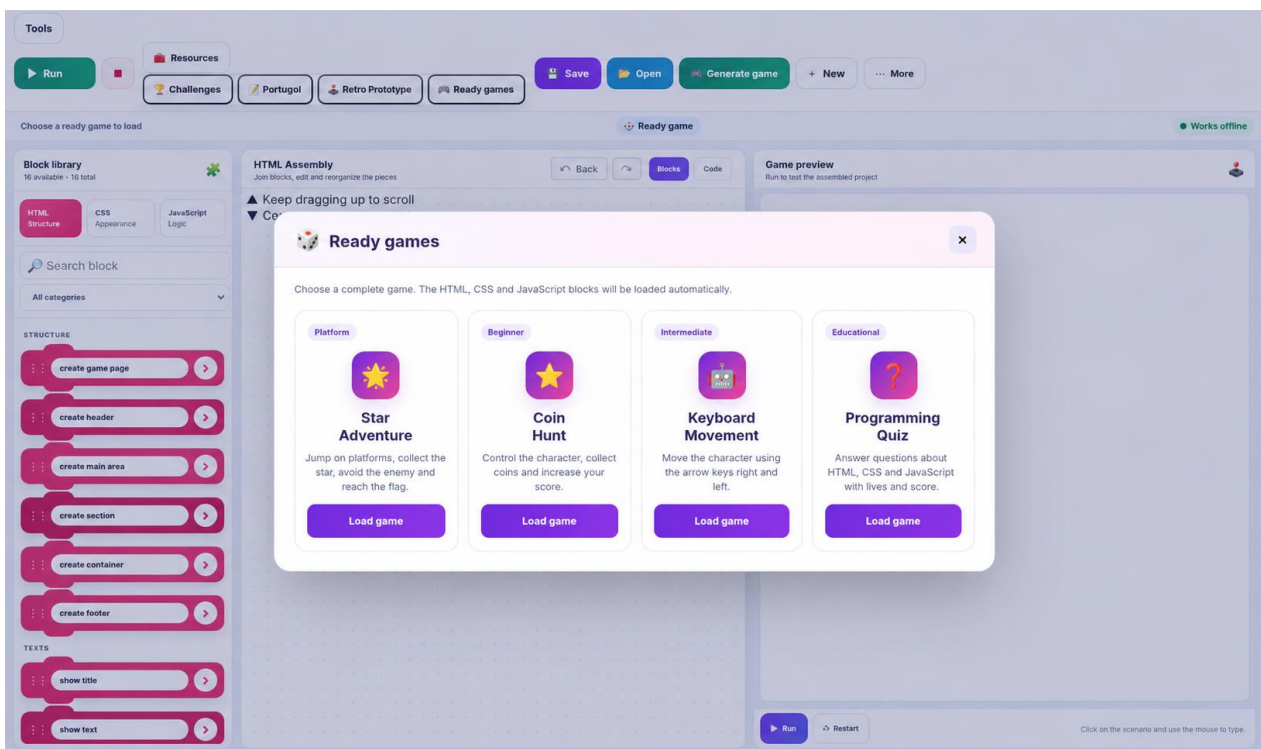
READY-MADE GAMES, REMIXING, AND ORIGINAL CREATION

The Ready-Made Games feature provides complete models that can be loaded automatically. The analyzed version includes Star Adventure, Coin Hunt, Keyboard Movement, and Programming Quiz. The

models encompass different levels and mechanics, allowing students to begin with a functional implementation and then examine the blocks, change parameters, remove components, and create variations. This approach can be used for code-reading activities, remixing, comparing strategies, or extension challenges.

Figure 6

Library of ready-made games available for analysis and remixing



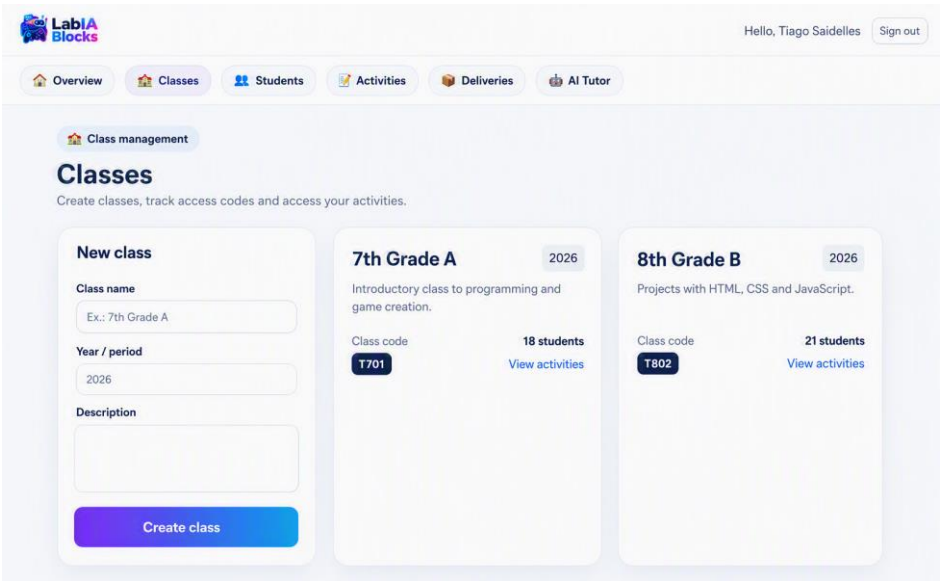
Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

The use of complete examples is particularly relevant for students who are not yet able to plan a game from scratch. Rather than treating the model as the final answer, teachers can turn it into an object of investigation by asking students to identify which blocks create the interface, where the score is updated, how collisions are detected, which conditions determine victory and defeat, or how a rule can be modified. The logic of creation and remixing is consistent with a perspective on digital fluency that emphasizes producing and transforming artifacts rather than merely consuming technology (Resnick et al., 2009, pp. 60–67).

FEATURES OF THE TEACHER AREA

The teacher area organizes the use of the tool as a classroom environment. Teachers can create classes with access codes, register and manage students, publish activities, and monitor submissions. When creating an activity, teachers provide the class, title, instructions, and deadline. They can also select the level of AI assistance from five options: 0 – No AI; 1 – Questions; 2 – Hints; 3 – Tutor; and 4 – Laboratory. This scale makes it possible to adapt the support to the objective of the activity by restricting assistance when greater autonomy is desired or expanding it in situations involving guided exploration. Student submissions are linked to projects and activities. Teachers can assign grades and record feedback comments, changing the status of a submission to reviewed. There is also a specific area for configuring the OpenAI key, selecting the model, and enabling the AI Tutor globally. The architecture keeps the key out of the student's browser, which is an important technical quality for institutional use, although schools must still adopt their own data security, privacy, and governance policies. From a pedagogical perspective, teacher management can be understood as an integrated three-stage process: creating a class, registering students, and then publishing the activity that will guide the learning experience. This organization allows teachers to transform a programming proposal into a monitorable sequence by linking each student to a group, each challenge to a class, and each submission to a specific activity. Rather than using the editor merely as an isolated resource, the platform begins to function as an environment for lesson planning, development, and monitoring.

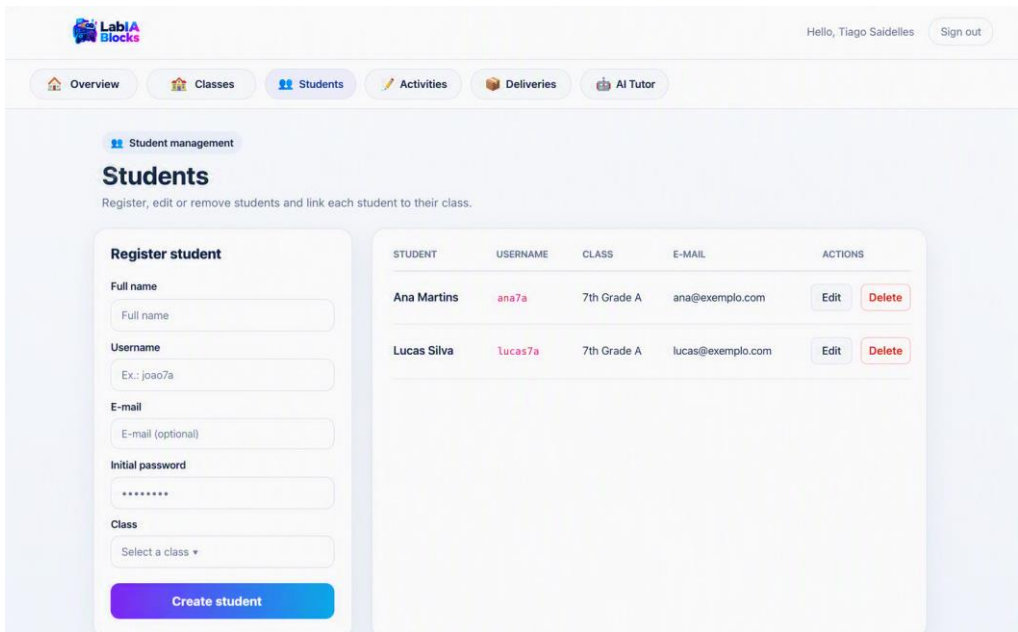
Figure 7
Class registration and organization in the teacher dashboard



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

The class-creation process shown in Figure 7 establishes the organizational unit for the work. The teacher enters a name, academic period, and description, and the system generates a code associated with the class. In a pedagogical application, this feature can be used to distinguish groups by grade, workshop, project, or level of complexity. The class also serves as a reference for assigning activities and monitoring student work, allowing the same tool to be used in different contexts without mixing student records.

Figure 8
Student registration, assignment, and management



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

In the next stage, teachers register students, define their usernames and initial passwords, and select the class to which each student will be assigned, as shown in Figure 8. The ability to edit or delete records facilitates class management throughout the academic period. From a pedagogical standpoint, individual registration enables monitored learning pathways: each student accesses a personal space, receives the relevant activity, and develops projects within a structure that enables teachers to observe submissions and provide feedback. User management thus ceases to be merely an administrative function and begins to support personalization and formative monitoring.

Figure 9*Publishing an activity with a class, instructions, deadline, and AI support level*

The screenshot shows the LabIA Blocks web interface. At the top, there's a navigation bar with tabs: Overview, Classes, Students, Activities (selected), Submissions, and AI Tutor. The user is logged in as 'Hello, Tiago Saidelles' with a 'Sign out' button. The main content area is titled 'Activities' with a subtitle 'Publish activities to a class and define the support level of the AI Tutor.' On the left, the 'Create Activity' form is visible, containing fields for Class (7th Grade A), Title (Coin Hunt), Instructions (Create a game where the character collects 3 coins and displays a victory message.), Deadline (28/08/2026 17:00), and AI Level (2 — Hints). A 'Publish Activity' button is at the bottom of the form. On the right, a published activity card for 'Coin Hunt' is shown, indicating it is published and has an AI Level of 2 with 6 submissions.

Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

Publishing activities completes this process. As shown in Figure 9, teachers select the class, define a title, describe the mission, establish a deadline, and choose the AI Tutor support level. This configuration allows mediation to be adapted to the pedagogical purpose. In an introductory activity, for example, a higher level of guidance may be offered to help students recognize the function of the blocks. In subsequent activities, support may be reduced to increase decision-making and authorship. The activity statement may also specify success criteria, such as moving a character, using a variable, constructing a victory condition, and testing the game before submission. Creating the activity therefore establishes the learning objectives, completion criteria, and degree of support. One possible classroom strategy is for the teacher to prepare the class and access credentials in advance, publish a short mission, and begin the lesson by reading the problem collectively. Students can then record the logic in Portugol, construct the structure in HTML, work on its presentation in CSS, and complete the interaction in JavaScript. During development, the teacher monitors recurring difficulties and decides when to intervene directly or advise students to consult the AI Tutor. At the end, the submission may be accompanied by an explanation of the solution adopted, making it possible to assess not only whether the game works but also whether students

understand the relationships among the blocks used, the configured values, and the behavior produced in the game.

Table 2

Examples of Potential Pedagogical Activities Using the Platform

Type of Activity	Teacher Action	Student Action	Concepts Involved
Guided assembly	Provide an objective and limit the level of AI assistance.	Assemble the specified sequence and test the result.	HTML structure, CSS styling, events, and variables.
Debugging challenge	Provide a project containing an error or incomplete rule.	Use execution, code, and the AI Tutor to identify the error.	Debugging, conditions, state, and causality.
Game project	Define a theme, criteria, and deadline.	Plan, create, test, revise, and submit a game.	Decomposition, logic, authorship, and design.
Portugol to blocks	Require an algorithm before implementation.	Write the logic and convert it into blocks.	Algorithms, sequence, conditions, and repetition.
Remixing	Select a ready-made game and propose modifications.	Examine the existing structure and modify its mechanics.	Code reading, reuse, and creativity.
Gamified challenges	Define a sequence of challenges and criteria.	Meet progressive goals and monitor feedback.	Progression, autonomy, and metacognition.
Student-created quiz	Request a question-based game about curricular content.	Program questions, answer choices, scoring, and lives.	Events, conditionals, interface, and formative assessment.
Project presentation	Ask students to explain how the game works.	Display the blocks and code and explain design decisions.	Communication, justification, and computational thinking.

Source: Prepared by the authors (2026).

POTENTIAL PEDAGOGICAL QUALITIES AND BENEFITS

The first quality identified is the coherence between visual representation and textual language.

The environment does not present block-based programming as a domain separate from HTML, CSS, and JavaScript. Instead, it organizes the blocks according to these languages and allows students to view the resulting code. This characteristic may reduce the disruption commonly experienced when students transition from an exclusively visual environment to a written programming language. The literature on block-based environments suggests that visual representations can support initial learning by reducing syntax errors and facilitating the recognition of structures, provided that the transition and conceptual understanding are appropriately planned (Weintrop; Wilensky, 2018, pp. 1–25). The second quality is product-oriented learning. Students do not assemble abstract sequences merely to obtain numerical outputs; they construct an interactive experience with a setting, characters, rules, and objectives. The visible result gives immediate meaning to their changes. Such a dynamic may promote motivation and

persistence, particularly when teachers organize the work as a project involving intermediate goals, revision, and a final presentation. This interpretation is consistent with active learning approaches in which students participate in constructing solutions and receive feedback throughout the process (Freeman et al., 2014, pp. 8410–8415).

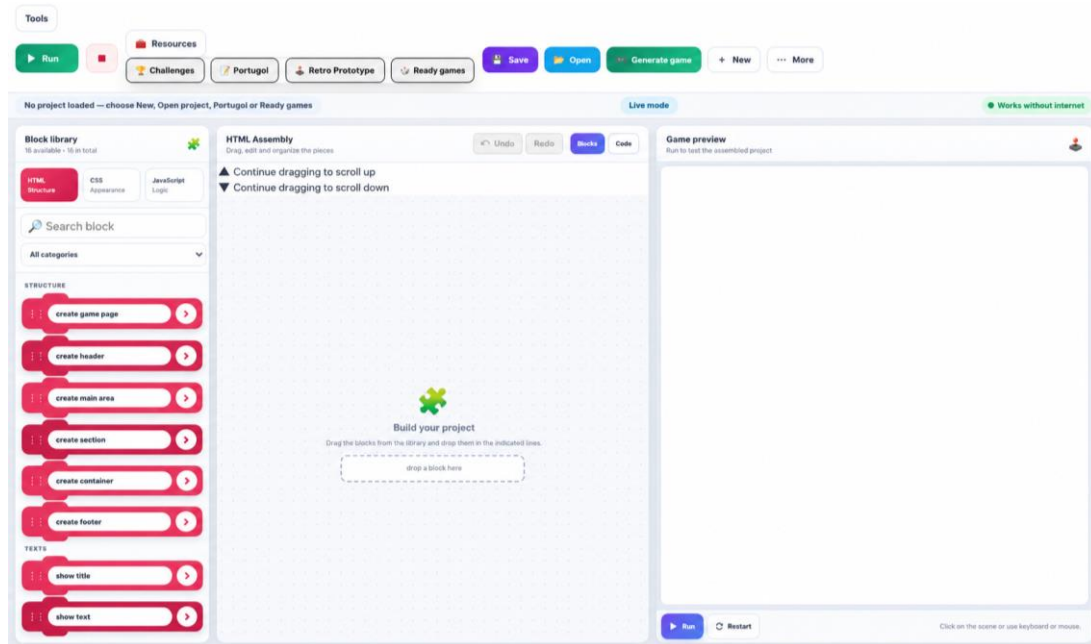
The third quality is the possibility of pedagogical differentiation. The same environment can be used in free mode, through challenges, with ready-made models, through planning in Portugal, or within an activity defined by the teacher. In addition, the level of AI assistance can vary among activities. In a heterogeneous class, teachers can propose the same objective with different degrees of support: some students may work from a ready-made example, others may receive only hints, and others may be challenged to create the solution from the outset. The fourth quality concerns feedback. Students have access to immediate game execution, challenge messages, analysis from the AI Tutor, and the ability to compare blocks and code. Teachers, in turn, can monitor submissions and record assessments and comments. This combination creates different layers of feedback originating from the system itself, the AI, and the teacher. The educational potential of AI nevertheless depends on supervision and the design of tasks that require explanation, revision, and justification, thereby preventing automated responses from replacing understanding. This caution is consistent with the risks highlighted by Humble (2024) and UNESCO's (2024) recommendations for human-centered and pedagogically validated use. The fifth quality is the presence of gamification elements integrated into the learning process. Unlockable challenges, progress, achievements, and ready-made games make the experience resemble a mission-based pathway. The pedagogical use of these elements may promote engagement when progress represents clear learning objectives. The tool thus enables teachers to employ gamification without reducing the activity to points and badges because the verified goals are associated with concrete programming actions.

TEACHING STRATEGY FOR USING LABIA BLOCKS IN THE CLASSROOM

The pedagogical use of LabIA Blocks can be organized as a progressive construction pathway in which students move from understanding the problem to representing it algorithmically and subsequently implementing the game. The recommended starting point is not the random selection of blocks but the definition of a clear mission: what the player must do, which objects exist, which rules determine success or failure, and which actions must occur in response to each event. This initial stage promotes problem decomposition and brings the activity closer to computational thinking practices in which problems are organized into smaller parts, relationships, and procedures before implementation (Grover; Pea, 2013, pp. 38–43). When preparing the lesson, teachers can organize the class, register students, and publish an activity linked to that group in advance. The activity can present the challenge, expected product, deadline, submission criteria, and AI Tutor support level. This stage is important because it makes the pedagogical purpose explicit before students open the editor. Instead of beginning by randomly selecting blocks, students receive a mission with defined objectives and can plan how to represent the solution in HTML, CSS, and JavaScript. Teachers, in turn, can adjust task complexity and monitor the development of submissions throughout an instructional sequence. A possible instructional sequence for students begins with reading the mission and planning in Portugol. At this stage, the aim is to record actions in language resembling ordinary speech, such as starting the game, creating a character, moving when a key is pressed, checking for collisions, changing the score, and testing the victory condition. Students then access the editor and begin with the HTML structure, selecting blocks that organize the page, setting, titles, text, scoreboard, and other necessary elements. The next step focuses on CSS, when appearance, spatial organization, dimensions, and visual identity are addressed. Only after establishing this foundation do students implement events, variables, conditions, repetition, collisions, and game rules in JavaScript.

Figure 10

Editor in its initial state: block library, assembly area, and game preview



Source: Prepared by the authors based on the analyzed version of LabIA Blocks (2026). Interface text translated and image adapted.

Figure 10 highlights an important characteristic for lesson organization: the block library, assembly area, and preview space remain available simultaneously. This arrangement promotes a short action-and-feedback cycle. Students select a block, configure its values, connect it to the sequence, run the project, and observe the consequence. If the behavior differs from what was expected, they can return to the assembly and revise the structure. In this context, errors can be addressed as part of the learning process rather than merely as negative outcomes. Teachers can explore this cycle by asking students to formulate hypotheses before each change and subsequently explain why a particular modification produced the observed result. The AI Tutor can be incorporated primarily during moments of uncertainty, debugging, and revision. A pedagogically productive use consists of asking for explanations about the function of a particular block, requesting hints to identify an error, or comparing two ways of implementing a mechanic. The response received must be tested in the editor itself and compared with the game's behavior. In this way, AI becomes part of an investigative process rather than a substitute for execution. UNESCO (2024) recommends that the use of generative AI in education be guided by

pedagogical purpose, human supervision, and the development of critical abilities. In LabIA Blocks, these conditions can be operationalized through teacher control over assistance levels and the requirement that suggestions be validated in practice.

At the end of an activity, students should present not only a functioning game but also the logic employed. They can explain which blocks structure the interface, which events receive keyboard commands, which variables store states, how conditions control victory or defeat, and which changes were made during debugging. This presentation transforms the digital product into evidence of the learning process and enables teachers to assess understanding, authorship, and the ability to justify decisions. The practice also helps address a recurring difficulty in tasks involving artificial intelligence: distinguishing a solution that was merely copied from one that was understood and modified by the student.

PROPOSED SEQUENCE OF ACTIVITIES AND FORMATIVE ASSESSMENT

LabIA Blocks makes it possible to structure a sequence of activities that begins with short tasks and advances toward original projects. In an initial stage, teachers can propose interface-recognition activities and guided exploration of HTML, CSS, and JavaScript blocks. The objective is not to build a complex game immediately but to understand the function of each group of commands. A simple activity may ask students to create a title, a message, and a setting; another may require them to change colors and dimensions; and a third may introduce keyboard movement. Each task adds a layer of complexity and provides a repertoire for the subsequent project. In a second stage, logic challenges can address events, variables, and conditions separately. Students can create a counter, make an object disappear after a collision, limit the number of lives, or end the game when a variable reaches a specific value. Progression through small goals tends to make causal relationships visible before they are combined into larger mechanics. This organization is consistent with active methodologies because students engage with concrete problems, test solutions, and receive feedback throughout the process. These characteristics have

been associated with better outcomes in active learning contexts compared with exclusively passive exposition (Freeman et al., 2014, pp. 8410–8415). Figure 9 illustrates how teachers can transform a programming competency into a learning mission. Rather than simply asking students to “make a game,” the activity can specify mechanics, functional criteria, and mandatory elements. A collection challenge, for example, may require keyboard movement, three independent items, score updates, and a victory message after the final item is collected. An objective description facilitates assessment because the same requirements used to guide construction can form part of an assessment rubric. The AI assistance level, defined when the activity is published, becomes part of the instructional plan and may vary according to complexity and the intended degree of autonomy.

Table 3

Suggested Instructional Sequence for Introductory Programming and Game Creation

Stage	Instructional Objective	Student Action	Assessment Evidence
1. Plan	Decompose the game into entities, rules, and objectives.	Describe the mission and represent the logic in Portugol.	A coherent sequence of actions and conditions.
2. Structure with HTML	Understand how interface elements are organized.	Assemble the setting, text, scoreboard, and necessary components.	A structure compatible with the proposed game.
3. Style with CSS	Relate visual properties to the gaming experience.	Configure colors, dimensions, arrangement, and appearance.	A legible interface consistent with the proposal.
4. Program with JavaScript	Implement behavior, events, and states.	Create movement, variables, collisions, and rules.	Mechanics executed according to the requirements.
5. Test and debug	Develop error-analysis and revision skills.	Run the project, identify errors, request hints, and correct them.	A record or explanation of the changes made.
6. Present and remix	Consolidate authorship and explanatory skills.	Demonstrate the game, justify the blocks used, and propose improvements.	Presentation, functionality, and reflection on the project.

Source: Prepared by the authors (2026).

Table 3 can be used across a sequence of sessions or adapted to an intensive workshop. In introductory classes, the three languages can be introduced progressively, preventing the large number of available blocks from becoming a source of overload. In more experienced classes, teachers can propose a single project and use the stages as monitoring milestones. This flexibility is particularly useful for group activities: participants can discuss game rules, test different configurations, and compare solutions, but

assessment should preserve individual evidence of understanding, such as an oral explanation, a brief written justification, or the modification of a rule in the teacher's presence.

Formative assessment can combine the game's functionality with the development process. At least five dimensions should be considered: understanding of the problem, selection and organization of blocks, coherence of the logic, ability to test and debug, and explanation of decisions. Aesthetic elements may be valued, but they should not obscure the central objective of understanding programming structures. Similarly, use of the AI Tutor can be considered part of the process when students demonstrate that they analyzed the suggestion, executed the solution, and made their own adjustments. The emphasis therefore falls on supported authorship rather than merely on the presence or absence of artificial intelligence. Gamification elements can be integrated into this assessment without turning learning exclusively into a competition for points. Challenges, achievements, progression, and missions can indicate completed stages, provide short-term objectives, and recognize progress. Deterding et al. (2011, pp. 9–15) define gamification as the use of game design elements in nongame contexts. In the educational context analyzed here, its value depends on progression representing actual learning. Unlocking a challenge may therefore mean that a student has demonstrated a competency, rather than merely having remained connected to the platform for a longer period.

LIMITATIONS AND CONDITIONS FOR EDUCATIONAL USE

Although the analysis reveals a broad set of resources, the tool should not be interpreted as a substitute for teachers or as an automatic guarantee of learning. The first limitation arises from the nature of the present study: no data were collected on student performance, engagement, or learning. Based solely on the functional analysis, it is therefore not possible to claim that LabIA Blocks increases grades, reduces dropout rates, or produces measurable gains in computational thinking. Such hypotheses must be investigated through implementation studies. The second limitation concerns the AI Tutor. Even with validation based on the block catalog and semantic rules, generative models may produce inappropriate

responses, interpret ambiguities differently from the student's intention, or suggest a solution that is technically possible but pedagogically undesirable. Teachers must maintain monitoring criteria and encourage students to execute, test, and justify the responses they receive. The tool makes a greater contribution when AI is treated as a source of hints and explanations subject to verification rather than as a final authority.

The third condition concerns infrastructure. The editor was designed to operate locally, but the portal uses PHP/MySQL, and Bootstrap components may depend on a content delivery network, depending on the installation. The AI Tutor also requires connectivity and a configured API when enabled. In schools with limited connectivity, an entirely local deployment must include the necessary front-end resources and provide for activities that remain functional without the Tutor. The ability to operate the editor and save projects in JSON provides an important alternative in such contexts.

CONCLUSION

This study described the construction and features of LabIA Blocks and analyzed its potential for introductory education in HTML, CSS, JavaScript, and game development. The platform combines visual block-based programming, code visualization, immediate execution, planning in Portugol, progressive challenges, ready-made games, achievements, activity management, and an AI Tutor within a single environment. Analysis of the catalog identified 108 blocks, ranging from basic structural and styling elements to events, variables, lists, collisions, scoring, lives, and game mechanics. For teachers, the tool provides class and student organization, activity creation with deadlines and differentiated levels of AI support, submission monitoring, and the recording of assessments and feedback. For students, it offers a pathway that may begin with examples and challenges and progress toward original projects, allowing them to observe the relationship between blocks and textual code. This combination creates conditions for project-based learning, problem-solving, debugging, and remixing activities while employing gamification elements such as progression, challenges, and achievements. The main potential pedagogical

contribution of LabIA Blocks lies in its integration of different forms of representation and support: planning in algorithmic language, assembling visually, reading code, running the game, receiving feedback, and revising the solution. The AI Tutor can expand this mediation when used contextually, with assistance levels defined by the teacher and the preservation of student authorship. Nevertheless, AI does not eliminate the need for verification, teacher mediation, and the development of critical thinking.

As a continuation of this research, implementation studies should be conducted with basic education classes and introductory programming education, comparing different strategies for using the tool. Future research may investigate the learning of specific concepts, project quality, debugging patterns, teacher and student perceptions, levels of autonomy, and the influence of the different AI Tutor assistance levels. This stage will permit a transition from the analysis of pedagogical potential to empirical evidence concerning the conditions, limitations, and outcomes associated with the use of LabIA Blocks in real educational contexts.

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CONTEMPORARY CHALLENGES IN PUBLIC BASIC EDUCATION: AN INTEGRATIVE PERSPECTIVE ON PROFESSIONAL DEVELOPMENT, INNOVATION, LEARNING AND SCHOOL COEXISTENCE

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Abstract

Public Basic Education faces technological, pedagogical, informational, and relational challenges that cannot be adequately addressed through isolated responses. This qualitative, documentary, descriptive-analytical, and comparative study analyzes five doctoral theses in Basic Education and identifies convergent dimensions related to professional development, infrastructure and access, mediation, inclusion and equity, institutional governance, and the sustainability of educational actions. The corpus comprises studies on school library automation, teacher professional development and ICTs, post-pandemic learning difficulties, school conflict and a culture of peace, and artificial intelligence in education. Objectives, methods, findings, conclusions, limitations, and proposed products were organized in an analytical matrix and subjected to thematic comparison. Six cross-cutting dimensions emerged: continuing professional development; infrastructure and conditions for participation; human mediation;

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inclusion, equity, and rights protection; governance and institutional support; and monitoring, evaluation, and sustainability. Their articulation led to a conceptual synthesis termed the Integrated Institutional Cycle. The findings indicate that sustainable educational transformation depends less on the isolated adoption of technologies programs than on the coordinated interaction of institutional conditions, professional competencies, mediation, equity, governance, and continuous monitoring.

Keywords: Basic Education, Continuing Professional Development, Educational Governance, Educational Innovation, Equity.

INTRODUCTION

Contemporary Basic Education is undergoing technological, pedagogical, social, and relational transformations that are reshaping the conditions under which teaching, learning, access to information, educational service organization, and interpersonal relationships within schools take place. The digitalization of educational practices, inequalities in access, the educational impacts of the COVID-19 pandemic, the growing attention to school coexistence, and, more recently, the widespread adoption of artificial intelligence systems demonstrate the multidimensional nature of the challenges currently faced by educational institutions.

This complexity requires caution regarding technologically deterministic interpretations. The Global Education Monitoring Report 2023 warns that the role of technology in education must be assessed in terms of relevance, equity, sustainability, and evidence of educational benefit rather than solely on the basis of its availability (UNESCO, 2023a). From a convergent perspective, the OECD (2023) conceptualizes digital education as an ecosystem in which infrastructure, data, professional capacities, governance, and trust are interconnected. Accordingly, equipment and digital platforms constitute important conditions, but they are not sufficient in themselves to generate pedagogical innovation.

Educational innovation, therefore, should not be equated with technological novelty. In discussing

information ecology, Davenport (1998) had already highlighted the limitations of approaches centered exclusively on technology. Choo (2006) further argues that information and knowledge acquire value when they are incorporated into processes of interpretation, learning, and decision-making. In the educational field, Masetto (2012) emphasizes pedagogical mediation as the component that provides intentionality to the use of technologies, whereas Libâneo (2013) situates planning, objectives, methods, and assessment as interconnected dimensions of pedagogical practice.

The central role of mediation is also grounded in Freirean thought. By asserting that “teaching is not transferring knowledge” (Freire, 2021, p. 47, translation by the authors), Freire shifts education away from a transmission-based logic toward a practice that creates opportunities for the production and construction of knowledge.

This perspective is particularly relevant to contemporary educational debates because digital systems, libraries, platforms, and artificial intelligence may broaden opportunities for access and knowledge production, but they do not eliminate the need for professional judgment, dialogue, and the active participation of educational subjects.

Professional development therefore becomes a strategic dimension. Tardif (2014) demonstrates that teachers’ professional knowledge is plural and develops through the interaction of formal education, professional experience, and the context of practice. Nóvoa and Alvim (2022), in discussing recent challenges facing the teaching profession, reinforce the need to strengthen professional communities and institutional environments capable of sustaining educational change. In the context of digital education, this requirement is further developed in international frameworks: UNESCO (2024) proposes an AI competency framework for teachers that integrates a human-centered mindset, ethics, technological foundations, pedagogy, and professional development, while the European Commission (2022) advises educators to consider opportunities, risks, data, transparency, and accountability simultaneously.

In the field of school libraries, the same systemic perspective is explicitly evident. The 2025 IFLA–UNESCO School Library Manifesto states that the school library program improves and enhances

teaching and learning when qualified professionals, collections, spaces, equipment, services, and collaboration are brought together (IFLA; UNESCO, 2025). Campello (2009) positions the school library within the development of information literacy and learning; Almeida Júnior (2015) conceptualizes information mediation as an intervention in the relationship between individuals and information; and Lankes (2016) shifts the focus of librarianship from collections toward knowledge creation and community empowerment.

Challenges related to learning likewise demonstrate that educational problems cannot be reduced to individual factors. Research on learning losses resulting from school closures during the pandemic has documented substantial and unequal effects (Engzell; Frey; Verhagen, 2021). Within school settings, learning recovery requires diagnostic assessment, planning, differentiated interventions, continuous monitoring, and institutional support. An interpretation focused exclusively on student performance risks obscuring the social, family-related, emotional, technological, and organizational factors that shape learning.

The relational dimension is equally constitutive of the school experience. School coexistence, belonging, respect, violence prevention, and the capacity to engage in dialogue across differences affect the conditions for participation and learning. Vygotsky (2007) provides a theoretical basis for understanding the social nature of developmental processes, while Freire (2021) associates autonomy, dialogue, and respect with an ethically grounded educational practice. From this perspective, school conflicts should not be regarded merely as disciplinary incidents but as phenomena requiring institutional understanding, appropriate mediation, and protection networks.

Artificial intelligence further intensifies these tensions. UNESCO (2023b) recommends a human-centered approach to generative AI in education, emphasizing privacy, equity, pedagogical validation, and the development of human capabilities. The European Commission (2022) similarly stresses that the use of AI and data in schools requires critical understanding, ethical awareness, and institutional accountability. AI therefore does not introduce an entirely new educational problem; rather, it makes

increasingly visible issues that were already embedded in digital transformation, including professional development, mediation, governance, equity, and assessment.

Against this background, the present article brings together five doctoral studies addressing distinct objects of investigation: automation and information management in school libraries; teacher professional development, ICTs, and digital inclusion; post-pandemic learning difficulties; school conflicts, violence, and a culture of peace; and artificial intelligence in Basic Education. Bringing these studies into dialogue does not imply equivalence among the phenomena investigated, nor does it authorize the aggregation of their samples or the reanalysis of their primary data as though they constituted a single study.

The scientific interest lies at a different analytical level: determining whether distinct investigations identify convergent institutional conditions for addressing contemporary challenges in schools. The present study therefore constitutes a second-order comparative documentary analysis, guided by a common analytical matrix while preserving the objects, methods, and limitations of each individual thesis.⁶

The following research question was formulated: What cross-cutting dimensions emerge from the comparative analysis of five doctoral studies on contemporary challenges in Basic Education, and how can these dimensions contribute to integrated institutional responses in public schools?

Accordingly, the general objective is to comparatively analyze five doctoral studies in the field of Basic Education, identifying convergent dimensions related to professional development, infrastructure and access, mediation, inclusion and equity, institutional governance, and the sustainability of educational initiatives.

The relevance of the study lies in its potential to produce a synthesis that goes beyond the mere juxtaposition of five research topics. The interpretive hypothesis guiding the analysis is that sustainable

⁶ In this article, the expression “second-order comparative documentary analysis” refers to the comparative examination of findings, conclusions, limitations, and propositions already consolidated in the five doctoral theses, without access to or reanalysis of their original primary datasets. The expression is used descriptively to characterize the analytical level adopted in this study.

educational responses do not result from isolated technologies, programs, or interventions, but rather from the articulation of institutional conditions, professional development, human mediation, equity, governance, and continuous monitoring. This hypothesis is examined throughout the following sections without transforming analytical convergence into statistical generalization.

METHODOLOGY

The study is characterized as qualitative, documentary, descriptive-analytical, and comparative research. A qualitative approach was adopted because the objective is not to statistically aggregate results, but rather to understand similarities, differences, complementarities, and limitations among studies conducted in distinct contexts. Minayo, Deslandes, and Gomes (2022) emphasize the relevance of qualitative approaches to social phenomena shaped by meanings, relationships, and contexts, while Creswell (2014) highlights their potential for the systematic interpretation of complex phenomena.

The documentary corpus consists of five doctoral theses completed in 2026 in the field of Education Sciences. The studies were intentionally selected on the basis of analytical interfaces among investigations addressing contemporary challenges in Basic Education. The corpus comprises Souza's (2026) study on the implementation of the Pergamon System in a school library; Faria's (2026) thesis on teacher professional development, social policies, and ICTs; Henschel's (2026) research on post-pandemic learning difficulties; Oliveira's (2026) study on school conflicts, violence, and a culture of peace; and Amorim's (2026) research on artificial intelligence, pedagogical practices, teacher professional development, and ethical challenges.

The theses were treated as autonomous documentary units. No access to or reanalysis of the primary datasets derived from questionnaires, interviews, observations, or other research instruments used by the original researchers was undertaken. This methodological decision preserved the original research designs, the contexts in which the data were produced, the ethical boundaries of the individual studies, and the different levels of evidence provided by each investigation.

To ensure comparability, ten units of analysis were established: object of investigation; research problem and objectives; educational context; methodological design; participants or corpus; instruments and procedures; main findings; conclusions; limitations; and contributions, products, or propositions. This information was extracted and organized into a comparative analytical matrix.

The analysis followed a thematic and categorical approach informed by Bardin (2016) and was conducted in three stages. First, an analytical reading of the five theses was performed, followed by the standardized extraction of relevant information. Second, convergences, complementarities, specificities, and divergences were identified. Third, the findings were reorganized into cross-cutting categories to interpret educational conditions shared across distinct research objects.

Evidence was considered convergent when findings originating from different research problems pointed to a similar educational condition; complementary when different perspectives expanded the understanding of the same dimension; and specific when findings remained associated with the particular object or context of a single thesis. Divergences were preserved rather than reinterpreted as inconsistencies. This procedure prevented the homogenization of findings derived from empirical field studies and bibliographic/documentary research.

The comparative process resulted in six analytical categories: (a) continuing professional development and professional competencies; (b) infrastructure, access, and conditions for participation; (c) pedagogical, informational, and relational mediation; (d) inclusion, equity, and rights protection; (e) governance, management, and institutional support; and (f) monitoring, evaluation, and sustainability.

From an ethical standpoint, the article uses exclusively consolidated results reported in the academic documents. No participant from the original studies was reidentified, and the empirical datasets were not recombined. The proposed products presented in the theses were classified according to their status: empirically observed results were distinguished from models, programs, and workshops that had not yet been implemented or validated. This distinction is essential to prevent unsupported claims of effectiveness.

The methodological process can therefore be summarized as follows: corpus construction; analytical reading; standardized data extraction; development of the comparative matrix; cross-cutting thematic coding; identification of convergences, complementarities, specificities, and divergences; integrative interpretation; and formulation of a conceptual synthesis for discussion.

RESULTS AND DISCUSSION

The comparative analysis showed that, despite addressing different research objects and employing distinct methodological designs, the five studies converge on a set of structural and institutional conditions required to address contemporary challenges in Basic Education. The most significant result does not lie in the recurrence of identical findings, but rather in the repeated identification of relationships among people, resources, mediation, rights, management, and monitoring. The six categories discussed below constitute the analytical framework through which these relationships are interpreted.

CONTINUING PROFESSIONAL DEVELOPMENT AND PROFESSIONAL COMPETENCIES

Professional development constitutes one of the strongest convergences across the corpus. In Souza (2026), the implementation of the Pergamum System demonstrated that automation and the reorganization of work processes depend on the acquisition of new procedural knowledge, ongoing support, and change management. Within the MIRABE framework, role-specific professional development and continuous monitoring are presented as conditions for preventing capacity-building initiatives from being reduced to one-time technical training. This finding is consistent with Davenport (1998) and Choo (2006), who argue that information systems must be accompanied by appropriate organizational practices and human capabilities.

Faria (2026) extends this discussion by arguing that teachers' digital competence cannot be reduced to technical proficiency. The study associates professional development with the ability to select,

plan, adapt, evaluate, and critically reflect on the use of technologies, a perspective consistent with Tardif (2014) and Nóvoa and Alvim (2022). Importantly, however, the Format Digital Program was developed as a theoretically grounded applied proposal and was not implemented as an intervention whose effectiveness had been empirically demonstrated.

In Henschel (2026), professional development assumes a pedagogical function oriented toward diagnosis, learning recovery, and continuous monitoring. The findings indicate that teachers and schools employ reinforcement activities, parallel recovery strategies, adapted learning activities, and diagnostic assessment. However, these practices require systematic organization, collective planning, adequate resources, and support from pedagogical coordination. Libâneo (2013) supports this interpretation by conceptualizing teaching as an intentional activity that integrates objectives, methods, and assessment.

Oliveira (2026) introduces relational and socio-emotional competencies into the analysis. Conflict prevention, dialogue, peer education, and the promotion of a culture of peace require specific professional development and an institutional capacity to distinguish situations that may appropriately involve mediation from those requiring immediate protection and adult intervention. Professional development therefore also entails ethical responsibility and an understanding of the limits of mediation.

Amorim (2026) adds the critical and ethical dimensions associated with artificial intelligence. The study identifies the potential of AI to support lesson planning, material adaptation, and accessibility while emphasizing concerns related to authorship, bias, privacy, verification, and the preservation of meaningful intellectual participation. These findings are consistent with UNESCO's human-centered approach (2023b; 2024) and the guidelines issued by the European Commission (2022).

The comparative analysis therefore suggests that the competencies required in contemporary schools are multidimensional: technical, pedagogical, digital, informational, relational, and ethical. Technology constitutes the central object of three of the theses but is not the common denominator across the corpus. Rather, the cross-cutting element is the professional and institutional capacity to interpret contexts, make informed decisions, and adapt practices in response to complex educational challenges.

INFRASTRUCTURE, ACCESS, AND CONDITIONS FOR PARTICIPATION

The second analytical category demonstrates that infrastructure must be understood in broader terms. In Souza (2026), equipment, connectivity, technical support, data quality, and operational continuity affected the functioning of the school library system. The implementation experience showed that the mere availability of software does not eliminate network limitations, technical processing requirements, inconsistencies in registration data, or constraints on service capacity.

Faria (2026) situates infrastructure within the broader field of digital inclusion and demonstrates that access cannot be reduced to device ownership. Connectivity, accessibility, technical support, competencies, socioeconomic conditions, and opportunities for meaningful educational use all affect participation. This interpretation is consistent with UNESCO (2023a), which recommends assessing educational technology according to contextual appropriateness and equity, and with the OECD (2023), which describes the digital education ecosystem as dependent on interconnected infrastructure and governance.

Henschel (2026) shows that inequalities experienced during and after the pandemic were also manifested through inadequate internet access, insufficient equipment, unsuitable learning environments, and limited educational support. A lack of pedagogical resources constrains individualized responses and reinforces the need to understand material conditions as part of the learning problem itself rather than as an external variable.

Oliveira (2026) adds a relational dimension to infrastructure through the need for permanent spaces for listening, dialogue, mediation, and support. This contribution broadens the category by demonstrating that appropriate institutional environments encompass not only physical spaces but also organizational mechanisms that enable safe participation and collaborative problem-solving.

In Amorim (2026), access to artificial intelligence is associated with platforms, data, accessibility, and digital inequality. Infrastructure therefore also encompasses security, privacy, and the conditions necessary for responsible use. Taken together, the findings indicate that material, technological,

informational, organizational, and relational resources constitute an interconnected foundation for educational participation.

PEDAGOGICAL, INFORMATIONAL, AND RELATIONAL MEDIATION

Mediation is the category that most clearly challenges automated or technology-driven interpretations of educational change. In the school library context, automation expanded the possibilities for searching, locating, and organizing information. However, frequency of use and pedagogical appropriation cannot be inferred solely from the availability of an online catalog. Campello (2009), Almeida Júnior (2015), and Lankes (2016) help explain why potential access must be transformed into meaningful learning experiences through mediation and user education.

Faria (2026) reaches a conceptually similar conclusion in the field of ICTs: teachers need to select technologies according to pedagogical objectives rather than adapting teaching practices to whatever technological tool happens to be available. Masetto (2012) supports this perspective by conceptualizing pedagogical mediation as an intentional process that promotes participation and knowledge construction.

In Henschel (2026), mediation takes the form of pedagogical monitoring, diagnosis, listening, and adaptation. Teachers remain central to this process, but they cannot be held individually responsible for learning difficulties shaped by social, emotional, family-related, and institutional factors. From a Freirean perspective, education requires the creation of possibilities and recognition of learners as active subjects rather than the unilateral transmission of content (Freire, 2021).

Oliveira (2026) explicitly addresses conflict mediation. Peer education may contribute to the management of minor conflicts when appropriate training, supervision, and clearly defined boundaries are in place. Situations involving violence, intimidation, or power imbalances, however, require adult intervention and protective measures. Mediation, therefore, should not be understood as neutrality or as the transfer of institutional responsibility to students; it is a practice governed by ethical and institutional criteria.

Amorim (2026) demonstrates that artificial intelligence increases rather than eliminates the need for human mediation. Verifying AI-generated responses, identifying bias, preserving authorship, and determining appropriate educational uses all require professional judgment. UNESCO (2023b) reinforces this perspective by advocating regulation and pedagogical design grounded in a human-centered approach.

The comparative synthesis supports the proposition that the greater the technological, pedagogical, or relational complexity of an intervention, the greater the need for qualified human mediation tends to become. None of the five theses provides evidence supporting the assumption that resources, methods, or algorithms can replace the interpretive work performed by educational professionals and other participants in the educational process.

INCLUSION, EQUITY, AND RIGHTS PROTECTION

Inclusion emerges across the five studies through different dimensions: access and informational autonomy; digital inclusion and accessibility; inequalities in learning; belonging and protection from violence; and digital rights. The comparative analysis demonstrates that formal equality of provision does not necessarily ensure equitable participation.

In the school library context, democratizing access involves making collections discoverable, understandable, and effectively usable by the school community. The 2025 IFLA–UNESCO School Library Manifesto connects inclusive and equitable education with qualified professionals, physical and digital collections, equipment, services, and collaboration (IFLA; UNESCO, 2025). An automated library system therefore represents only one component of this broader institutional architecture.

Faria (2026) demonstrates that students may have access to devices while still experiencing unstable internet connectivity, shared equipment, limited digital competence, or accessibility barriers. Inclusion must therefore encompass resources, competencies, and genuine opportunities for meaningful educational use. UNESCO (2023a) likewise warns that technology may exacerbate inequalities when

conditions of access and use are asymmetrical.

Henschel (2026) shifts the discussion of equity toward learning trajectories. Post-pandemic learning difficulties cannot be attributed exclusively to individual students or their families.

Socioeconomic, emotional, technological, and institutional conditions affect educational development and require responses proportionate to identified needs.

Oliveira (2026) incorporates belonging, respect, and protection. Distinguishing conflict from violence is essential to protecting students' rights: minor disagreements may provide opportunities for educational dialogue, whereas bullying, threats, aggression, and other risk situations require protective measures and adult intervention. Student participation does not remove the institution's duty of care.

Amorim (2026) adds privacy, data protection, authorship, and algorithmic bias to the discussion. The use of AI in school settings creates new asymmetries and requires criteria to ensure that innovation does not compromise fundamental rights. The European Commission (2022) and UNESCO (2023b; 2024) converge in advocating critical competencies and principles for safe, ethical, and responsible use.

From these intersections emerges an operational understanding of equity comprising five elements: access, accessibility, learning, participation, and protection. This formulation does not erase differences among the five studies; rather, it provides a shared analytical language for assessing whether institutional changes expand or constrain educational opportunities.

GOVERNANCE, MANAGEMENT, AND INSTITUTIONAL SUPPORT

Governance constitutes the dimension through which individual initiatives can become sustainable institutional processes. In Souza (2026), MIRABE incorporates diagnosis, assignment of responsibilities, data quality, phased implementation, support, and monitoring. The implementation experience indicates that automation without governance may produce inconsistent databases, duplicated work, and operational instability even when the technology itself is functional.

Faria (2026) demonstrates that digital policies need to integrate infrastructure, professional

development, funding, accessibility, support, and monitoring. This interpretation is consistent with Ball (1994) and Mainardes (2006), who argue that educational policies are reinterpreted in practice and depend on local implementation conditions. The OECD (2023) likewise identifies governance as a central component of digital education ecosystems.

In Henschel (2026), school management and pedagogical coordination function as organizational structures for listening, collective planning, monitoring, teacher support, and engagement with families. This institutional structure helps prevent learning recovery from depending exclusively on the individual efforts of teachers.

Oliveira (2026) demonstrates that school coexistence and violence-prevention initiatives tend to lose effectiveness and continuity when they depend on occasional campaigns or on the initiative of a small number of professionals. Clear procedures, defined responsibilities, spaces for dialogue, coordination with families and protection networks, and integration with school planning and the School Political-Pedagogical Project are conditions for institutional continuity.

In Amorim (2026), governance also assumes a digital dimension through rules governing AI use, data protection, authorship, accountability, and assessment criteria. Generative technologies shift part of the issue from the individual to the institutional level because decisions concerning data and digital tools have consequences that extend beyond the practice of an individual teacher.

The comparative analysis therefore enables a distinction between operational management and educational governance. Management organizes resources, activities, and schedules; governance establishes principles, responsibilities, boundaries, decision-making criteria, and monitoring mechanisms. Sustainability depends on the articulation of both dimensions.

MONITORING, EVALUATION, AND SUSTAINABILITY

The sixth category demonstrates that diagnosis, monitoring, and evaluation should not be treated as isolated stages conducted only after an intervention has been completed. In Souza (2026), MIRABE

proposes phased implementation, progression criteria, operational indicators, quality control, and stabilization procedures. Success is not inferred merely from the presence of the system but assessed through evidence concerning its functioning and appropriation.

Faria's (2026) Formar Digital Program includes diagnosis, professional development, practical application, knowledge sharing, and evaluation. Because the program was not implemented, these components represent a proposed sustainability framework rather than empirical evidence of effectiveness. Preserving this distinction is methodologically essential.

In Henschel (2026), monitoring assumes a pedagogical character. The study identified weaknesses in the systematic monitoring of learning difficulties and emphasized the need for records, targeted interventions, diagnostic assessment, and collective planning. These findings indicate that identifying learning gaps without subsequently monitoring progress limits the school's capacity for evidence-informed decision-making.

Oliveira (2026) proposes School Coexistence Indicators within the CONVIVER Method, which likewise had not yet been empirically validated. Amorim (2026), in turn, presents an AI professional development workshop whose effectiveness would require future implementation, contextual adaptation, and evaluation. Thus, these proposed products reinforce the analytical importance of monitoring but must not be interpreted as empirically validated outcomes. Their existence demonstrates that the original studies identified monitoring and evaluation as necessary components of future implementation; it does not establish that the proposed interventions are effective.

The comparative synthesis reveals a recurring institutional sequence: diagnosis → planning → implementation → monitoring → evaluation → adjustment → continuity. Sustainability, from this perspective, no longer refers merely to the temporal persistence of an initiative. Instead, it denotes an institution's capacity to learn from evidence and continuously revise its own practices.

INTEGRATIVE SYNTHESIS: AN INSTITUTIONAL CYCLE FOR CONTEMPORARY EDUCATIONAL RESPONSES

The articulation of the six analytical categories gives rise to the principal original contribution of this article: an Integrated Institutional Cycle comprising the conditions required to address contemporary challenges in Basic Education.

The conceptual synthesis can be represented as follows: Institutional Conditions and Infrastructure → Professional Development → Pedagogical, Informational, and Relational Mediation → Inclusion, Equity, and Rights Protection → Governance and Institutional Coordination → Monitoring and Evaluation → Adjustment of Actions → Renewed Diagnosis.

The Integrated Institutional Cycle does not constitute a universal model, a standardized intervention protocol, or an empirically validated framework. Its purpose is analytical and conceptual: to make visible the recurring relationships identified through the comparative examination of studies addressing distinct educational phenomena.

Within the cycle, the first dimension provides resources and enabling conditions; the second develops professional competencies; the third transforms resources and competencies into meaningful educational practice; the fourth establishes criteria for equity, participation, and protection; the fifth institutionalizes principles and responsibilities; and the sixth generates evidence to inform continuity, modification, or renewed intervention.

The interdependence among these dimensions is critical. Infrastructure without professional development may result in underutilization; professional development without adequate institutional conditions may restrict the practical application of competencies; mediation without equity may reproduce existing inequalities; innovation without governance may become excessively dependent on individual actors; and implementation without monitoring makes it difficult to distinguish administrative continuity from meaningful educational outcomes.

This synthesis also reframes the meaning of innovation across the corpus. School library

automation, ICTs, and artificial intelligence represent different forms of technological innovation, whereas learning recovery and the promotion of a culture of peace involve primarily pedagogical and relational challenges. Nevertheless, all five studies indicate that meaningful innovation occurs when changes in working conditions, participation, learning, mediation, and management are institutionally coordinated.

The human dimension, therefore, does not become less important in the context of digital transformation. On the contrary, increasingly complex systems require professionals capable of interpreting information, making informed decisions, mediating relationships and learning processes, and responding ethically to emerging challenges. This conclusion brings Freire (2021), Tardif (2014), Masetto (2012), Lankes (2016), and recent UNESCO frameworks (2023b; 2024) into conceptual dialogue around a common principle: technologies and institutional structures acquire educational meaning through situated human action.

Table 1

Dimensions of the Integrated Institutional Cycle

Dimension	Cross-cutting synthesis	Risk when addressed in isolation
Institutional conditions and infrastructure	Resources, connectivity, information, spaces, support, and accessibility provide the enabling conditions for educational action.	Provision of resources without effective use or continuity.
Professional development	Technical, pedagogical, digital, informational, relational, and ethical competencies.	One-time training without sustainable changes in practice.
Human mediation	Professionals and educational participants provide educational intentionality to technologies, information, and relationships.	Automation or decontextualized intervention.
Governance and institutional support	Responsibilities, policies, planning, coordination, quality assurance, and support.	Dependence on individual initiatives and discontinuity.
Monitoring and sustainability	Diagnosis, indicators, monitoring, evaluation, and adjustment.	Continuation of initiatives without sufficient evidence of effective functioning.

Source: Prepared by the authors based on the comparative analysis of the five doctoral theses (2026).

CONCLUSION

This study comparatively analyzed five doctoral studies addressing contemporary challenges in Basic Education and identified six cross-cutting dimensions: continuing professional development and professional competencies; infrastructure, access, and conditions for participation; pedagogical, informational, and relational mediation; inclusion, equity, and rights protection; governance, management, and institutional support; and monitoring, evaluation, and sustainability.

In response to the research question, the findings indicate that these dimensions help explain why isolated interventions tend to have limited reach. The results do not suggest that a single solution can be uniformly applied to school libraries, ICTs, learning difficulties, school coexistence, and artificial intelligence. Rather, they indicate that consistent educational responses depend on an institutional architecture capable of integrating resources, competencies, mediation, rights, coordination, and organizational learning.

Continuing professional development emerged as a particularly strong point of convergence. Although the competencies required vary according to the object of each study, all five investigations indicate that sustainable change depends on professionals capable of learning, interpreting contexts, and reorganizing their practices. Infrastructure also emerged as a multidimensional concept encompassing connectivity, informational resources, physical and organizational spaces, accessibility, support, and conditions for participation.

Human mediation constitutes another central finding. School library systems, ICTs, artificial intelligence, learning recovery strategies, and school coexistence practices acquire educational meaning only when integrated into pedagogical and institutional decision-making. The analysis reinforces the understanding that increasing technological or relational complexity does not reduce the need for mediation; on the contrary, it increases the importance of professional judgment, ethical responsibility, and contextualized decision-making.

Equity connects the five fields by shifting attention from the formal provision of opportunities to

the actual conditions under which individuals are able to participate. Access, accessibility, learning, belonging, privacy, and protection therefore become criteria for evaluating the quality of educational transformations. Governance and monitoring complete this institutional architecture by enabling individual initiatives to become shared processes that can be systematically monitored, evaluated, and revised.

As its principal original contribution, this article proposes the Integrated Institutional Cycle, organized around institutional conditions and infrastructure, professional development, mediation, inclusion and equity, governance, monitoring, and adjustment. The cycle is not presented as an empirically validated model; rather, it constitutes an analytical-conceptual synthesis derived from comparative documentary analysis. Its contribution lies in providing a shared analytical language for examining the conditions that may support sustainable educational change without erasing the specific characteristics of the different research objects.

The study has several limitations. The corpus was intentionally selected and consists of only five doctoral theses; the methodological designs are heterogeneous; three studies include fieldwork, whereas two are bibliographic/documentary in nature; and several proposed products have not yet been implemented or validated. The samples from the original studies were not aggregated, and the findings do not support statistical generalization to Brazilian Basic Education as a whole.

The transferability of evidence from each thesis must also be considered carefully. Findings derived from case studies or specific regional contexts should be interpreted in relation to the conditions under which they were produced. Likewise, programs, workshops, and models proposed in the original studies require implementation and empirical testing before any claims regarding their effectiveness can be made.

Future research may empirically examine the Integrated Institutional Cycle across different education systems and educational levels, expand the corpus to include additional doctoral theses, master's dissertations, and international studies, and develop indicators capable of examining

relationships among the six dimensions. Future studies should also implement and evaluate the products proposed in the original research while adopting evaluation designs capable of distinguishing among process, outcomes, and context.

In conclusion, contemporary challenges in Basic Education require responses that are less fragmented and more institutionally coordinated. Technologies, pedagogical practices, information services, and school coexistence strategies may contribute to educational improvement, but their sustainability depends on how resources, people, rights, management, and evaluation are combined. The main contribution of this article is to make this institutional architecture visible and to offer it as a conceptual hypothesis for further investigation, contextual adaptation, and refinement across diverse educational settings.

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**MENTAL HEALTH, TEACHER EDUCATION, AND TEACHING WORK IN
CONTEMPORARY SOCIETY: PSYCHOSOCIAL CHALLENGES, PROFESSIONAL
IDENTITIES, INCLUSION, TECHNOLOGIES, EDUCATIONAL POLICIES, AND
PERSPECTIVES ON THE CARE AND APPRECIATION OF EDUCATORS**

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Abstract

Mental health, teacher education, and teaching work in contemporary society are fundamental issues in light of the social, educational, and technological changes that have been reshaping the conditions under which teaching is performed. This qualitative literature review aims to analyze the main psychosocial challenges faced by teachers, considering working conditions, the construction of professional identity, the demands of inclusive education, the incorporation of digital technologies, and policies concerning teacher education and professional appreciation. The methodology was based on an analysis of scholarly publications concerning mental health, teacher education, and teaching work in the contemporary educational context. The results indicate that work overload, work intensification, institutional demands, the need for continuous professional development, and difficulties related to inclusion and the use of new technologies may contribute to stress, emotional strain, and occupational burnout. Conversely, continuing education, institutional support, professional recognition, collaborative relationships, and adequate working conditions emerge as important protective factors. It is concluded that promoting teachers' mental health requires coordinated measures involving care, education, and professional appreciation, together with educational policies capable of ensuring more humane, inclusive, and sustainable working conditions.

Keywords: Professional identity, Teacher appreciation, Teacher education, Teacher mental health, Teaching work.

INTRODUCTION

Teaching work has undergone significant changes in recent decades, reflecting social, cultural, technological, and institutional transformations that have directly affected school organization and teachers' professional practice. In addition to activities traditionally associated with teaching, such as planning, monitoring learning, and assessment, teachers have increasingly had to address administrative

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demands, inclusion processes, the use of digital technologies, continuing education, and social and emotional issues that permeate everyday school life. In this context, discussing the mental health of education professionals has become necessary in order to understand not only individual illness, but also the concrete conditions under which teaching work is performed.

The relationship between teaching work and teachers' health has been discussed in Brazilian educational literature for many years. In analyzing the working conditions of education workers, Codo (1999) drew attention to the prevalence of burnout among teachers, linking occupational strain to the characteristics and demands inherent in teaching. Subsequent studies have reinforced the position that teacher distress cannot be understood in isolation from institutional conditions and the organization of work. According to Gasparini, Barreto, and Assunção (2005), changes within the educational system have expanded teachers' responsibilities without necessarily ensuring equivalent conditions for carrying out these new duties.

In this regard, the intensification of professional activities is an important aspect in understanding the challenges experienced by teachers as an occupational group. Assunção and Oliveira (2009) observe that changes in school organization and the expansion of the demands placed on teachers may result in work overload and intensification. Many of these demands extend beyond formal working hours into periods intended for rest and personal life. Planning, preparing and grading assignments, completing records, participating in professional development, and communicating with students and families are examples of tasks that may increase the amount of time effectively devoted to the profession.

This reality also affects how teachers perceive their profession and construct their identity. According to Nóvoa (1992), teacher education is not limited to acquiring specific techniques or knowledge, as it also involves reflecting on one's own trajectory and professional practice. Teacher identity is continuously constructed and influenced by individual experiences, relationships established within the school, and changes affecting education. Tardif and Lessard (2005) further emphasize that

teaching is essentially interactive work conducted through human relationships, a characteristic that gives it particular complexity and a strong emotional dimension.

In the contemporary context, other issues have become increasingly embedded in teachers' daily work. Inclusive education, for example, requires schools to develop practices capable of serving students with different characteristics, needs, and learning trajectories. Mantoan (2003) argues that inclusion presupposes changes in the organization of schools and in pedagogical practices themselves and cannot be reduced to the mere placement of students within the school environment. For teachers, this process requires education, planning, institutional support, and adequate conditions so that inclusion can be implemented effectively.

Digital technologies constitute another dimension that has changed the ways in which teaching, learning, and pedagogical work are organized. Kenski (2012) emphasizes that technologies alter relationships with knowledge and require new ways of organizing educational practices. Their incorporation into everyday school life offers important possibilities for diversifying methodologies and expanding access to information, but it also requires continuous learning on the part of teachers. When this adaptation takes place without adequate infrastructure, training, or support, it may represent an additional source of pressure in professional practice.

These various demands make it possible to define the problem guiding this study: **How do contemporary transformations in teaching work, particularly those related to working conditions, professional development, inclusion, technologies, and educational policies, affect teachers' mental health and the construction of their professional identity?** This question is based on the understanding that teacher well-being does not depend exclusively on individual coping strategies and that the institutional, organizational, and political aspects structuring the profession must also be considered.

In light of this problem, the general objective of this chapter is to analyze the challenges related to mental health, teacher education, and teaching work in contemporary society, considering their relationship with working conditions, professional identity, inclusion, technologies, and educational

policies. Its specific objectives are to understand the main psychosocial factors associated with strain and distress in teaching work; discuss the importance of initial and continuing teacher education in response to new educational demands; analyze the effects of inclusion and technologies on professional practice; reflect on the construction of teacher identity amid transformations in the profession; and identify possibilities for care, illness prevention, and the appreciation of education professionals.

This study is justified by the need to broaden the debate on teachers' mental health beyond a perspective centered exclusively on the individual. Care policies that disregard working hours, remuneration, professional recognition, schools' material conditions, workplace relationships, and professional development opportunities tend to achieve limited results. According to Esteve (1999), the social changes affecting schools place new demands on teachers and may generate feelings of insecurity, dissatisfaction, and strain when they are not accompanied by the conditions necessary for professional performance.

Understanding teacher mental health therefore entails recognizing the complexity of the work performed in educational institutions and the different dimensions that affect professional practice. Appreciating educators involves adequate teacher education, decent working conditions, social and professional recognition, participation in educational decision-making, and the availability of institutional support networks. By connecting mental health, teacher education, identity, inclusion, technologies, and educational policies, this chapter seeks to contribute to a broader understanding of teachers' experiences and to the discussion of strategies conducive to healthier, more highly valued, and more sustainable professional practice.

METHODOLOGY

TYPE AND APPROACH OF THE STUDY

This study is characterized as bibliographic research with a qualitative, descriptive-analytical approach. This methodological path was selected because of the need to gather and discuss previously

produced knowledge on teacher mental health, professional development, working conditions, teacher identity, inclusion, educational technologies, and teacher appreciation policies. According to Gil (2008), bibliographic research is conducted using previously prepared materials, particularly books and scholarly articles, enabling researchers to examine different perspectives on a given problem.

The qualitative approach proved appropriate because it enabled the interpretation of phenomena involving professional experiences, workplace relationships, perceptions, practices, and institutional conditions. Minayo (2014) emphasizes that qualitative research addresses dimensions of reality that cannot be reduced solely to quantification, making it possible to understand meanings, relationships, and processes within social phenomena. Accordingly, the study did not seek to measure the occurrence of disorders or establish statistical relationships among variables, but rather to understand how different aspects of the teaching profession are associated with teachers' mental health and well-being in the literature analyzed.

PROCEDURES FOR SEARCHING AND SELECTING MATERIALS

The literature search was conducted by consulting scholarly publications available in academic databases and repositories, with an emphasis on articles, books, book chapters, and institutional documents related to the topic. Studies published in Portuguese, English, and Spanish were considered when they addressed, either directly or indirectly, teaching work and its relationship with mental health, psychological distress, burnout, teacher education, professional identity, school inclusion, digital technologies, and educational policies.

To guide the identification of publications, descriptors such as “teacher mental health,” “teaching work,” “teacher burnout,” “teacher education,” “teacher identity,” “inclusive education,” “digital technologies in education,” and “teacher appreciation” were used, as were combinations of these terms. The selection prioritized works directly related to the subject of this chapter, as well as studies considered relevant to the conceptual foundation of the discussion.

The inclusion criteria encompassed full texts that contributed to an understanding of working conditions, psychosocial factors, professional development, and contemporary transformations in the teaching profession. Duplicate materials, texts without a direct relationship to the topic, and publications adopting an exclusively technical approach without contributing to the analysis of the psychosocial dimensions of teaching work were excluded.

ORGANIZATION AND ANALYSIS OF THE SELECTED PUBLICATIONS

After the materials had been identified, an exploratory reading was conducted to determine their relevance to the subject under investigation. This was followed by a selective and analytical reading of the publications, aimed at identifying recurring concepts, findings, and arguments. Gil (2008) notes that reading within the bibliographic research process involves different stages, beginning with recognition of the material and progressing toward a more in-depth analysis of information relevant to the research problem.

The information identified was organized into thematic axes defined on the basis of the study objectives. The first axis encompassed working conditions, overload, the intensification of professional activity, and mental health. The second brought together aspects related to initial and continuing teacher education and the construction of teacher identity. The third focused on discussions of inclusion, diversity, and the expansion of teachers' responsibilities. The fourth addressed the presence of digital technologies and their implications for pedagogical practice. Finally, the fifth axis encompassed studies concerning educational policies, institutional care, and professional appreciation.

The interpretation of the material drew on the principles of thematic analysis, understood as a procedure that enables the identification of recurring units of meaning within a given body of information. Minayo (2014) states that thematic analysis makes it possible to organize qualitative content according to themes relevant to understanding the phenomenon under study. In this sense, the study did

not merely describe the publications, but instead conducted a comparative analysis of the convergences, differences, and relationships among the selected studies.

DEFINITION OF THE DOCUMENTARY SAMPLE

Because this was a bibliographic study, the sample consisted of scholarly publications and documents selected according to their thematic relevance rather than human participants. Priority was given to authors considered key references in the debate on the teaching profession, work, and teacher education, including Codo, Nóvoa, Tardif, Lessard, Esteve, Assunção, Oliveira, Mantoan, and Kenski, as well as contemporary studies capable of broadening the discussion of challenges found in everyday educational settings.

The selection was not intended to exhaust all existing scholarship on the subject, but to construct a sufficiently diverse theoretical body for discussing the main aspects related to the chapter's subject matter. This procedure is supported by Marconi and Lakatos (2017), according to whom bibliographic research enables a given phenomenon to be examined through contributions that have already been systematized, thereby facilitating the establishment of relationships among different interpretations and schools of thought.

ETHICAL ASPECTS AND METHODOLOGICAL LIMITATIONS

Because it relied exclusively on publicly accessible documents and scholarly publications, without the direct participation of human beings or the use of personally identifiable information, the study did not involve direct data-collection procedures with participants. The principles of authorship and intellectual property were observed, and the sources used were cited in accordance with the applicable academic standards.

Among the methodological limitations, it is acknowledged that the diversity of approaches found in the literature may hinder direct comparisons among studies, especially because mental health and

teaching work are investigated across different institutional contexts, educational levels, and theoretical frameworks. Nevertheless, this diversity also contributes to a broader understanding of the phenomenon by demonstrating that teacher distress and well-being are influenced by personal, professional, relational, organizational, and political factors.

The methodology adopted therefore made it possible to develop a well-founded analysis of recent transformations in the teaching profession while avoiding an interpretation of mental health as the teacher's exclusive responsibility. The integration of different studies enabled illness and professional appreciation to be discussed as phenomena linked to the concrete conditions of education, work, recognition, and institutional support.

RESULTS AND DISCUSSION

The literature analysis revealed that teacher mental health is related to a set of factors extending beyond the individual dimension and encompassing working conditions, institutional organization, interpersonal relationships, professional recognition, education, inclusion, and the incorporation of technologies into everyday school life. The studies analyzed converge in demonstrating that changes in education have expanded the responsibilities assigned to teachers, making the relationship among teaching, responding to institutional demands, and preserving personal and professional well-being increasingly complex.

WORKING CONDITIONS AND TEACHER MENTAL HEALTH

One of the most recurrent aspects in the literature concerns work intensification. Teaching is not limited to time spent in the classroom. Planning, preparing and grading assignments, maintaining school records, attending meetings, participating in continuing education, assisting students, and communicating with families expand the range of tasks performed by teachers. Assunção and Oliveira (2009) associate

changes in the organization of schoolwork with the intensification of teaching activities, emphasizing that new demands have been incorporated into teachers' daily professional lives.

Gasparini, Barreto, and Assunção (2005) also draw attention to the disparity between the responsibilities assigned to teachers and the conditions provided for fulfilling them. This issue is important because it demonstrates that emotional strain should not be interpreted exclusively as an individual inability to manage pressure. The characteristics of work organization and the material and institutional conditions available directly affect professional experience.

Occupational burnout appears as one possible consequence of this process. In a study of education workers, Codo (1999) had already demonstrated the significance of burnout syndrome in discussions of teaching work. Such strain may manifest as emotional exhaustion, detachment from work, and a diminished sense of professional accomplishment. Maslach and Leiter (2016) reinforce the position that burnout must be understood in relation to the occupational environment, particularly when overload, conflict, lack of recognition, and incompatibility between workers' expectations and the concrete conditions under which they perform their activities are present.

Table 1

Main factors associated with teachers' psychosocial strain identified in the literature

Dimension	Situations identified	Possible repercussions
Work organization	Overload and multiplicity of tasks	Fatigue and emotional exhaustion
Working hours	Activities performed outside school hours	Reduced time for rest
Institutional demands	Demands, record-keeping, and pressure to achieve results	Stress and a sense of overload
Professional relationships	Conflict and lack of support	Isolation and professional dissatisfaction
Recognition	Social and professional devaluation	Demotivation and weakened professional identity
Inclusion	Pedagogical demands without sufficient support	Insecurity and overload
Technologies	Constant need for adaptation	Pressure to remain up to date and an increased workload

Source: Prepared by the authors based on Codo (1999), Gasparini, Barreto, and Assunção (2005), Assunção and Oliveira (2009), and Maslach and Leiter (2016).

The findings therefore demonstrate that discussing teacher mental health requires attention to the very structure of the work. Interventions focused solely on individual coping strategies may prove insufficient when excessive working hours, precarious conditions, lack of resources, institutional conflict, and lack of recognition persist.

TEACHER EDUCATION AND THE CONSTRUCTION OF PROFESSIONAL IDENTITY

Another important finding concerns the relationship between teacher education and professional identity. Teacher education does not end upon completion of an undergraduate degree, as educational practice requires professionals to remain up to date in response to social, pedagogical, and technological changes. Nóvoa (1992) argues that teacher education must consider professional development and reflection on practice, recognizing teachers as active agents in their own education.

Tardif (2014) emphasizes that teachers' knowledge originates from different sources and is constructed throughout their professional trajectories. This means that teacher identity is shaped not only by the knowledge acquired during initial education, but also by everyday experiences, relationships established within the school, and situations encountered throughout one's career.

In this regard, continuing education may serve a protective function when it responds to teachers' concrete needs. Professional development processes disconnected from the problems encountered at school may be perceived as yet another obligation. By contrast, educational spaces linked to practice, the exchange of experiences, and the collective construction of solutions can strengthen autonomy and a sense of professional belonging.

INCLUSION AND THE EXPANSION OF TEACHERS' RESPONSIBILITIES

Inclusive education also emerged as an important dimension of the discussion. Expanded access to schooling and recognition of the right to education for students with different needs represent fundamental achievements. However, the effective implementation of inclusion equires material

conditions, teacher training, pedagogical resources, accessibility, and coordinated action among different professionals.

Mantoan (2003) argues that inclusion presupposes the transformation of schools and their practices and cannot be understood simply as a student's physical presence in a mainstream classroom. This perspective makes it clear that responsibility for inclusion should not be transferred exclusively to the teacher.

When teachers are assigned new responsibilities without specific training, resources, or institutional support, a rights-based policy may be experienced in everyday practice as an increased burden. The results therefore indicate that inclusion and teacher mental health should not be treated as competing concerns. On the contrary, adequate conditions for teachers are part of the conditions required to provide genuinely inclusive education.

DIGITAL TECHNOLOGIES AND THE REORGANIZATION OF WORK

The presence of digital technologies has significantly changed pedagogical work. Virtual environments, educational platforms, communication applications, and digital resources have become part of different stages of teaching activity. Kenski (2012) observes that technologies affect access to knowledge and the relationships established within the educational process, requiring changes in pedagogical practices.

Technological resources can foster methodological diversification, access to different materials, and new possibilities for interaction. Their benefits, however, depend on the conditions under which they are incorporated. A lack of equipment, connectivity, technical support, and adequate training may turn technology into a new source of difficulty.

Furthermore, the expansion of digital communication has contributed to blurring the boundaries between professional and personal time. Messages, electronic records, platforms, and demands received outside working hours may extend work beyond the physical boundaries of the school. The problem

therefore lies not in technology itself, but in how its use is implemented, organized, and regulated within teaching work.

EDUCATIONAL POLICIES, CARE, AND PROFESSIONAL APPRECIATION

The analysis also revealed that professional appreciation must be understood broadly. Remuneration and career development are fundamental dimensions, but they do not encompass the entire issue. Adequate material conditions, pedagogical autonomy, professional development, respectful professional relationships, participation in decision-making, and institutional support also affect how teachers experience their profession.

Esteve (1999) draws attention to the effects of social transformations on teaching work, particularly in light of the growing expectations placed on schools and teachers. When demands increase without corresponding institutional support and recognition, feelings of dissatisfaction, insecurity, and strain may arise.

The findings analyzed make it possible to organize the risk and protective factors related to teacher mental health.

Table 2

Risk and protective factors related to mental health and teaching work

Risk factors	Protective factors
Work overload and intensification	Balanced organization of working hours
Excessive pressure to achieve results	Autonomy and participation in decision-making
Lack of recognition	Professional appreciation
Lack of institutional support	Support from school management and collaborative work
Insufficient training for new demands	Continuing professional development aligned with school realities
Difficulties implementing inclusion	Multidisciplinary teams and adequate resources
Disorganized use of technologies	Digital training and the establishment of professional boundaries
Professional isolation	Support networks and collaboration among teachers

Source: Prepared by the authors based on the literature analyzed.

The factors presented should not be understood in isolation. A teacher may simultaneously be exposed to overload, pressure to achieve results, structural difficulties, and limited professional appreciation, thereby increasing the complexity of the professional experience. Likewise, management support, collaborative relationships, and professional development opportunities can contribute to a healthier relationship with work.

PERSPECTIVES ON CARING FOR EDUCATORS

The main interpretation arising from the analysis is that caring for teachers' mental health requires moving beyond proposals centered solely on self-care. Individual practices for promoting well-being may be useful, but they cannot replace changes in the conditions under which teaching is performed. When problems also arise from overload, precarious conditions, or lack of support, holding teachers exclusively responsible for preserving their own health may obscure the institutional dimensions of work-related illness.

Nóvoa (1992) contributes to this discussion by situating professional development within a perspective that values teachers' experience, reflection, and participation. Tardif and Lessard (2005), in

turn, emphasize the interactive dimension of the profession, demonstrating that teaching involves complex human relationships and significant personal investment. These characteristics help explain why relational and institutional conditions are so important to teachers' well-being.

The synthesis of the results therefore indicates the need for a care policy based on several dimensions: illness prevention, improved working conditions, continuing education, institutional support, strengthened professional relationships, and the social and economic appreciation of teaching. In this sense, mental health and educational quality emerge as interconnected issues. Teachers who have adequate conditions in which to teach, learn, plan, and participate in school decision-making have better prospects of building sustainable professional careers.

The findings therefore reinforce that teacher appreciation must not remain confined to rhetoric. It must be realized through policies and practices capable of recognizing the complexity of the work performed in schools each day. Caring for educators means creating conditions in which teachers can practice their profession with dignity, autonomy, support, recognition, and genuine opportunities for professional development.

CONCLUSION

This study aimed to analyze the challenges related to mental health, teacher education, and teaching work in contemporary society, considering working conditions, the construction of professional identity, the demands of inclusive education, the presence of digital technologies, and educational policies focused on the care and appreciation of teachers. The analysis made it possible to understand that these dimensions are directly interconnected and that changes within the educational landscape affect both pedagogical practice and the ways in which teachers experience and attribute meaning to their profession.

The main findings indicate that work intensification, the multiplicity of roles, pressure to achieve results, administrative requirements, the need to remain continually up to date, and the expansion of teachers' responsibilities constitute significant challenges in everyday professional life. These issues are

compounded by demands related to educational inclusion and the incorporation of digital technologies, which represent important advances in education but require appropriate training, infrastructure, and institutional support so that they do not become additional sources of overload.

The literature analyzed also demonstrated that distress related to teaching work cannot be explained exclusively by individual characteristics. Schools' material conditions, the organization of working hours, relationships within the professional environment, social recognition, autonomy, and professional development opportunities directly affect teachers' experiences. In this respect, strategies focused solely on self-care have limited effectiveness when they are not accompanied by changes in the concrete conditions under which the profession is practiced.

Conversely, elements were identified that may help protect mental health and strengthen professional identity. Continuing education aligned with the school's actual needs, management support, collaborative relationships among professionals, the availability of resources for inclusion, the planned use of technologies, pedagogical autonomy, and professional recognition are relevant to building healthier work environments. Teacher appreciation must therefore encompass not only remuneration and career development, but also adequate conditions in which to teach, plan, learn, and participate in educational decision-making.

As a contribution, the study reinforces the need to address teacher mental health as an issue involving individual, institutional, and political responsibilities, while avoiding interpretations that place sole responsibility for coping with occupational strain on teachers themselves. Promoting the well-being of educators should be integrated into teacher education and appreciation policies, in recognition of the fact that educational quality also depends on the conditions provided to the professionals responsible for its daily realization.

Future research should conduct field studies with teachers working at different stages and in different modalities of education, encompassing various educational systems and regional realities. Qualitative studies based on interviews and focus groups may deepen understanding of teachers'

experiences, while quantitative research may help identify the frequency and distribution of factors associated with mental health strain and protection. It would also be relevant to investigate the effects of digital technologies, inclusion policies, and recent changes in work organization on teachers' well-being.

It is concluded that caring for educators requires recognition that teacher mental health is linked to the very ways in which education and schoolwork are organized. Investing in teacher education, institutional support, working conditions, and professional appreciation is not only a measure to protect teachers, but also an indispensable element in building a more humane, inclusive, and socially committed education system.

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THE SCHOOL IN THE FACE OF GENERATIVE ARTIFICIAL INTELLIGENCE: AUTHORSHIP, COGNITION, AND LEARNING IN THE FINAL YEARS OF ELEMENTARY EDUCATION AND IN HIGH SCHOOL

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Abstract

The spread of generative artificial intelligence has introduced new questions into everyday school life, particularly at stages of Basic Education in which students consolidate more complex forms of reading, writing, argumentation, problem-solving, and intellectual autonomy. This article analyzes the implications of using generative artificial intelligence in the Final Years of Elementary Education and in High School, focusing on authorship, the cognitive processes involved in learning, and the ways in which schools can incorporate these technologies without transferring to them intellectual functions essential to students' development. This is a qualitative, bibliographic, and theoretical-analytical study based on books, scientific articles, institutional documents, a doctoral dissertation, and recent studies on artificial intelligence, education, writing, cognition, and digital literacy. The analysis demonstrates that the educational effects of generative AI cannot be understood solely in terms of the presence or absence of the technology, as they depend on how it is used, its pedagogical purposes, students' age and development, and teacher mediation. The studies examined point to possibilities related to personalization, writing support, feedback generation, and the development of digital literacy, while also highlighting risks of dependence, cognitive offloading, weakened authorship, and the uncritical use of automatically generated content. It is concluded that the central issue for schools is neither to prohibit nor to normalize generative AI, but to establish pedagogical conditions that preserve students' intellectual participation and assign technology a role consistent with the educational objectives of Basic Education.

Keywords: Authorship, Basic Education, Cognition, Generative artificial intelligence, Learning.

INTRODUCTION

Generative artificial intelligence has entered everyday school life more rapidly than educational institutions have been able to establish pedagogical criteria for its use. Tools capable of producing texts, images, explanations, summaries, and solutions to various tasks have begun to participate in activities previously carried out predominantly by students themselves. This change, however, is not limited to the

presence of yet another technology in schools. When a system can formulate an argumentative response, reorganize ideas, or provide a ready-made summary, it becomes necessary to ask which intellectual operations remain the student's responsibility and which may be supported by technology. UNESCO (2023) observes that generative AI produces content by statistically identifying patterns in large datasets, without this amounting to an understanding of the objects and social relations underpinning language. For this reason, its responses cannot necessarily be regarded as reliable.

In the Final Years of Elementary Education and in High School, this issue takes on particular importance because reading, writing, argumentation, source evaluation, problem-solving, and intellectual autonomy are still being consolidated. Bueie, Skar, and Graham (2026) show that generative AI already participates in different stages of school writing, from idea generation to revision and editing, while warning of the risk of dependence that may reduce students' engagement in analytical and compositional processes. The discussion of authorship therefore extends beyond the problem of copying or plagiarism. From a broader perspective, Orlandi (2012) enables authorship to be understood as a position assumed by the subject in the production of meaning, while Santaella and Kaufman (2024) situate generative AI among the technologies that place pressure on notions historically associated with human creation and symbolic production. What is changing is not only the way a text is written, but the very relationship between subject, language, and intellectual production.

The cognitive dimension adds another layer to the problem. A tool that summarizes, explains, compares, and answers may provide support, but it may also prematurely take over intellectual operations that the student still needs to develop. Tao (2025) proposes that AI integration should be considered in light of stages of cognitive and socioemotional development, rejecting both indiscriminate prohibition and uncritical adoption. Farrokhnia et al. (2024), in analyzing the strengths, weaknesses, opportunities, and threats associated with ChatGPT in education, likewise demonstrate this ambivalence: personalized responses and rapid access to information coexist with limitations related to deep understanding, assessment of response quality, biases, and the development of higher-order thinking skills.

An interpretation focused solely on risks, however, would be equally inadequate. In a study involving 500 students from grades 7 through 12, Wu and Zhang (2025) found positive associations between generative AI applications, innovative capacity, and digital literacy, involving critical thinking, creative problem-solving, and adaptive learning. Kasneci et al. (2023) also recognize possibilities related to personalization, feedback, and material production, while emphasizing the need for critical thinking, information verification, and human oversight. In a systematic review of 71 empirical studies, Liu and Zhong (2025) further demonstrate that the outcomes of integrating AI into learning are strongly related to pedagogical design and underscore the importance of teacher scaffolding. This weakens any assumption that merely providing access to the tool would produce better learning outcomes.

This debate is also unfolding in schools already shaped by hyperconnectivity and the acceleration of digital practices. Silva (2025) identifies fragmented attention and immediacy as factors capable of interfering with concentration and depth of learning, while acknowledging the educational possibilities opened up by technologies. Generative AI intensifies this context because it does more than expand access to information: it participates in selecting, organizing, and formulating that information. The discussion also has an ethical dimension, since the educational use of these systems entails human decisions regarding responsibility, purpose, and limits. Santaella (2025) argues precisely that ethics should provide guidance in relation to generative AI, a perspective that shifts the focus from the tool's technical capabilities to the human decisions directing its use.

It is at this point that the problem guiding this article takes shape: how can schools integrate generative artificial intelligence into the Final Years of Elementary Education and High School without compromising authorship, cognitive development, and the effective construction of learning? This question avoids two common responses that offer little help in understanding the phenomenon: that the technology should simply be prohibited because it poses risks, and that its use is inevitable and should therefore be incorporated without substantial resistance. UNESCO (2023) summarizes this need by arguing that AI technologies should serve to expand human capabilities rather than replace them. In its

formulation, these tools should “extend or augment human intellectual capabilities and social skills, and not undermine, conflict with, or usurp them” (UNESCO, 2023, p. 38, our translation). The relevance of this study lies precisely in the need to shift the debate away from the mere presence of technology and toward the pedagogical conditions governing its use.

Considering this issue, the article’s general objective is to analyze the implications of generative artificial intelligence for the authorship, cognition, and learning of students in the Final Years of Elementary Education and in High School. More specifically, it seeks to discuss how the automated production of content affects the understanding of authorship in school settings; examine possible relationships between AI use, the delegation of cognitive effort, and the development of intellectual capabilities; identify educational possibilities highlighted in recent literature; and reflect on the role of schools and teachers in developing uses that keep students intellectually engaged in the learning process. The purpose is neither to establish an opposition between human learning and technology nor to attribute uniform effects to AI. The focus is on the conditions that distinguish a resource used as support from a tool that begins to perform precisely what the student needed to learn how to do.

Methodologically, this is a qualitative, bibliographic, and theoretical-analytical study. The corpus comprises books, scientific articles, institutional documents, and recent academic scholarship on generative artificial intelligence and education, with particular attention to studies addressing Basic Education, adolescence, writing, cognition, and digital literacy. The analysis prioritizes dialogue between perspectives that recognize the educational possibilities of AI and research that problematizes its effects on autonomy, authorship, and cognitive activity. The methodological process will be detailed in a separate section, including the procedures adopted to select, organize, and analyze the references.

In addition to this introduction, the article first presents the research methodology. The discussion is then organized into three interrelated movements. The first addresses authorship and school production in the context of the automated generation of texts and content. The second examines the relationships among cognition, intellectual effort, and learning in practices mediated by generative AI. The third shifts

the analysis to schools, discussing teacher mediation, AI literacy, and pedagogical criteria for its use in the Final Years of Elementary Education and in High School. The final considerations revisit the principal arguments to maintain that the contemporary educational challenge is not simply to decide whether to accept or reject generative AI, but to preserve, in its presence, what constitutes the educational purpose of schooling: creating conditions for students to learn to think, produce meaning, evaluate, decide, and assume authorship of their own intellectual development.

METHODOLOGY

The study adopts a qualitative, bibliographic, and theoretical-analytical approach, based on the understanding that issues related to generative artificial intelligence in Basic Education require the articulation of recent empirical studies, theoretical scholarship, and documents that make it possible to examine the phenomenon beyond its strictly technological aspects. The research process was guided by the article's central problem, concerning the implications of generative AI for authorship, cognition, and learning in the Final Years of Elementary Education and in High School.

The literature review prioritized works directly related to generative artificial intelligence in educational contexts, with particular attention to Basic Education, adolescence, school writing, cognitive development, digital literacy, authorship, and teacher mediation. Scientific articles, books, institutional documents, literature reviews, and academic studies available in scientific journals, academic publishers' portals, and institutional repositories were consulted. The corpus comprises studies published by various scientific journals and publishers, documents from UNESCO and the OECD, and academic works available in university repositories. The selection was supplemented by consulting references cited in the studies themselves, particularly when they contributed to the conceptual understanding of authorship, cognitive offloading, the pedagogical integration of technology, ethics, and education for the use of artificial intelligence.

The inclusion criteria prioritized works directly related to one or more of the dimensions under investigation; empirical studies involving students or teachers; reviews capable of synthesizing recent evidence; theoretical works relevant to understanding authorship, cognition, and pedagogical mediation; and institutional documents recognized in the fields of education and artificial intelligence. Most of the works were published between 2023 and 2026, a period corresponding to the expansion of publicly accessible generative AI and the growth of research into its educational uses. Earlier works were retained when necessary to support concepts that did not emerge with generative AI, such as authorship, technological mediation, and the delegation of cognitive activities. Predominantly commercial materials, texts without identifiable authorship or academic provenance, and publications whose discussions were limited to the technical operation of systems without a substantive relationship to the educational processes under analysis were excluded.

The corpus was read in a series of interconnected stages. An exploratory reading was initially conducted to identify the relevance of the works to the study's problem and objectives. The selected materials were then examined in full or through the sections directly related to the research topic, with records made of the main conceptual categories, empirical findings, convergences, divergences, and limitations identified by the authors. This procedure made it possible to organize the analysis into three areas: authorship and school production in the context of automated content generation; cognition, intellectual effort, and learning; and teacher mediation, AI literacy, and pedagogical criteria for its use in schools.

The analysis did not seek to arrange arguments for and against AI into opposing blocks, but rather to understand the conditions under which certain forms of use may contribute to learning and the circumstances in which they begin to replace intellectual operations relevant to students' development. The works were therefore placed in dialogue, with attention to points of convergence, divergence, and the limitations of their findings. Direct quotations were selected from the full texts of the works consulted and checked against the original pagination. Excerpts from English-language materials were translated into

Portuguese and identified as our translations. This methodological choice is consistent with the article's perspective: to analyze the presence of generative AI in schools without adopting in advance a position either celebrating or rejecting the technology, taking as a reference its concrete implications for educational processes.

AUTHORSHIP AND SCHOOL PRODUCTION IN THE CONTEXT OF AUTOMATED CONTENT GENERATION

The ability to generate a formally organized text within seconds changes a long-familiar situation in schools. For a long time, the work submitted by students provided teachers, albeit imperfectly, with indications of the process through which it had been produced. A text revealed lexical choices, hesitations, distinctive ways of organizing reasoning, inadequacies, revisions, and traces of the writer's repertoire. Generative AI partially disrupts this correspondence between the product presented and the intellectual process undertaken. A student may submit a linguistically sophisticated response without having developed, to the same extent, the reading, selection, organization, and compositional processes that the text appears to demonstrate.

This change places school authorship in a position that cannot be resolved merely by identifying who wrote each sentence. In Orlandi (2012), authorship is related to the position assumed by the subject in producing discourse and to responsibility for organizing meaning, a perspective that allows the discussion to move beyond material ownership of words. From this standpoint, being an author does not simply mean linguistically producing an utterance, but assuming a position toward what is said by articulating choices, relationships, and meanings. The issue becomes particularly complex when some of these operations can be performed by systems capable of producing coherent texts from relatively simple prompts.

Santaella and Kaufman (2024) broaden this problem by discussing how generative artificial intelligence challenges traditionally established boundaries between human capabilities and machine

production, particularly in the domains of language and symbolic creation. The presence of these technologies does not eliminate human authorship, but makes it less evident where the decisions that give a work direction, intention, and accountability are located. In the school environment, therefore, it is important to determine not only who produced a particular sequence of words, but also who defined the perspective adopted, selected and prioritized information, evaluated the content received, and is able to explain, defend, or rework what is presented as their own.

This tension ceases to be merely conceptual when examined in students' own practices. Bueie, Skar, and Graham (2026) show that generative tools already reach different stages of writing in High School and that their use is growing rapidly. In the authors' study, the proportion of students who reported using generative AI for school purposes rose from 43.7% in 2023 to 71.4% in 2024. Nevertheless, many participants expressed reservations about the benefits of these tools for writing and the reliability of the texts they produced. This finding is important because it precludes both the interpretation that students have simply transferred writing to machines and the assumption that increased use necessarily corresponds to uncritical acceptance.

Instead, the relationship is more contradictory: students are increasingly using the technology, but this does not mean that they place unrestricted trust in it or regard learning to write as unnecessary. The challenge for schools is precisely to understand this intermediate space. Between producing an entire text without assistance and asking a tool to produce it in full, there are different forms of interaction: seeking ideas, requesting explanations, testing possible organizational structures, asking for reformulations, comparing versions, revising arguments, or receiving suggestions. These actions are not pedagogically equivalent and should not be assessed as if they were. It is precisely the nature of this participation, both human and technological, that determines the extent to which AI supports the authorial process or assumes decisions that should remain the student's responsibility.

This distinction is particularly clear when Bueie, Skar, and Graham (2026) discuss the educational implications of their findings among students:

In 2024, seven out of ten High School students in this study indicated that they had used generative AI for school purposes. In the span of only one year, its use for these purposes had increased by 163%. Despite this rapid growth, only half of the students in 2024 indicated that generative AI had been discussed at school, and only two out of seven stated that their school had a policy concerning the use of this technology. Because students need to learn how to use generative AI in authorized, responsible, ethical, and safe ways both in and outside school, teachers, administrators, and school systems need to determine how these tools will be used in writing and establish guidelines accordingly, if they have not already done so. (Bueie; Skar; Graham, 2026, p. 623, our translation).

The passage highlights an important gap: students are incorporating the tool into their practices more quickly than schools are turning it into an object of pedagogical discussion. When schools fail to establish criteria, a lack of guidance does not mean a lack of use. Rather, it means that some decisions about when, why, and to what extent AI should be used are made individually by students, often without sufficient means to assess the consequences of these choices for their own learning. This finding is consistent with what Liu and Zhong (2025) identify in their analysis of studies on integrating generative AI into learning: the technology's potential depends heavily on the pedagogical strategies accompanying its use, while students' independent use does not always receive the support needed to transform technological interaction into learning. In this context, authorship ceases to be merely a matter of academic integrity and comes to require explicit instruction concerning the permissible degrees of technological participation in different activities.

There is a considerable difference, for example, between asking AI to generate questions that help develop an idea the student has already conceived and assigning it the task of formulating the thesis, arguments, and conclusion of a text. In the first case, the tool may function as an interlocutor; in the second, it may take the place of the compositional work itself. This boundary is not fixed, nor can it be defined solely by the number of words generated by the machine. A text partially produced using AI may involve intense intellectual activity on the student's part if it entails selection, evaluation, comparison with sources, rewriting, and justification of choices. Similarly, an apparently authorial work may result from successive requests to the tool in which the student merely accepts ready-made responses. The decisive factor is the quality of the intellectual participation maintained throughout the process.

This perspective helps explain why school writing serves a function that extends beyond producing a linguistically correct result. Students also learn to write by writing: by struggling to formulate an idea, noticing gaps in their own arguments, reorganizing a sequence that does not work, choosing among expressive possibilities, and revisiting what they had regarded as finished. In this sense, writing is simultaneously an object of learning and a means of learning other content. Bueie, Skar, and Graham (2026) warn that dependence on AI for school writing may reduce precisely the time devoted to analyzing and thinking about the information students should mobilize during production. The issue brings authorship and cognition together: when technology systematically eliminates stages of formulation, revision, and decision-making, it changes not only the material origin of the text, but also the intellectual process through which students learn to produce it.

The problem becomes even more evident when one considers that generative systems produce texts whose fluency may conceal weaknesses in content. UNESCO (2023) emphasizes that these systems operate on the basis of statistical regularities found in the data on which they were trained and may produce convincing responses without understanding what they state. Farrokhnia et al. (2024) add that although tools such as ChatGPT offer speed, personalization, and expanded access to information, limitations persist regarding response quality, bias, lack of deep understanding, and implications for higher-order thinking skills. Requiring students to examine, compare, and justify generated content therefore ceases to be an additional precaution and becomes part of education for authorship in digital environments. Accepting a text because it “seems correct” is very different from assuming intellectual responsibility for it.

This responsibility also changes teachers’ work. Concern with determining whether a particular text “was made by AI” tends to generate an unproductive competition between generative systems and detection tools. Kasneci et al. (2023) had already noted the growing difficulty of distinguishing responses produced by students from those produced by language models and argued that, in the long term, curricula and teaching practices should incorporate creative and well-founded uses of these systems rather

than rely exclusively on detection mechanisms. For schools, this entails shifting part of the assessment from the product to the process: preliminary versions, justifications, oral defenses of choices, research records, source comparisons, and rewrites may reveal far more about learning and authorship than an isolated analysis of the final text.

This shift also connects authorship with artificial intelligence literacy. UNESCO (2024) argues that student education should go beyond the instrumental use of tools to encompass a critical understanding of systems, ethical responsibility, and the ability to evaluate when and how to use AI. Its framework organizes these competencies around a human-centered perspective in which students should develop the ability to understand, use, and progressively create with AI without losing their capacity to judge its outputs. In this sense, declaring that a tool was used is only the first step. It is also important to understand what the tool did, which decisions remained the student's responsibility, and how the generated material was evaluated and transformed.

This does not mean abandoning written texts as evidence of learning, but recognizing that their interpretation needs to change. In activities in which generative AI is available, authorship also comes to involve transparency concerning use of the tool, the ability to assess its contribution, and sufficient command of the content to accept, reject, or transform what has been generated. A student author is not necessarily someone who never uses AI, but someone who remains responsible for the intellectual decisions involved in their work. The tool may offer possibilities; it should not silently take the place of the person who needs to learn how to choose among them.

For the Final Years of Elementary Education and High School, this distinction carries particular educational significance. These are stages during which students progressively expand their ability to formulate their own arguments, work with multiple sources, recognize different perspectives, and construct positions. AI may enrich this process when it introduces counterpoints, provides material for analysis, or makes different formulation possibilities visible. Conversely, it may impoverish the process when it systematically eliminates the need to confront uncertainty, produce an initial version, formulate a

hypothesis, or defend an argument. The discussion of authorship thus inevitably leads to the cognitive dimension: if writing, researching, and arguing are also ways of thinking, it becomes necessary to examine what happens to learning when some of this effort is transferred to the machine.

COGNITION, INTELLECTUAL EFFORT, AND LEARNING IN PRACTICES MEDIATED BY GENERATIVE AI

The discussion of generative artificial intelligence in schools cannot be limited to the quality of the responses produced by the tool. For learning, it is equally important to observe the path students follow to arrive at a response, interpretation, or solution. Reading a problem, selecting relevant information, retrieving prior knowledge, formulating hypotheses, testing alternatives, and revising a conclusion are operations that do not always appear in the final product but constitute an important part of the cognitive work involved in learning. When AI begins to perform some of these stages, the pedagogical question ceases to be only what the technology is capable of doing and comes to include what students cease to do when they use it. This distinction is particularly important because, as Liu and Zhong (2025) demonstrate, the educational outcomes associated with generative AI depend on the forms of pedagogical integration and the support offered to students. Tool use and learning therefore cannot simply be equated.

The concept of cognitive offloading helps explain this process. Risko and Gilbert (2016) use the term cognitive offloading to describe situations in which external resources are mobilized to reduce internal cognitive demands. This transfer is not inherently harmful. Notes, calculators, calendars, and search engines also make it possible to move certain operations to external supports. The distinctiveness of generative AI lies in the breadth of tasks it can undertake: in addition to storing or retrieving information, it can organize, relate, summarize, and present information in the form of seemingly finished answers. The ease with which different stages of a task can be transferred to the system therefore broadens an existing human practice, while changing its scale and nature.

It is precisely at this point that the distinction between support and substitution becomes less clear. Farrokhnia et al. (2024) recognize that generative tools can expand access to information, offer personalized responses, and support certain learning activities, but they also identify limitations related to deep understanding and possible implications for the development of higher-order thinking capabilities. The issue, therefore, is not to regard cognitive offloading as necessarily negative, but to identify which operations may be externalized without detriment and which need to remain the student's responsibility because they are part of the skill being developed. A tool that reduces operational effort may free up resources for more intellectually complex activities. The same tool, when used to produce the answer before students have developed the ability to formulate it themselves, may remove precisely the effort required for learning.

This distinction prevents an automatic association between ease and cognitive impoverishment. Not all effort produces learning, and not every reduction in effort represents a loss. The pedagogical issue lies in the nature of the operation being transferred, the student's prior knowledge, the stage of skill development, and the purpose of the activity. It is in this respect that Tao's contributions (2025) become particularly relevant, as she relates AI integration to different stages of cognitive development and the need to preserve progressively increasing levels of intellectual autonomy.

Tao (2025) brings this concern into the field of development by proposing different levels of AI integration according to students' ages. For adolescents, the author recognizes a greater capacity for self-regulation and the possibility of using tools in more sophisticated ways, without concluding, however, that mediation can be dispensed with. Addressing the age group that largely corresponds to High School, she states:

At the final stage, the model provides for regulated collaboration, in which students may use AI more extensively but must maintain a predominant level of independent participation and submit an AI use statement for each activity, detailing how and why the tool was used. The proposal acknowledges AI's legitimate role as a productivity resource but requires that the central intellectual contribution, the "human value added," remain dominant. (Tao, 2025, p. 7, our translation).

The idea of “regulated collaboration” is relevant to schools because it moves the debate away from binary thinking. It is not necessary to choose between completing every activity without any technological support and allowing AI to produce the work on the student’s behalf. There is an intermediate field in which the tool may be used, provided that the core reasoning continues to be developed by the learner. The difficulty lies precisely in identifying that core. In a research activity, for example, obtaining initial keyword suggestions does not produce the same cognitive effect as requesting a ready-made summary and using it without consulting the sources. Likewise, comparing one’s own answer with one generated by AI differs from resorting to the tool before even attempting to solve the question.

This distinction takes on particular importance in the Final Years of Elementary Education, when many skills are still being consolidated. Tao (2025) emphasizes that younger students’ executive functions and self-regulation mechanisms are still developing, requiring greater caution regarding forms of use that encourage dependence or automatic trust in generated responses. The principle can be extended to schoolwork in simple terms: the less firmly established a particular skill is, the greater the caution required when delegating it. A student who still struggles to construct an argumentative paragraph needs to experience the effort involved in selecting an idea, developing it, and connecting it to the text. If this operation is systematically handed over to AI, immediate efficiency may conceal the fact that learning has not occurred.

This does not mean turning difficulty into an absolute pedagogical value. Learning does not depend on keeping students permanently engaged in tasks they are unable to solve. Mediation exists precisely to offer support, cues, examples, and interventions that make possible what students cannot yet accomplish independently. In this respect, AI may perform valuable scaffolding functions: producing examples for comparison, formulating questions, offering alternative explanations, or providing initial feedback. Kasneci et al. (2023) identify possibilities of this kind in different fields and observe that language models can produce personalized materials, explanations, and questions designed to elicit critical thinking. Liu and Zhong (2025), in examining empirical studies on the integration of generative

AI into learning, reinforce the importance of the pedagogical strategies accompanying its use. Educational benefit therefore depends less on the amount of assistance offered by the tool than on whether that support enables students to progress toward more autonomous forms of action.

The findings of Wu and Zhang (2025) help prevent an excessively defensive interpretation. In their study of students from grades 7 through 12, the authors identified positive relationships among generative AI use, digital literacy, and innovative capacity. The result indicates that AI-mediated environments may foster critical thinking and creative problem-solving when organized for this purpose. The data themselves, however, do not justify the conclusion that frequent use automatically corresponds to greater learning. In subsequent analyses, the authors note that mere frequency of interaction may be insufficient to develop more sophisticated capabilities when it is not accompanied by depth and diversity in forms of use. This qualification is important: extensive use of a technology and extensive learning through it are different phenomena.

Silva (2025) adds another element by relating contemporary digital practices to fragmented attention and immediacy. Generative AI is entering schools within a culture marked by an expectation of speed, a circumstance that may make the possibility of eliminating laborious stages especially attractive. An immediate answer, however, is not always pedagogically desirable. There are situations in which searching, making mistakes, revising, and sustaining uncertainty for some time form part of the process through which knowledge is developed. The tool's speed may be advantageous when it reduces peripheral tasks, but it becomes problematic when it eliminates the cognitive time students need to construct relationships themselves.

The central issue, therefore, is not to preserve forms of work artificially simply because they existed before AI. Nor is it a matter of regarding every effortful activity as cognitively valuable. The challenge consists in distinguishing what can be delegated without detriment from what students need to experience for learning to take place. This distinction varies according to age, content, the skill involved, the degree of prior mastery, and the purpose of the activity. The same tool that helps one student progress

in a complex task may prevent another from building a basic skill when it is used to replace that student's first attempt at developing a response.

In this regard, schools will need to make the learning process more visible. Asking students how they reached a particular answer, requesting that they explain a choice, comparing versions, proposing that they rework something without assistance from the tool, or asking them to critically evaluate an AI-generated response are strategies that can make observable some of the intellectual work that the final product can no longer reveal on its own. Concern with cognition therefore does not lead to distancing education from technology, but to developing practices in which AI does not erase the learner's process. This movement restores the teacher to a decisive position, since determining when a tool expands intellectual activity and when it begins to replace it is, above all, a pedagogical decision.

TEACHER MEDIATION, AI LITERACY, AND PEDAGOGICAL CRITERIA FOR SCHOOLS

The presence of generative AI expands the range of decisions teachers must make. It is not enough to be familiar with a tool or show students how to produce effective prompts. Teachers must decide when its use is appropriate, which objectives it may advance, which skills need to remain independent, and how to determine whether the expected learning has occurred. This understanding is consistent with Holmes, Bialik, and Fadel (2019), for whom the discussion of artificial intelligence in education needs to be linked to pedagogical purposes and to the changes these technologies may bring about in teaching and learning processes, rather than only to their technical capabilities. Teacher mediation thus becomes less centered on controlling technology and more concerned with organizing the conditions under which it participates in schoolwork.

In discussing the growing presence of artificial intelligence in education, Selwyn (2019) questions perspectives that treat automation as the natural replacement of tasks performed by teachers. His criticism is particularly pertinent in the context of generative AI because educational decisions encompass contextual, relational, and developmental dimensions that cannot be reduced to generating a technically

adequate response. Teachers know the class's learning trajectory, identify difficulties that are not apparent from a written request, and recognize when students need support and when they need to confront a task with greater autonomy. These decisions form part of pedagogical work and cannot be transferred entirely to systems that operate through probabilistic patterns.

The central role of teachers also appears in the OECD Digital Education Outlook 2023. The document distinguishes mere digitalization from effective educational transformation, arguing that teachers' digital competencies, their ability to critically evaluate technological resources, and their authority to make pedagogical decisions about their use are fundamental conditions for integrating artificial intelligence responsibly. The OECD (2023) specifically highlights teacher agency and continuing professional development among the elements necessary for incorporating digital resources critically into the pedagogical repertoire.

This helps dispel another oversimplification: the idea that preparing teachers for AI would mean teaching them only how to operate platforms or produce effective prompts. Instrumental knowledge is necessary but insufficient. In examining educational uses of ChatGPT, Tlili et al. (2023) identified possible applications accompanied by problems involving response quality, academic integrity, privacy, misleading content, and manipulation. The authors therefore advocate safe and responsible adoption, which requires educators and institutions to understand not only what these tools do well, but also the risks associated with their use.

At the same time, mediation should not take the form of permanent surveillance. Centering the school's response on attempts to determine whether students have used AI tends to make the pedagogical relationship defensive and lacking in educational value. The difficulty of distinguishing human-authored texts from those produced by language models was already identified by Kasneci et al. (2023), who argue that changes in teaching practices and curricula constitute a more consistent response than reliance on detection mechanisms. The challenge is to make the use of AI visible, open to discussion, and intellectually justifiable.

This shift also requires teacher education. In presenting the practical implications of their research, Wu and Zhang (2025) assign a central role to teachers' professional development:

Systematic professional development for educators is essential to maximizing the potential of generative artificial intelligence in the classroom. Equipping teachers with the competencies required to use these tools effectively can ensure their alignment with pedagogical objectives. These initiatives should strengthen educators' own digital literacy and innovative capacity, enabling them to model these competencies for students as well. (Wu; Zhang, 2025, p. 17, our translation).

The education mentioned by the authors cannot be limited to operational mastery of platforms. Knowing how to formulate prompts, generate materials, or use particular resources constitutes only part of the issue. Teachers need to understand system limitations, the risks of fabricated information, bias, privacy concerns, and the differences between activities in which AI serves as support and those in which its intervention compromises the learning objective. Kasneci et al. (2023) likewise associate the educational integration of these models with the development of competencies among teachers and students to recognize limitations, verify information, and maintain human oversight. Tlili et al. (2023), in examining ChatGPT in educational settings, reach a similar conclusion by relating its possible uses to the need to consider academic integrity, privacy, information reliability, and responsible use. Teacher education for AI must therefore combine technical knowledge, pedagogical judgment, and critical capacity.

This perspective is also consistent with the OECD (2023), which identifies teacher education and agency as conditions necessary for digital transformation to move beyond the mere introduction of tools into educational institutions. In this case, teacher competence does not consist in following every technological novelty, but in having the ability to assess what a particular technology adds to a proposed activity, what it may compromise, and which interventions are needed to ensure that its use remains subordinate to educational purposes. It is precisely in this decision-making capacity that human mediation retains its centrality.

In this context, it becomes appropriate to speak of AI literacy. For students, this means more than learning how to obtain better answers. At a level appropriate to their stage of schooling, it entails understanding that generative systems do not possess knowledge or intention in the same terms as humans; that their responses may contain errors; that their outputs depend on the information provided and on patterns present in the training data; and that seemingly convincing content must be compared with other sources. UNESCO (2023) emphasizes precisely that fluent responses do not guarantee accuracy and that many errors may go unnoticed when users lack sufficient knowledge of the subject.

UNESCO's (2024) AI Competency Framework for Students broadens this understanding by proposing AI education guided by a human-centered perspective, ethics, knowledge of artificial intelligence techniques and applications, and the capacity for critical participation in its use. It is therefore not enough to teach students to interact with generative systems. They must develop the ability to understand their limitations, assess their responses, and recognize the implications of their own choices. This conception connects AI literacy with intellectual autonomy: the more powerful the tool becomes, the greater the user's capacity must be to decide when to trust, question, or reject what it offers.

This finding has an important pedagogical consequence: disciplinary knowledge does not lose relevance in the face of AI. In several respects, it becomes even more necessary. Students can critically evaluate a historical explanation, a scientific argument, or a literary analysis only if they possess frames of reference that enable them to recognize inadequacies. The idea that easy access to answers would reduce the need to learn content overlooks the fact that evaluating an answer requires knowledge. The greater AI's ability to produce plausible texts, the more important it becomes to educate students not to confuse plausibility with truth. This concern also aligns with Santaella's (2025) positioning of ethics as a guiding principle for decisions involving generative AI: responsibility lies not only in the system used, but also in how individuals and institutions decide to incorporate it into human practices.

Schools also need to establish different criteria for different tasks. In an activity intended to assess authorial writing, it may be legitimate to restrict AI use at certain stages. On another occasion, a teacher

may explicitly ask students to compare a response produced by the tool with academic sources, identify problems, and propose an improved version. In a research project, AI may assist with the initial organization of questions, provided it does not replace consultation and reading of sources. There is therefore no single rule capable of addressing every situation. Rather, there are principles that must be translated into pedagogical decisions consistent with what is to be taught. Holmes, Bialik, and Fadel (2019) had already warned that the educational value of artificial intelligence depends on its relationship with learning objectives and pedagogical choices, not merely on the functionalities offered by the technology.

Transparency may constitute one such principle. Asking students to report when they used AI, for what purpose, and what they did with the material obtained turns use of the tool into an object of reflection. Tao's (2025) proposal for an AI use statement for older students follows this direction. More than a monitoring measure, such a record may serve a metacognitive function: it requires students to recognize when they resorted to the tool and what its actual contribution to the work was. Transparency thus becomes part of the construction of authorship itself, as it makes visible the distribution of decisions between student and system.

Another criterion concerns assessment. When automated production weakens the correspondence between the final text and learning, it becomes necessary to expand assessment instruments. Oral defenses, classroom production, portfolios, process records, comparisons between versions, and application activities may coexist with work completed with technological support. This does not mean returning exclusively to closed, in-person assessments, but gathering different forms of evidence that enable teachers to understand what students actually know and can do. Tao (2025) points in this direction by advocating more process-oriented assessment, including portfolios, reflections, peer feedback, and oral defenses as ways of preserving the authenticity of learning in contexts shaped by AI.

Teacher mediation therefore assumes a function that does not diminish as technologies advance. Contrary to what an automation-centered perspective might suggest, the growing capabilities of systems

intensify the need for well-informed pedagogical decisions. Although approaching the issue from different perspectives, Selwyn (2019), Holmes, Bialik, and Fadel (2019), the OECD (2023), and UNESCO (2024) converge on the importance of human participation in defining the educational purposes of technology. The teacher ceases to be merely the person who supplies information that can now be found or generated quickly and becomes even more necessary as a professional capable of organizing experiences in which information is questioned, connected, and transformed into knowledge. Between a response produced by a machine and learning constructed by a student lies a distinctly pedagogical space. It is in this space that schools need to act, establishing limits, possibilities, and responsibilities without ignoring technology, but also without handing over to it decisions that belong to the sphere of human development.

FINAL CONSIDERATIONS

The presence of generative artificial intelligence in the Final Years of Elementary Education and in High School confronts schools with a change that goes beyond the incorporation of a new digital tool. By producing texts, organizing information, formulating explanations, and participating in task-solving, these systems begin to operate precisely within activities that, in schools, have always been connected to the development of reading, writing, reasoning, and intellectual autonomy. The analysis conducted throughout this article has therefore shown that the most important educational issue is not whether AI should be present in schools, but what happens to learning when part of the intellectual work can be transferred to it.

In the field of authorship, Bueie, Skar, and Graham (2026) reveal a reality in which generative AI can no longer be treated as a future possibility, while Orlandi (2012) helps explain that authorship involves more than the material origin of words: it presupposes a position assumed in the production of meaning. Santaella and Kaufman (2024), in turn, help situate the shift brought about by systems capable of operating in the domains of language and symbolic creation. In AI-mediated activities, it therefore

becomes necessary to observe who constructed the argument, selected information, evaluated the content received, made decisions, and is able to assume intellectual responsibility for what is presented. School production remains important, but it must be understood in conjunction with the process that made it possible.

The cognitive dimension reinforces this need. Risko and Gilbert (2016) show that transferring certain operations to external resources forms part of the ways in which humans organize cognitive activity. Generative AI, however, considerably expands the scope of such delegation. Tao (2025) relates its use to developmental stages and the degree of autonomy students have already attained, while Farrokhnia et al. (2024) and Liu and Zhong (2025) help demonstrate that the technology's educational effects depend on the tasks performed and the pedagogical conditions accompanying its use. In the Final Years of Elementary Education and in High School, it does not seem reasonable to treat in the same way an established skill, for which AI may offer productivity gains, and a skill still under development, whose performance by the tool may deprive students of a necessary intellectual experience.

The studies analyzed also preclude a conclusion focused exclusively on risks. Wu and Zhang (2025) found positive associations among uses of generative AI, digital literacy, and innovative capacity among secondary education students, while Kasneci et al. (2023) identify possibilities related to personalization, feedback, and support for different learning situations. These contributions nevertheless converge on one point: the mere presence of AI does not in itself produce critical thinking, creativity, or learning. The tool's potential must be converted into pedagogical experience through practices that keep students intellectually active in relation to what they receive.

The discussion becomes even more relevant when situated within the context of hyperconnectivity analyzed by Silva (2025). If speed, immediacy, and fragmented attention already affected how students studied and learned, AI adds the possibility of obtaining not only information rapidly, but also preorganized answers. This ease may be productive when it removes peripheral stages and makes it possible to focus efforts on more complex operations. It may be impoverishing when it eliminates

precisely the difficulty that needed to be confronted for a particular form of learning to become established. The pedagogical challenge lies in recognizing this difference.

At this point, teacher mediation remains central. Selwyn (2019) questions interpretations in which automation appears as the inevitable replacement of human work; Holmes, Bialik, and Fadel (2019) connect AI's value to teaching and learning purposes; and the OECD (2023) and UNESCO (2024) reinforce the need to educate teachers and students capable of making critical decisions regarding digital technologies. Kasneci et al. (2023) and Tlili et al. (2023) add that this integration requires knowledge of system limitations, verification of information, attention to ethical issues, and human oversight. Teachers do not compete with machines' ability to produce answers within seconds. Their role lies in something a ready-made answer cannot resolve: defining why a task should be performed, what kind of effort it should elicit, when assistance is appropriate, how learning can be recognized, and which decisions should not be delegated.

This also entails reviewing certain school practices. Assessment focused exclusively on the final product becomes more fragile when formally sophisticated texts can be generated automatically. Monitoring versions, process records, oral defenses, activities completed under different conditions, and disclosure of AI use may provide more consistent evidence of what students have actually understood. At the same time, educating students for AI literacy means teaching them to question responses, compare sources, recognize limitations, identify bias, and assume responsibility for the choices made with technological assistance. The ethical perspective discussed by Santaella (2025) reinforces that this responsibility cannot be transferred entirely to the system: it remains human and institutional.

The analysis developed here therefore supports the conclusion that generative artificial intelligence can be integrated without compromising authorship, cognitive development, and learning, provided that its use remains subordinate to the educational purposes of schools. This requires distinguishing between support and substitution, attending to developmental stages, ensuring transparency regarding use of the tool, diversifying forms of assessment, and maintaining effective teacher mediation.

AI can collaborate with students in relation to what they are already able to question, evaluate, and transform. It becomes problematic when it silently begins to perform what they still needed to learn how to do.

Schools therefore do not need to choose between preserving a past without artificial intelligence and embracing a future defined by technological possibilities. Their responsibility is more demanding: to decide pedagogically which intellectual experiences remain indispensable to human development in a context in which many of them can be automated. The answer will lie neither in generalized prohibition nor in unrestricted adoption, but in the capacity to preserve the student as the subject of the learning process. As UNESCO's (2023) human-centered perspective maintains, technology should expand human capabilities, not usurp them. In this sense, the most important criterion for assessing the presence of generative AI in schools may also be the simplest: after using it, students need to be able to think, understand, explain, produce, and decide more, rather than merely submit the requested work more quickly.

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**ARTIFICIAL INTELLIGENCE, INCLUSION, AND ACCESSIBILITY IN EDUCATION:
POSSIBILITIES AND CONTRADICTIONS IN THE FACE OF THE DIGITAL DIVIDE**

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Abstract

The incorporation of Artificial Intelligence into educational processes has expanded the possibilities for developing resources aimed at accessibility, personalization, communication, and the participation of students with diverse characteristics and needs. Machine translation systems, captioning, speech recognition and synthesis, intelligent screen readers, adaptive interfaces, and tools based on natural language processing exemplify applications that can help reduce educational barriers. However, the inclusive potential of these technologies coexists with inequalities related to infrastructure, digital skills, socioeconomic conditions, data representativeness, and linguistic, cultural, and algorithmic biases. This chapter aims to critically analyze the possibilities and contradictions of Artificial Intelligence in promoting educational inclusion and accessibility, considering the digital divide as a phenomenon that extends beyond the availability of devices and connectivity. It adopts a qualitative, bibliographic, and exploratory approach grounded in national and international studies on inclusive education, Artificial Intelligence, assistive technologies, and digital inequality. The analysis indicates that AI can increase autonomy, access to content, and forms of participation, but its benefits are not automatically distributed equitably. It concludes that an inclusive approach to AI requires accessible infrastructure, teacher education, participatory design, linguistic and cultural diversity, algorithmic transparency, and policies capable of ensuring that technological innovation is accompanied by educational justice.

Keywords: Accessibility, Artificial Intelligence, Digital divide, Educational equity, Inclusive education.

INTRODUCTION

Artificial Intelligence (AI) has come to occupy an increasingly prominent position in discussions about the future of education. Systems capable of producing texts, images, and audio; translating content; recognizing speech patterns; adapting materials; and supporting different forms of interaction have broadened the possibilities for using digital technologies in teaching and learning processes. In the field

of inclusive education, these features are of particular interest because of their potential to reduce barriers to communication, access to information, and participation.

The relationship between technology and inclusion, however, is not linear. Holmes, Bialik, and Fadel (2019) had already emphasized that the educational benefits of AI depend on the pedagogical and social choices guiding its implementation. Selwyn (2019), in turn, questions technodeterministic perspectives that attribute to technology an autonomous capacity to solve educational problems. Along similar lines, UNESCO (2023) argues that the use of AI systems in education should be guided by principles of equity, rights protection, transparency, and human-centeredness.

When the analysis turns to inclusive education, this caution becomes even more necessary. Mantoan (2003) understands inclusion as the transformation of school conditions for participation and learning, rather than simply placing individuals within pre-existing structures. In their discussion of Universal Design for Learning, Zerbato and Mendes (2018) reinforce the importance of addressing diversity from the educational planning stage by expanding forms of representation, expression, and participation.

In this context, AI-based tools offer significant possibilities. Kooli and Chakraoui (2025) analyze intelligent screen readers, voice assistants, speech recognition, and natural language processing systems designed to include students with visual, physical, and cognitive disabilities. The authors identify contributions to autonomy, engagement, and content accessibility, while also noting limitations related to system accuracy, infrastructure, teacher preparation, data protection, and algorithmic biases.

Fitas (2025) broadens this discussion by simultaneously considering students with disabilities and those who face language barriers. Real-time translation, captioning, adaptive systems, and assistive technologies can facilitate the participation of groups that encounter obstacles in conventional models of communication and access to content. At the same time, the author cautions that the positive effects identified still coexist with limited long-term evidence and with the risk that differences in adoption between more and less advantaged institutions may create new digital divides.

This point significantly changes how the digital divide is understood. Warschauer (2003) had already argued that technological inequality cannot be reduced to computer ownership or the availability of connectivity. The capacity to participate meaningfully in digital environments also depends on skills, social resources, literacy practices, and institutional conditions. Van Dijk (2020) develops this conception further by distinguishing among different dimensions of access, demonstrating that inequalities may persist even after devices and connectivity become available.

With the expansion of AI, this discussion reaches a new level. Matjie, Nethavhani, and Matlakala (2026) demonstrate that the digital divide associated with Artificial Intelligence must account for access, skills, outcomes, cultural representativeness, and the very operation of algorithms. According to the authors, formal access to systems does not ensure that users benefit from them equally. The following formulation summarizes one of the theoretical foundations of this chapter:

The adoption of AI in education is shaped by three interrelated dimensions. The digital access and skills divide emphasizes that mere access to devices and connectivity is insufficient; students and educators also require digital literacy and institutional support to interact meaningfully with AI. The algorithmic divide highlights that AI systems may reproduce social inequalities because of biases in unrepresentative datasets and design choices, disproportionately affecting marginalized students. Finally, sociocultural and institutional mediation determines how AI interacts with pedagogy, curricula, and community contexts. (Matjie; Nethavhani; Matlakala, 2026, p. 3, our translation).

This understanding makes it possible to move beyond a discussion of who has access to technology toward another question: who actually benefits from it? Matjie, Nethavhani, and Matlakala (2026) use the concept of a third-level digital divide to address inequalities in outcomes even when access is already available. Systems trained on inadequately representative data may provide less appropriate feedback, misinterpret the work of certain groups, or offer recommendations of uneven quality.

The linguistic and cultural dimensions make this issue even more complex. Systems developed predominantly in dominant languages may perform less effectively when dealing with local languages, language varieties, speech patterns, or cultural contexts that are underrepresented in training datasets.

Matjie, Nethavhani, and Matlakala (2026) argue that exclusion may therefore result not only from a lack of access, but also from the design of the technology itself. Digital inclusion ceases to be solely a matter of availability and comes to encompass representativeness as well.

Fitas (2025) offers a complementary perspective by showing that translation and language-processing technologies can, paradoxically, have opposing effects. When appropriately developed and used, they can reduce barriers faced by students learning in a language different from the one used in their home environment. When they perform poorly for certain languages or are implemented without cultural sensitivity, they may reproduce precisely the inequalities they are intended to address.

It is also necessary to recognize that technological accessibility does not result solely from technical features. Kooli and Chakraoui (2025) emphasize that the successful implementation of AI-based assistive technologies depends on compatible devices, stable connectivity, technical support, and teacher preparation. Without these conditions, potentially inclusive tools may remain inaccessible in precisely the educational settings that could benefit most from them.

Teacher education therefore occupies a decisive position. It is not enough for teachers to be aware that these tools exist; they must develop the capacity to assess their pedagogical relevance, accessibility, limitations, and associated risks. Such preparation includes the ability to evaluate automated responses, recognize biases, protect student information, and determine when a technological solution actually expands participation.

There is also a political and participatory dimension. Systems developed for historically marginalized groups cannot dispense with the participation of those very groups. Fitas (2025) recommends that students with diverse needs participate in testing new tools, allowing their experiences to guide modifications or reveal that a particular solution is unsuitable. Kooli and Chakraoui (2025) likewise advocate codesign processes involving people with disabilities and the adoption of international accessibility standards from the earliest stages of development.

The question guiding this chapter arises from this tension: under what conditions can Artificial Intelligence enhance educational inclusion and accessibility, and how might the digital divide, algorithmic biases, and sociocultural inequalities limit or contradict this potential?

The general objective is to critically analyze the possibilities and contradictions associated with using Artificial Intelligence to promote educational inclusion and accessibility in the face of the various dimensions of the digital divide. More specifically, the chapter seeks to discuss the expansion of the concept of the digital divide in the context of AI; examine the possibilities offered by assistive technologies and intelligent resources; critically address linguistic, cultural, algorithmic, and institutional inequalities; and reflect on the conditions required for more equitable implementation in education.

In addition to this introduction, the chapter presents the methodological approach and develops three main areas of discussion: the possibilities of Artificial Intelligence for inclusion and accessibility; the transformation of the digital divide in the context of intelligent systems; and the contradictions related to bias, infrastructure, teacher education, participation, and governance. The final considerations revisit the idea that AI is neither inherently inclusive nor inherently exclusionary: its effects depend on the social, pedagogical, cultural, and political conditions that guide its development and use.

METHODOLOGICAL APPROACH

The study adopts a qualitative, bibliographic, and exploratory approach. This choice reflects the objective of critically understanding a phenomenon that is still undergoing rapid transformation by bringing together contributions concerning inclusive education, accessibility, Artificial Intelligence, and the digital divide. The analysis is not limited to the technical features of the tools but seeks to relate them to the social, pedagogical, cultural, and institutional conditions that affect their adoption.

The corpus consisted of books, documents produced by international organizations, and scientific articles, with priority given to recent studies directly addressing AI, inclusive education, assistive technologies, and digital inequalities. The conceptual references include Warschauer (2003), Holmes,

Bialik, and Fadel (2019), Selwyn (2019), Van Dijk (2020), and UNESCO (2023). For the contemporary discussion, Fitas (2025), Kooli and Chakraoui (2025), and Matjie, Nethavhani, and Matlakala (2026) are central, complemented by Brazilian studies related to inclusion and accessibility.

The selection prioritized studies that did not present AI exclusively as a technical innovation, but simultaneously discussed its possibilities, limitations, and implications for different groups of students. This approach is similar to the procedure adopted by Fitas (2025), whose review focused specifically on the intersection of AI, education, inclusion, and accessibility. The author describes it as follows:

The article is based on a comprehensive review of the literature and reports at the intersection of Artificial Intelligence, education, inclusion, and accessibility. Peer-reviewed journals, conference proceedings, and academic databases were examined, primarily for articles published in the preceding three years. [...] The inclusion criteria encompassed studies that explicitly addressed AI in an educational context, involved students with disabilities and/or multilingual contexts, and discussed outcomes, benefits, or challenges related to inclusion. (Fitas, 2025, p. 5730, our translation).

The present chapter does not constitute a systematic review and does not replicate the procedures employed by Fitas (2025). The similarity lies in the choice of a recent, interdisciplinary corpus that allows technological potential to be examined alongside the conditions required for inclusion. The analysis was organized along three lines: the possibilities of AI for accessibility and participation; the transformation of the digital divide in the context of intelligent systems; and the ethical, pedagogical, and institutional conditions required for more equitable integration.

ARTIFICIAL INTELLIGENCE AND INCLUSION: RESOURCES THAT CAN REDUCE BARRIERS

AI has expanded the range of resources that can be used to address certain educational barriers. Screen readers enhanced by intelligent processing, speech recognition and synthesis, transcription

systems, automatic captioning, real-time translation, image description, and adaptive interfaces offer important possibilities for students with diverse needs.

Kooli and Chakraoui (2025) analyze these applications in relation to students with visual, physical, and cognitive disabilities. The authors emphasize that AI-based screen readers can go beyond the linear conversion of text into speech by incorporating features such as voice modulation, contextual identification, and navigational support. Voice assistants and speech-recognition systems can also reduce dependence on keyboards and mice, enabling greater autonomy in school activities.

This type of application changes the meaning of assistive technology by incorporating a greater capacity for adaptation. The purpose is not to replace existing technologies, but to add interpretation, prediction, and personalization capabilities. The inclusive potential thus emerges when technology reduces a specific barrier and expands a student's opportunity to participate.

Fitas (2025) identifies a similar process when addressing translation and language support. In multilingual classrooms, text and speech translation tools can assist students who have not yet mastered the predominant language of schooling. Real-time captioning systems, bilingual glossaries, and adapted explanations can provide an additional layer of understanding that would not be available in conventional materials.

Inclusion, in this sense, can be understood as extending beyond disability. Linguistic, cognitive, communicative, and format-related barriers also affect opportunities for learning. This understanding brings the discussion closer to the Universal Design for Learning perspective presented by Zerbato and Mendes (2018), insofar as different forms of representation can foster the participation of a broader range of students.

Kooli and Chakraoui (2025) summarize the potential of these technologies while simultaneously drawing attention to a fundamental condition:

Despite these benefits, successful implementation requires more than simply making the technology available. Robust technical infrastructure is essential, including compatible devices, stable internet connectivity, and processing capacity. Without these conditions, the benefits of AI tools may remain inaccessible, especially in underserved educational settings. In addition, educators must be prepared not only to operate these tools but also to integrate them meaningfully into pedagogy. (Kooli; Chakraoui, 2025, pp. 3–4, translation).

This passage is particularly relevant because it prevents the analysis from being reduced to software capabilities. Between a potentially accessible technology and a genuinely inclusive experience lie several intermediate conditions: compatible equipment, connectivity, support, planning, and teacher education.

The authors themselves acknowledge technical limitations. Intelligent screen readers may struggle with scientific language, multimedia content, and complex visual structures. Speech-recognition systems produce different results depending on noise, accent, and the characteristics of the user's speech. Interfaces based on language processing may oversimplify certain content or misinterpret less standardized forms of expression.

This point reveals an important contradiction. A tool created to enhance accessibility can produce a new barrier when it interprets certain patterns of language, voice, or behavior more effectively than others. A system's average performance is therefore insufficient to assess how inclusive it is. It is necessary to ask for whom it works adequately and who remains subject to higher error rates.

Fitas (2025) reaches a similar conclusion. Although the author identifies benefits for students with disabilities and those who face language barriers, he stresses that long-term evidence remains limited and that unequal adoption among schools with differing economic resources may undermine inclusion objectives.

Thus, the first possibility offered by AI is real but conditional: intelligent systems can reduce barriers to access, communication, and interaction, but they do not automatically transform an educational experience into an inclusive one. Their contribution depends on the relationship among the student's needs, the quality of the tool, and the conditions under which it is used.

FROM THE ACCESS DIVIDE TO THE ALGORITHMIC DIVIDE: NEW FORMS OF INEQUALITY

The expansion of AI requires a reassessment of simplified conceptions of the digital divide. Warschauer (2003) had already demonstrated that owning equipment does not necessarily entail meaningful participation in digital culture. Van Dijk (2020) also distinguishes among material access, skills, and forms of use, showing that inequalities persist even as connectivity expands.

In the context of AI, Matjie, Nethavhani, and Matlakala (2026) deepen this discussion by demonstrating that educational benefits may be distributed unequally even among formally connected users. Their analysis considers divides related to access, digital skills, outcomes, language, culture, and the characteristics of algorithms.

The so-called third-level digital divide is particularly important. It shifts the question from “Who has access?” to “Who achieves better outcomes through that access?” Systems trained on inadequately representative datasets may provide less accurate feedback to certain groups, misinterpret their work, or classify them according to inappropriate standards. Matjie, Nethavhani, and Matlakala (2026) observe:

AI systems trained on datasets that underrepresent certain populations generate biased predictions, provide less appropriate feedback, and misinterpret students’ work, producing what may be understood as a third-level digital divide, related not to access but to who ultimately benefits from AI. In educational settings, these unequal outcomes manifest themselves in differences in the quality of the feedback and recommendations provided to students. (Matjie; Nethavhani; Matlakala, 2026, p. 3, translation).

This interpretation significantly broadens the debate on equity. Two students may have access to the same system and use similar equipment yet derive different benefits because the algorithm responds more effectively to the language, context, writing pattern, or cultural references of one of them.

Linguistic inequality is a particularly striking example. According to Matjie, Nethavhani, and Matlakala (2026), many AI-based educational technologies privilege dominant languages, especially English, while local and Indigenous languages and languages with a smaller digital presence remain

underrepresented. The result is not only a matter of translation: examples, metaphors, discursive structures, and cultural references also affect the pedagogical relevance of responses.

Fitas (2025), on the other hand, demonstrates that the same technology can be used to address language barriers. Translators, captioning systems, and language-processing tools can facilitate communication between teachers and students from different backgrounds. The contradiction lies precisely here: AI can simultaneously reduce and reproduce linguistic inequalities, depending on the quality of the models, the languages covered, and the cultural conditions under which they were developed.

The study by Matjie, Nethavhani, and Matlakala (2026) also presents experiences that point to alternative paths. In Kenya, a translation project involving English and Kenyan Sign Language used codesign and included the participation of the Deaf community. In Mali, the production of content in Bambara combined AI with human editing and culturally contextualized resources. In African countries, open educational resource initiatives linked AI localization to teacher education.

These cases suggest that representativeness should not be treated solely as a technical feature of a dataset. It is also a matter of social participation. Communities, teachers, and students can help test tools, identify inadequacies, and produce resources that reflect their contexts.

There are also inequalities related to skills. Matjie, Nethavhani, and Matlakala (2026) present the case of mathematics teachers in urban and rural schools in China, where the problem lay not simply in the absence of infrastructure, but in differences in professional preparation for the pedagogical use of technologies. This finding is consistent with the second dimension of the digital divide discussed by Van Dijk (2020): access without skills does not ensure meaningful appropriation.

The authors' comparative analysis demonstrates that interventions implemented without teacher preparation or contextualization can lead to underuse, student dissatisfaction, and widening inequalities. By contrast, experiences associated with community participation and professional education yield more favorable outcomes.

The digital divide in the age of AI therefore encompasses multiple layers. Traditional inequalities in infrastructure and connectivity persist, but they are compounded by differences in skills, quality of use, outcomes, linguistic and cultural representativeness, and algorithmic treatment. The more extensively AI participates in educational processes, the more important it becomes to investigate these dimensions.

TEACHER EDUCATION, PARTICIPATION, AND GOVERNANCE: CONDITIONS FOR INCLUSIVE AI IN EDUCATION

If the effects of AI depend on conditions that extend beyond technology, the discussion must address the responsibilities of institutions, teachers, developers, and public policy. UNESCO (2023) maintains that generative systems used in education must preserve human agency, data protection, and equity. Selwyn (2019) adds that decisions about educational technologies are also social and political decisions, as they determine who participates, who controls resources, and which conceptions of education are prioritized.

Teacher education is one of the conditions most frequently identified in the studies analyzed. This does not merely mean teaching educators how to operate a particular platform. The incorporation of AI requires competencies to evaluate responses, identify biases, assess accessibility, understand data-related risks, and make pedagogical decisions about when a given tool should or should not be used.

Fitas (2025) draws attention to the enduring importance of the human role even in environments where AI begins performing tasks that previously depended directly on teachers. In summarizing the conclusions of his review, he states:

AI technologies do not constitute a universal solution and present challenges of their own. Issues related to equitable access, such as the digital divide and biases in AI systems, pose genuine risks of widening inequalities if they are not directly addressed. [...] This means investing in infrastructure, selecting or developing culturally and linguistically inclusive solutions, and keeping human beings in the loop to identify and correct the limitations of algorithms. Teachers remain irreplaceable as facilitators, decision-makers, and providers of emotional support in the classroom. (Fitas, 2025, p. 5755, translation).

The human presence mentioned by Fitas (2025) should not be understood merely as the final supervision of an automated response. It involves pedagogical judgment. Systems can recognize patterns, generate materials, and propose pathways, but they do not have complete access to the relationships, histories, and circumstances that shape a class. Teacher mediation remains necessary to determine whether an adaptation preserves learning objectives and whether a particular resource is appropriate for a given context.

Kooli and Chakraoui (2025) also connect teacher education with infrastructure. In the case of speech-recognition tools, for example, successful implementation depends on devices, microphones, connectivity, and professional preparation. When these conditions are absent, students may theoretically have access to an inclusive solution while remaining unable to use it adequately.

Another factor is data protection. Accessibility resources may process voice data, writing patterns, performance information, and characteristics associated with a student's disability or needs. Kooli and Chakraoui (2025) caution that intelligent interfaces frequently process sensitive data, requiring specific safeguards for the storage, sharing, and use of such information.

Inclusion also requires participation in technological development. Matjie, Nethavhani, and Matlakala (2026) demonstrate that models built with community participation and the integration of local languages have greater potential to reduce cultural biases. In their comparative framework, the study shows that projects based on codesign with Deaf users or on culturally contextualized content produce results different from those implemented through top-down approaches.

Such participation changes the traditional position of users. People with disabilities, students from linguistic minority communities, and teachers cease to be merely the recipients of externally developed solutions and begin contributing to their design, evaluation, and improvement.

From an institutional perspective, governance must keep pace with innovation. The adoption of AI without clear policies on accessibility, data protection, criteria for selecting tools, and responsibilities may transfer important decisions to private platforms or opaque automated processes. In this regard, UNESCO

(2023), Selwyn (2019), and Matjie, Nethavhani, and Matlakala (2026) converge on the need to treat technology integration as an educational and social decision, rather than merely an administrative one.

The case analysis conducted by Matjie, Nethavhani, and Matlakala (2026) leads the authors to a particularly significant conclusion: equitable outcomes depend on participatory design, sustained teacher education, and institutional preparedness. Mere access to tools does not guarantee meaningful use, and the operation of systems must be analyzed in relation to skills, cultural context, and institutional capacity.

An AI policy committed to inclusion must therefore address multiple areas simultaneously: accessible infrastructure, critical professional development, bias assessment, linguistic and cultural diversity, user participation, data protection, and outcome monitoring. The absence of any one of these dimensions may transform a tool designed to reduce barriers into yet another source of inequality.

FINAL CONSIDERATIONS

The analysis developed in this chapter demonstrates that the relationship among Artificial Intelligence, inclusion, and accessibility is marked by concrete possibilities and equally significant contradictions. Intelligent screen readers, speech recognition, interfaces based on natural language processing, machine translation, captioning, and adaptive systems can enhance autonomy and reduce certain barriers to accessing educational processes.

The existence of these resources, however, does not ensure that their benefits will be distributed equally. The contemporary digital divide extends beyond the availability of connectivity and equipment. It encompasses skills, conditions of use, the quality of outcomes, data representativeness, linguistic and cultural appropriateness, and institutions' capacity to integrate technologies in pedagogically meaningful ways.

The studies by Fitas (2025), Kooli and Chakraoui (2025), and Matjie, Nethavhani, and Matlakala (2026) show that the same AI capable of enhancing accessibility may also produce new forms of exclusion. Systems may perform unevenly when processing certain languages, accents, forms of

expression, or user characteristics; schools may possess differing capacities to implement the tools; and formally connected students may derive profoundly different educational benefits.

In this sense, the issue examined in this chapter cannot be resolved simply by stating that AI either promotes or hinders inclusion. Its inclusive potential depends on the conditions under which it is developed, accessed, used, and governed. Intelligent resources contribute to more accessible education when they respond to concrete barriers, are evaluated in diverse contexts, preserve human participation, and are supported by adequate infrastructure and teacher education.

It is also necessary to shift the discussion from AI created for certain groups to AI built with their participation. The involvement of people with disabilities, linguistic communities, students, and teachers in development and evaluation processes can help identify barriers that would not be recognized by technical teams alone.

It can therefore be concluded that the central issue for inclusive education in the age of Artificial Intelligence is not merely expanding access to technologies, but ensuring that students have equitable opportunities to benefit from them. The more intelligent systems mediate access to information and learning, the greater the commitment must be to accessibility, representativeness, participation, transparency, and educational justice. Innovation can be considered inclusive only when its technical capabilities are matched by the social and pedagogical conditions required to ensure that no students are excluded from its benefits.

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CONTINUING TEACHER EDUCATION FROM THE PERSPECTIVE OF BLENDED LEARNING AND DIGITAL EDUCATION

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Abstract

This study aims to analyze the importance of continuing teacher education from the perspective of blended learning and digital education, highlighting its challenges, possibilities, and contributions to pedagogical practice. This qualitative study was conducted through bibliographic and documentary research grounded in scientific publications, normative documents, and theoretical frameworks addressing educational innovation, teachers' digital competencies, and active learning methodologies. The

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results indicate that continuing education is essential to teachers' professional development, as it promotes the updating of knowledge, mastery of technological resources, and adoption of innovative pedagogical practices capable of responding to the demands of contemporary education. However, challenges were also identified in relation to technological infrastructure, inequalities in access, resistance to change, and the need for permanent public policies aimed at recognizing and enhancing teachers' professional qualifications. The study concludes that continuing education, when systematically planned, contextualized, and aligned with digital competencies, strengthens teachers' professional practice, expands opportunities for pedagogical innovation, and contributes to the development of more inclusive, participatory, and meaningful educational environments prepared to address the challenges posed by digital culture and society's ongoing transformations.

Keywords: Blended learning, Continuing teacher education, Digital education.

INTRODUCTION

The transformations brought about by digital culture have promoted significant changes in educational processes, requiring new ways of teaching, learning, and constructing knowledge. The incorporation of digital technologies into everyday school life is no longer merely a methodological innovation; it has become an inherent requirement in educating students who are capable of acting critically, creatively, and collaboratively in an increasingly connected society (Corrêa; Boll; Nobile, 2022). In this context, blended learning has emerged as a pedagogical approach that integrates in-person and digital activities, broadening opportunities to personalize learning and encouraging students to take an active role.

The consolidation of these new practices demonstrates that the mere availability of technological resources does not guarantee improvements in the quality of education. Investment in continuing teacher education is therefore essential to enable teachers to develop the pedagogical and digital competencies required for the critical, ethical, and effective use of educational technologies (Simões et al., 2021).

Accordingly, teachers no longer occupy the exclusive position of knowledge transmitters, instead serving as mediators, facilitators, and organizers of learning experiences (Bacich; Tanzi Neto; Trevisani, 2015).

Continuing education therefore plays a strategic role in implementing blended learning and digital education by contributing to professional development, reflection on pedagogical practice, and the incorporation of active learning methodologies capable of fostering greater student engagement (Simões et al., 2021). It also promotes the development of competencies related to planning, assessment, the curation of digital resources, and the use of virtual learning environments.

However, implementing these approaches still entails significant challenges, including inequalities in access to technology, infrastructure limitations, insufficient public investment, and the need for permanent policies supporting teachers' professional development (Gatti, 2008; Kenski, 2012). These challenges are compounded by the rapid evolution of digital technologies, which requires educators to update their knowledge continuously in order to keep pace with changes in how knowledge is produced and circulated.

Against this backdrop, the following research question was formulated: how does continuing teacher education contribute to the implementation of blended learning and digital education, considering the challenges and possibilities associated with developing teachers' competencies and improving teaching and learning processes?

To address this question, the study aims to analyze the importance of continuing education from the perspective of blended learning and digital education, discussing its contributions to pedagogical innovation, the strengthening of teachers' competencies, and the improvement of teaching and learning processes.

To achieve this objective, qualitative bibliographic and documentary research was conducted, drawing on scientific publications and documents addressing teacher education, educational technologies, blended learning, and digital education. The study sought to understand the principal challenges and

possibilities involved in consolidating an educational model aligned with the demands of contemporary society.

THEORETICAL FRAMEWORK

Continuing education is one of the principal instruments of teachers' professional development, particularly in light of the constant social, cultural, and technological transformations affecting the educational landscape. Unlike initial teacher education, this process is characterized by the continuous updating of knowledge, improvement of pedagogical practices, and critical reflection on professional practice. In this sense, continuing education extends beyond occasional courses and constitutes an ongoing process of knowledge construction and development of the competencies required for teaching (Imbernón, 2011). Complementing this understanding, Rocha (2022, p. 40) identifies the following as relevant elements of continuing education: "a focus on pedagogical content knowledge; the use of active learning methodologies; collaborative work among peers; sustained duration of training; and systemic coherence."

The National Common Foundation for the Continuing Education of Basic Education Teachers (Base Nacional Comum para a Formação Continuada de Professores da Educação Básica) establishes that professional development should promote competencies related to pedagogical knowledge, the use of digital technologies, methodological innovation, and improvements in student learning, thereby strengthening a culture of education throughout teachers' careers (Brasil, 2020). Along the same lines, Nóvoa (2022) emphasizes that the teaching profession requires continuous learning processes grounded in collaboration among teachers, reflection on practice, and the collective construction of pedagogical knowledge. According to the author, professional development occurs not only through the acquisition of content, but primarily through the ability to analyze the challenges of educational practice critically.

Tardif (2014) further argues that teachers' knowledge is constructed through the articulation of academic education, professional experience, and everyday life in schools. Continuing education thus

strengthens the integration of theory and practice, helping improve the quality of teaching and learning.

This understanding is also expressed by Costa (2021, p. 1):

[...] continuing education broadens the possibilities available to teaching practice and to teaching and learning through a wide range of content in constant dialogue with students' realities. It also stimulates cognitive skills that foster the ability to establish relationships, construct syntheses, think theoretically, and reflect critically on reality.

In this context, recognizing the value of teachers depends on the existence of public policies that ensure permanent educational opportunities, encourage pedagogical innovation, and provide suitable conditions for professional development, thereby contributing to an educational model aligned with the demands of the knowledge society (Brasil, 2020). Accordingly, Augusto et al. (2026, p. 926) state that:

[...] continuing education ceases to represent the mere updating of knowledge and becomes an ongoing process of constructing teacher professionalism, committed to improving the quality of education and fostering meaningful student learning.

Blended learning is characterized by the planned integration of in-person activities and experiences mediated by digital technologies, combining different spaces, times, and learning strategies. This approach breaks with traditional models centered exclusively on teacher-led exposition, promoting more flexible, collaborative, and personalized practices (Horn; Staker, 2015). According to Bacich, Tanzi Neto, and Trevisani (2015), blended learning restructures the educational process by intentionally combining in-person and online components, enabling students to participate actively in constructing knowledge. From this perspective, teachers serve as learning mediators, using different methodologies to meet students' individual needs.

The authors emphasize that the personalization of learning is one of the principal distinguishing features of blended learning, as it enables greater student autonomy, individualized monitoring, and the use of digital resources to support the development of the competencies established in the curriculum

(Bacich; Tanzi Neto; Trevisani, 2015). This concept is supported by the National Common Core Curriculum (Base Nacional Comum Curricular, BNCC), which recognizes digital culture as one of the general competencies of Basic Education. The document establishes that students must develop skills related to the critical, ethical, and responsible use of digital technologies and understand their application in communication, knowledge production, and problem-solving (Brasil, 2018).

Moran (2018) further states that blended learning represents an evolution in pedagogical practices because it integrates active learning methodologies, technological resources, and different learning environments, fostering greater student participation and the development of cognitive, socioemotional, and digital competencies. This broad conception of student education is supported by the BNCC:

It thus recognizes that Basic Education must aim at comprehensive human education and development, which entails understanding the complexity and nonlinearity of this development and breaking with reductionist views that privilege either the intellectual (cognitive) dimension or the affective dimension. It also means adopting a plural, individual, and comprehensive view of children, adolescents, young people, and adults, regarding them as learning subjects, and promoting an education devoted to welcoming, recognizing, and fully developing them in their uniqueness and diversity. Furthermore, as a space for learning and inclusive democracy, the school must strengthen itself through the coercive practice of nondiscrimination, nonprejudice, and respect for differences and diversity. (Brasil, 2018, p. 14).

Digital education encompasses the pedagogical use of digital technologies as instruments capable of expanding opportunities for teaching, learning, communication, and assessment. Its effectiveness, however, depends on preparing teachers to integrate these tools into pedagogical practices critically, ethically, and meaningfully (UNESCO, 2019). In this regard, Santana et al. (2026, p. 4) state that “contemporary teachers must develop competencies related to pedagogical mediation, the critical use of digital technologies, and the construction of more collaborative, flexible, and meaningful educational practices.”

The United Nations Educational, Scientific and Cultural Organization (UNESCO) emphasizes that developing teachers’ digital competencies involves not only technical mastery of technologies, but also

the ability to select appropriate resources, promote collaborative learning, use innovative methodologies, and assess educational processes mediated by digital environments (UNESCO, 2019).

Complementing this perspective, the European Framework for the Digital Competence of Educators (DigCompEdu) establishes that teachers must develop competencies related to pedagogical planning, the creation of digital resources, assessment, learner empowerment, and the facilitation of learners' digital competence, consolidating professional practice aligned with the demands of contemporary education (Redecker, 2017). In Brazil, the National Connected Schools Strategy (Estratégia Nacional de Escolas Conectadas) reinforces the need for teacher education focusing on the pedagogical use of digital technologies, recognizing technological infrastructure, connectivity, and professional qualification as inseparable elements in the digital transformation of education (Brasil, 2023).

Thus, continuing education emphasizing digital education supports the development of competencies related to digital content curation, the production of multimodal materials, the use of virtual learning environments, and the application of active learning methodologies, expanding opportunities for pedagogical innovation and improved learning (Moran, 2018).

Despite the progress made in incorporating digital technologies into educational contexts, several challenges continue to hinder the consolidation of blended learning in Brazilian schools. These include unequal internet access, technological infrastructure limitations, insufficient public investment, and gaps in teacher education (Brasil, 2023). According to UNESCO (2023), although digital technologies expand educational opportunities, their implementation requires public policies that ensure digital inclusion, equity, and teachers' continuous professional development. The organization emphasizes that the indiscriminate use of technology does not improve learning unless it is associated with clearly defined pedagogical objectives.

Beyond structural issues, Imbernón (2011) notes that many continuing education programs remain excessively technical and disregard teachers' actual needs and the specific contexts of schools. According

to the author, effective educational processes should foster critical reflection, collaboration among peers, and the permanent articulation of theory and practice. Nóvoa (2022) likewise emphasizes that teacher education must strengthen professional learning communities in which teachers share experiences, collectively produce knowledge, and develop solutions to the everyday challenges of educational practice. Prospects for blended learning therefore depend on the integration of public policies, infrastructure investment, high-quality continuing education, and the strengthening of teachers' digital competencies. Together, these elements contribute to a more inclusive and innovative educational model aligned with the demands of digital society.

METHODOLOGY

This research is characterized as a qualitative study because it seeks to understand, interpret, and analyze aspects related to continuing teacher education from the perspective of blended learning and digital education. Qualitative research makes it possible to investigate educational phenomena by considering their complexity, meanings, and the relationships established between theory and practice, thereby enabling an in-depth understanding of the object under investigation (Minayo, 2014).

With regard to its objectives, this research is descriptive and exploratory. Descriptive research aims to identify, record, and analyze the characteristics of a particular phenomenon, whereas exploratory research provides greater familiarity with the subject under investigation, helping expand knowledge and construct new interpretations (Gil, 2019). These characteristics are appropriate to the purpose of this study, which is to understand the importance of continuing education in developing the competencies teachers need for blended learning and digital education.

Regarding technical procedures, the investigation is classified as bibliographic and documentary research. According to Gil (2019), this type of research is developed from previously published materials, including books, scientific articles, dissertations, theses, legislation, and institutional documents, allowing researchers to bring together different theoretical perspectives on the phenomenon under study. Marconi

and Lakatos (2022) add that bibliographic research enables researchers to understand the state of the art on a given subject, identify gaps in knowledge, and provide a theoretical foundation for their analyses.

The choice of bibliographic research is justified by the extensive scientific literature on continuing education, active learning methodologies, blended learning, and digital technologies applied to education. Analyzing these sources makes it possible to understand how technological transformations have influenced teachers' professional development and which competencies are required to meet the demands of contemporary education (Imbernón, 2011).

Classic and contemporary works on teacher education, educational innovation, blended learning, digital competencies, and public education policies were consulted to construct the theoretical framework and analyze the data. Official documents published by the Ministry of Education were also used, particularly the National Common Core Curriculum (Base Nacional Comum Curricular, BNCC) (Brasil, 2018), the National Common Foundation for the Continuing Education of Basic Education Teachers (Brasil, 2020), and the National Connected Schools Strategy (Brasil, 2023). These documents establish guidelines for incorporating digital technologies into the curriculum and developing teachers' professional competencies.

In addition to national normative documents, the study analyzed international publications produced by the United Nations Educational, Scientific and Cultural Organization (UNESCO), particularly the ICT Competency Framework for Teachers (UNESCO, 2019) and the Global Education Monitoring Report 2023 (UNESCO, 2023), which present frameworks addressing teachers' digital competencies, digital inclusion, and the pedagogical use of technology in education.

The bibliographic search was conducted between June and August 2026 using the descriptors "continuing teacher education," "blended learning," "digital education," "teachers' digital competencies," "active learning methodologies," and "digital technologies in education," combined using the Boolean

operators AND and OR. Priority was given to publications from the preceding decade that were available in full and directly related to the object of investigation.

Priority was also given to publications indexed in national and international scientific databases, including the Scientific Electronic Library Online (SciELO), Google Scholar, the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES), and official documents made available by the Ministry of Education and UNESCO. Although the research prioritized works published during the preceding decade, publications regarded as classics in the field of teacher education were also included because they remain fundamental theoretical references for understanding the object under investigation.

The bibliographic material was examined through thematic content analysis. According to Bardin (2016), this technique makes it possible to organize, interpret, and categorize information obtained from documents by identifying recurring meanings that help answer the research question. An exploratory reading of the selected works was initially undertaken, followed by analytical and interpretive readings that made it possible to identify categories associated with continuing education, digital competencies, active learning methodologies, blended learning, digital education, and the challenges of teaching practice.

The data were subsequently organized into thematic axes, making it possible to establish relationships among the different theoretical frameworks and normative documents. This systematization enabled an understanding of the convergences between scientific publications and educational policies concerned with the digital transformation of education, demonstrating the strategic role of continuing education in implementing innovative pedagogical practices (Nóvoa, 2022).

The interpretation of the results was based on a critical analysis of the contributions presented by the different authors, considering the specific characteristics of the Brazilian educational context and the demands imposed by digital culture. As Bacich, Tanzi Neto, and Trevisani (2015) emphasize, implementing blended learning requires structural changes in pedagogical practices, making it essential

for teachers to develop competencies related to planning, learning mediation, the use of virtual environments, and the integration of active learning methodologies.

The research also recognized that continuing education should not be restricted to technical mastery of digital tools, but should encompass pedagogical, ethical, methodological, and reflective dimensions, fostering the construction of contextualized educational practices centered on student learning. This understanding is supported by Moran (2018), who states that educational innovation depends on the articulation of technology, active learning methodologies, and teachers' professional development.

Because this was exclusively bibliographic research, no human participants were involved and no field data were collected. Submission to a Research Ethics Committee was therefore unnecessary under the guidelines of National Health Council Resolution No. 510/2016, which exempts research conducted exclusively with public-domain materials and previously published documents from ethical review (Brasil, 2016).

The methodological procedures adopted thus enable a consistent analysis of continuing education from the perspective of blended learning and digital education, providing a theoretical basis for understanding the challenges, possibilities, and contributions of this process to strengthening teachers' competencies and improving the quality of education.

RESULTS AND DISCUSSION

CONTINUING EDUCATION AND TEACHERS' DIGITAL COMPETENCIES

The analysis of the bibliographic and documentary material demonstrated that continuing education is one of the central elements in the consistent implementation of blended learning and digital education. The studies examined converge in showing that incorporating technologies into educational processes does not, by itself, produce pedagogical innovation or automatically improve learning.

Qualitative change depends on teachers' ability to align digital resources with curricular objectives, student characteristics, mediation strategies, and assessment procedures. This finding challenges technocentric conceptions that attribute to platforms, applications, and devices the power to transform education independently of the pedagogical and institutional conditions under which they are used. UNESCO (2023) cautions that evidence concerning the effects of educational technologies remains uneven and that their adoption must be evaluated according to relevance, equity, scalability, and sustainability, rather than solely on the novelty of the resources employed.

The findings also indicated that the most effective continuing education is not limited to operational training in the use of equipment or software. Although instrumental competence is necessary, it represents only one dimension of teachers' digital competence. Teachers must understand when a particular technology should be used, which learning outcomes it is intended to foster, how student participation should be monitored, and which ethical, cognitive, and social risks arise from digital mediation. The DigCompEdu framework developed by Redecker (2017) supports this interpretation by organizing educators' digital competence into six areas: professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and facilitating learners' digital competence. The framework demonstrates that digital competence is not merely technical proficiency, but the ability to use technologies to enhance and innovate educational processes.

This finding has an important theoretical implication because it shifts the discussion from the material presence of technology to the quality of pedagogical action. A school may have internet access, computers, platforms, and virtual environments without substantially changing the transmissive logic of its teaching. In such situations, sophisticated digital resources merely reproduce traditional practices, including one-way exposition, standardized exercises, excessive control, and assessment centered on memorization. Modelski, Giraffa, and Casartelli (2019) argue that technology integration requires the knowledge, skills, and attitudes that allow teachers to reinterpret their practice within a cyberculture context. Simply digitizing printed materials or transferring lectures to a platform does not, in itself,

constitute high-quality digital education. Transformation occurs when technologies expand opportunities for interaction, authorship, investigation, collaboration, pedagogical differentiation, and knowledge production.

BLENDED LEARNING, PERSONALIZATION, AND PEDAGOGICAL MEDIATION

In this sense, blended learning was identified as a pedagogical conception broader than the mere alternation between in-person and remote activities. According to Bacich, Tanzi Neto, and Trevisani (2015), blended learning entails the intentional integration of in-person and digital experiences, with students exercising some degree of control over the time, place, path, or pace of learning. The review findings show that this integration can promote greater flexibility, diversification of experiences, and more individualized monitoring, but these benefits depend on rigorous pedagogical planning. Simply distributing tasks across two environments is insufficient; didactic continuity, coherence among activities, and clarity concerning the function of each environment within the learning pathway must be established.

The possibility of personalization emerged as one of the most frequently cited contributions of blended learning. Virtual environments can provide teachers with information on participation, performance, difficulties, and the pace at which students complete activities, enabling more targeted interventions. However, the critical analysis of the studies demonstrates that personalization does not mean fully individualizing education or replacing collective interaction with isolated learning paths. Pedagogically responsible personalization takes differences among students into account without weakening collaborative learning, dialogue, or the communal construction of knowledge. Moran (2018) understands active and blended learning methodologies as opportunities to reorganize times, spaces, and roles, thus encouraging greater student participation. This participation, however, must be accompanied by teacher guidance, clear objectives, and coherent assessment practices.

The literature analyzed also indicated that student autonomy does not emerge automatically from exposure to technology. Everyday familiarity with social networks, applications, and mobile devices is not equivalent to competence in autonomous learning within digital environments. Students may have difficulty selecting reliable sources, organizing routines, managing time, understanding instructions, producing original content, and monitoring their own learning. Teachers therefore retain a decisive role in blended learning, although their work is reconfigured. Rather than disappearing or losing relevance, they assume more complex functions involving planning, curation, mediation, monitoring, feedback, and the organization of meaningful experiences.

This reconfiguration runs counter to discourses that associate technological innovation with the replacement of teachers' work. The analysis suggests the opposite: the greater the complexity of the digital ecosystem, the more necessary qualified professional practice becomes. The Organisation for Economic Co-operation and Development emphasizes that effective digital systems depend on governance, infrastructure, interoperability, high-quality resources, and professional development and cannot be reduced to the isolated acquisition of technologies (OECD, 2023). Teachers must assess the appropriateness of tools, interpret educational data, protect personal information, address misinformation, and ensure that the resources used serve legitimate pedagogical purposes.

Assessment emerged as one of the weakest dimensions of the digitalization of education. Many teachers use technology to present content or distribute tasks while retaining assessment models centered on standardized responses and outcomes. Blended learning requires a process-oriented conception of assessment capable of bringing together evidence produced at different times and in different environments. Digital records can help monitor learning, provided they are not interpreted mechanically. The number of accesses, time spent online, and completion of activities do not necessarily represent conceptual understanding, intellectual engagement, or authorship. Teachers must combine digital indicators with observation, dialogue, analysis of student work, and qualitative feedback.

CHALLENGES OF DIGITAL TRANSFORMATION: INFRASTRUCTURE, INEQUALITIES, AND ETHICS

The use of educational data also presents risks that must be addressed in continuing education. Digital monitoring can facilitate early interventions, but it can also result in excessive surveillance, premature classifications, and decontextualized interpretations. Pedagogical analysis cannot be replaced by automated metrics. Data should support professional judgment rather than determine decisions in isolation. The OECD (2023) recognizes that intelligent technologies can free up teachers' time and support students requiring greater attention, but this depends on transparent systems, clearly defined pedagogical objectives, and the professional capacity to interpret the information generated.

The review also demonstrated that inequalities in access remain a structural obstacle to consolidating blended learning. The availability of equipment does not resolve disparities involving connection quality, the sharing of devices among family members, physical study conditions, and mastery of digital languages. UNESCO (2023) emphasizes that technology can expand opportunities for certain groups while simultaneously excluding others, particularly when policies disregard pre-existing socioeconomic inequalities. Blended approaches that assume permanent and uniform access can therefore deepen asymmetries by transferring to families responsibilities that should be taken into account by the educational system.

At this point, a divergence emerges between the theoretical potential of blended learning and the actual conditions under which it is implemented. Although part of the literature emphasizes flexibility and personalization, many school systems face unstable internet connections, insufficient equipment, overcrowded classrooms, excessive workloads, and a lack of technical support. This contradiction does not invalidate blended learning, but it precludes its idealization. Pedagogical innovation cannot depend exclusively on individual teachers' efforts, as this risks turning continuing education into a mechanism for holding professionals solely accountable. Demanding technological mastery without ensuring

infrastructure, planning time, support, and adequate working conditions places responsibility for resolving systemic problems upon teachers.

In examining the use of digital technologies as pedagogical resources, Aureliano and Queiroz (2023) highlight the relationship between continuing education and the possibility of integrating these resources effectively into teaching. However, education produces sustainable outcomes only when accompanied by coherent institutional policies. Schools must define priorities, ensure pedagogical support, allocate study time, and establish criteria for selecting and evaluating technologies. In the absence of these conditions, initiatives tend to become fragmented, dependent on individually motivated teachers, and vulnerable to discontinuation following administrative changes.

Another practical implication concerns recognition of the emotional dimension of professional development. The incorporation of technology can cause insecurity, resistance, and a sense of diminished competence, particularly when educational programs disregard participants' different levels of experience. Interpreting these reactions as a mere lack of interest reduces a complex phenomenon to an individual deficiency. Resistance may reflect frustrating prior experiences, lack of support, fear of exposure, excessive workloads, or legitimate disagreement regarding the appropriateness of a particular tool. A human-centered approach to professional learning must accommodate these differences without abandoning the expectation of professional development, creating gradual pathways and genuine opportunities for experimentation.

The critical analysis also demonstrated that digital education must incorporate ethical issues. The use of platforms involves data processing, image exposure, intellectual property, accessibility, security, misinformation, and the influence of commercial interests. Teachers' competence includes assessing not only what a technology makes it possible to do, but also which values, limitations, and forms of control are embedded in its operation. Recent developments in the international debate on digital competence have given greater attention to issues such as artificial intelligence, well-being, cybersecurity, rights, and sustainability, indicating that digital education must extend beyond functional mastery of tools.

PROSPECTS FOR CONTINUING TEACHER EDUCATION

Another significant finding concerns the need to contextualize continuing education. Standardized programs organized without diagnosing the concrete needs of schools and teachers tend to have limited transformative potential. Imbernón (2011) criticizes education models based on transmitting externally developed solutions because they disregard professional knowledge, institutional contexts, and the problems teachers actually experience. Continuing education must begin with the realities of schools, facilitate the analysis of authentic situations, and allow teachers to experiment with, evaluate, and reconstruct teaching strategies. This perspective does not eliminate contributions from specialists, but rejects top-down education that treats teachers merely as executors of previously defined techniques.

The studies by Santos, Jung, and Fossatti (2021) reinforce the need for a complex understanding of teacher education. According to the authors, technology does not, in itself, provide a distinctive advantage in the teaching and learning process; its contribution depends on the practices of professionals and the relationships constructed within the educational context. This approach converges with the findings of the present study by demonstrating that education must consider cognitive, emotional, relational, institutional, and cultural dimensions. Teachers do not learn merely by receiving information about a tool, but by attributing meaning to it, relating it to problems in their practice, testing it in concrete situations, and reflecting on its effects.

Collaborative education consequently emerged as a more consistent alternative than episodic and individualized initiatives. Nóvoa (2022) argues that professional education must be constructed within the profession through cooperation, shared reflection, and the strengthening of teacher communities. In digital education, such collaboration allows teachers to share materials, discuss difficulties, analyze experiences, develop assessment criteria, and construct solutions suited to the local context. Machado et al. (2021) found that technologies can also overcome pedagogical isolation by creating spaces for

interaction and professional development. This finding is important because it demonstrates that digital resources serve not only to educate students, but can also support learning networks among educators.

Nevertheless, the existence of virtual communities or exchange groups does not guarantee critical education. Collaborative spaces may reproduce superficial practices when they focus on the indiscriminate sharing of tools and activities without evaluating their quality. Professional collaboration must be guided by relevant pedagogical problems, evidence of learning, and analysis of implementation conditions. The rapid circulation of digital resources can foster a culture of consuming novelty in which applications are adopted because of their popularity, appearance, or convenience rather than their curricular relevance. Continuing education must therefore develop curation skills, enabling teachers to examine the authorship, accessibility, reliability, data protection, age appropriateness, and pedagogical potential of materials.

In theoretical terms, the results make it possible to understand continuing education as a situated, reflective, collaborative, and ethically oriented process of professional development. It is not a matter of accumulating courses or certificates, but of expanding teachers' ability to interpret problems, make informed decisions, and reconstruct practices. Tardif (2014) notes that teachers' knowledge is plural and results from the articulation of education, curriculum, experience, and professional relationships. Education for blended learning must engage with this knowledge, recognizing that teachers do not begin the process as empty vessels, but as professionals whose experiences, conceptions, and criteria have developed throughout their careers.

From a practical perspective, the findings suggest that continuing education programs must combine competency diagnosis, pedagogical foundations, guided experimentation, monitoring, collaboration, and assessment of effects on learning. One-off initiatives may raise participants' awareness but rarely produce lasting changes. Progressive educational pathways must be organized in which teachers plan interventions, implement them, collect evidence, discuss results, and revise their decisions.

Institutions must understand that errors and adjustments are part of the innovation process, avoiding both the immediate imposition of tools and their adoption without criteria.

In summary, the results discussed demonstrate that blended learning and digital education have the potential to expand flexibility, participation, authorship, and the personalization of learning, but this potential is conditioned by the quality of teacher education and by institutional conditions. Technology neither eliminates the historical problems of education nor, by itself, compensates for inequalities, curricular weaknesses, or the deterioration of working conditions. When guided by pedagogical objectives, ethical criteria, evidence, and a commitment to inclusion, it can strengthen teachers' work and diversify learning experiences. When adopted as an automatic response to the demand for innovation, it tends to reproduce traditional practices, intensify inequalities, and increase professional workloads. Continuing education must therefore be conceived as a permanent policy integrated into the pedagogical project, rather than as an emergency intervention or peripheral training. Its overarching purpose must be to ensure that teachers and students participate critically in digital culture, using technologies not as ends in themselves, but as instruments subordinate to human development, knowledge construction, and the right to learn.

CONCLUSION

This study aimed to analyze the importance of continuing education from the perspective of blended learning and digital education, considering the challenges and possibilities arising from the digital transformation experienced by contemporary education. The analysis of scientific literature and normative documents demonstrated that continuing education is a strategic element in strengthening teachers' pedagogical and digital competencies, enabling the construction of more innovative and inclusive educational practices aligned with the demands of the knowledge society.

The results showed that simply introducing digital technologies into school environments does not guarantee improvements in the quality of learning. The effectiveness of blended learning depends on teachers' ability to integrate technological resources, active learning methodologies, mediation strategies, and assessment processes consistent with educational objectives. In this sense, the study confirmed that continuous professional development is indispensable if teachers are to use technology critically, ethically, and in pedagogically meaningful ways.

The research also demonstrated that continuing education must extend beyond models centered exclusively on technical training in the use of digital tools. Developing teachers' competencies requires reflective, collaborative, and contextualized educational processes capable of articulating theory and practice, promoting exchanges of experience among professionals, and fostering the collective construction of solutions to the everyday challenges faced by schools.

Another relevant aspect identified concerns the structural limitations that remain present in Brazilian education. Problems involving technological infrastructure, connectivity, unequal access to digital resources, and insufficient investment in public policies continue to impede the consolidation of blended learning in different school contexts. Implementing innovative pedagogical practices therefore depends not only on teachers' commitment, but also on institutional and governmental policies that ensure adequate conditions for teaching and for the development of digital competencies.

From a practical perspective, the study concludes that continuing education should be conceived as a permanent policy for recognizing and supporting teachers, integrated into educational institutions' pedagogical projects and grounded in scientific evidence. Educational programs must address pedagogical planning, active learning methodologies, learning assessment, digital resource curation, ethical technology use, and the development of professional autonomy, enabling teachers to serve as learning mediators in both in-person and digital environments.

Finally, this study is acknowledged to have limitations because it is exclusively bibliographic and grounded in theoretical frameworks and official documents, without empirical investigation in

educational institutions. Future research should therefore conduct field studies involving Basic Education teachers, school administrators, and students to examine how continuing education has been implemented in practice and what effects it has on learning, the development of digital competencies, and the quality of educational processes. Such studies may expand knowledge of the subject and contribute to improving public policies for teacher education and the digital transformation of Brazilian education.

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