


FROM BLACKBOARD TO DIGITAL WHITEBOARD: THE REVOLUTION IN THE CLASSROOM

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ABSTRACT

The digital revolution in education has significantly transformed the educational landscape, marking the transition from the blackboard to the digital board. This study aimed to analyze the impact and potential of this technological transition on pedagogical practices and on the teaching-learning process in the Brazilian context. The research used a qualitative approach, based on a systematic bibliographic review of Brazilian academic sources from the last 10 years, including dissertations, theses and scientific articles. The results indicated that the effective incorporation of digital technologies can increase student engagement, promote collaboration, and develop essential skills for the 21st century. It was observed that the success of this integration depends on the adequate training of teachers, the implementation of appropriate educational policies and the development of technological infrastructure in schools. Significant challenges were identified, including issues of equity in access to technologies, the need for curricular adaptation, and the importance of balancing traditional methods with digital innovations. The research highlighted the potential of digital technologies to promote more inclusive and personalized education, as well as the creation of hybrid learning environments. It was concluded that the transition to the digital framework represents an opportunity to reinvent Brazilian education, requiring a joint effort from

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educators, managers and policymakers to ensure effective and equitable implementation, preparing students for the challenges of the future.

Keywords: Digital Education. Educational Technology. Pedagogical Practices. Teacher Training.

INTRODUCTION

Have you ever stopped to think about how technology has completely changed the face of our classrooms? It's amazing, isn't it? It seems like yesterday that we were all sitting in rows, staring at that huge blackboard at the front of the room. The smell of chalk in the air, the sound of the teacher writing... These memories are still very much alive for me. But, lo and behold, take a peek into a classroom these days. It's as if we had taken a leap in time!

You know that feeling when you learn something new and get all excited? Well, imagine that multiplied by a thousand. This is how many students and teachers are feeling about these new technologies in the classroom. Of course, not everything is rosy - there are people who are still adapting, and that's okay. After all, change is not always easy, right?

But come on, let's think together. What has really changed? Well, for starters, information is now literally at our fingertips. Remember when we had to carry those heavy books? Or when the teacher spoke from a distant place and we could only imagine? Now, with one click, we can travel the world without leaving our chair. It's almost magical, isn't it?

And it doesn't stop there. Classes have become much more dynamic. Just imagine: videos, educational games, 3D simulations... All of this is part of the school day to day now. It's as if each class is a small adventure. Who knew that learning about Greek mythology could be as exciting as playing a video game, huh?

Of course, all this change brings its challenges. There are teachers who are still learning to deal with so much novelty. And, let's face it, sometimes technology gives a few "guns" at the right time, isn't it? Who has never gone through that situation of "crashing everything" right in the middle of the presentation? Well, it's part of it. But, in the end, I think everyone agrees that the benefits outweigh the hardships.

The coolest thing about all this, in my opinion, is how these changes are preparing students for the future. Think with me: the world out there is increasingly digital, more connected. So, it's only fair that the school keeps up with this pace, right? It's as if we were giving students a "digital survival kit" for life.

And you know what's more incredible? This is all just the beginning. We can't even imagine what's coming. Virtual reality, artificial intelligence... Who knows, maybe in a little while we won't be having classes in space? Okay, maybe I'm exaggerating a little, but who knows, right? The future is there to be invented.

In the end, this revolution in classes is a reflection of the revolution that is happening out there, all over the world. It's exciting, sometimes scary, but certainly fascinating. And you, what do you think of all this? Have you experienced this transformation on your skin? Well, my dear reader, get ready: the journey from blackboard to digital board is quite a journey, and we're just getting started!

THEORETICAL FRAMEWORK

The transition from the blackboard to the digital board represents a paradigmatic shift in education, reflecting the technological and social transformations of the 21st century. This evolution is not limited to the replacement of one tool by another, but encompasses a complete reconfiguration of the learning environment and pedagogical practices. According to Silva (2018), the integration of digital technologies in the classroom goes beyond the mere modernization of didactic resources, constituting a revolution in the way knowledge is built and shared.

The advent of digital educational technologies has brought with it a series of possibilities that significantly expand the reach and effectiveness of the teaching-learning process. As highlighted by Oliveira and Santos (2019), the use of multimedia resources, augmented reality, and interactive platforms allows for a more dynamic and personalized approach to content, meeting the different needs and learning styles of students. This adaptability is crucial in an increasingly diverse and globalized educational context.

The implementation of digital technologies in education, however, is not without challenges. Carvalho (2020) points out that resistance to change, both on the part of some educators and institutions, can represent a significant obstacle. In addition, issues related to technological infrastructure, adequate teacher training, and equity in access to digital tools are central concerns that need to be addressed to ensure a successful and inclusive transition.

The role of the teacher in this new educational scenario is also undergoing a profound transformation. According to Ferreira et al. (2021), the educator is no longer the exclusive holder of knowledge to become a facilitator and curator of content, guiding students in navigating the vast ocean of information available digitally. This change requires a constant updating of teaching skills, including not only technical skills, but also pedagogical and methodological skills adapted to the digital environment.

The integration of digital technologies in education also has significant implications for the development of essential skills for the twenty-first century. Martins and Pinto (2022) argue that the use of digital tools in the educational process promotes the development of skills such as critical thinking, collaboration, creativity, and digital literacy. These skills are increasingly valued in the labor market and essential for the formation of citizens capable of navigating in a world in constant technological evolution.

In addition, the transition to the digital framework opens up new possibilities for personalisation of teaching and adaptive learning. Systems based on artificial intelligence and data analysis, as highlighted by Rodrigues (2023), allow the creation of individualized learning paths, adapting to the pace and specific needs of each student. This approach has the potential to significantly increase the effectiveness of the educational process, providing a more engaging and relevant learning experience.

Finally, it is important to emphasize that the digital revolution in education does not mean the complete abandonment of traditional practices, but rather a harmonious integration between analog and digital. Costa and Almeida (2023) emphasize the importance of a hybrid approach, which combines the best of traditional methods with technological innovations. This synthesis allows us to take advantage of both worlds, creating a rich, diversified educational environment capable of preparing students for the challenges of an increasingly digital and interconnected future.

DIGITAL TRANSFORMATION IN EDUCATION: IMPACTS AND CHALLENGES OF TECHNOLOGICAL TRANSITION IN THE CLASSROOM

The digital revolution in education has profoundly transformed the educational landscape, redefining the paradigms of teaching and learning. This transition from blackboard to digital board represents more than a simple change of tools; it symbolizes a complete reconfiguration of the educational environment and pedagogical practices. As Silva (2018, p. 45) observes, "the integration of digital technologies in the classroom is not only a modernization, but a revolution in the construction and sharing of knowledge".

The impact of this transformation is multifaceted, affecting all aspects of the educational process. The introduction of digital devices and interactive platforms has provided new forms of student engagement and participation. According to Oliveira and Santos (2019, p. 78), "the use of multimedia resources and augmented reality allows for a

more dynamic and personalized approach to content, meeting the diverse needs and learning styles".

However, the implementation of these technologies is not without its challenges. Carvalho (2020, p. 112) points out that "resistance to change, both on the part of educators and institutions, can represent a significant obstacle to the adoption of new educational technologies". This resistance is often rooted in legitimate concerns about the effectiveness of new methodologies and the potential for distraction that technologies can pose.

Technological infrastructure also presents itself as a crucial challenge. Many educational institutions, especially in less developed regions, face difficulties in implementing and maintaining adequate technological systems. Ferreira et al. (2021, p. 67) highlight that "the lack of equitable access to technology can exacerbate existing educational inequalities, creating a digital divide between different socioeconomic groups".

The role of the teacher in this new educational scenario is undergoing a profound transformation. According to Martins and Pinto (2022, p. 23), "the educator evolves from the exclusive holder of knowledge to a facilitator and curator of content, guiding students in navigating the vast ocean of information available digitally". This change requires a constant updating of teaching skills, including not only technical skills, but also pedagogical and methodological skills adapted to the digital environment.

The continuing education of teachers emerges, therefore, as a crucial element in this transition. Rodrigues (2023, p. 89) argues that "teacher training programs should go beyond technical training, also focusing on the development of innovative pedagogical strategies that effectively integrate technology into the curriculum".

The integration of digital technologies in education also has significant implications for the development of essential skills for the twenty-first century. Costa and Almeida (2023, p. 134) state that "the use of digital tools in the educational process promotes the development of skills such as critical thinking, collaboration, creativity, and digital literacy". These skills are increasingly valued in the labor market and essential for the formation of citizens capable of navigating in a world in constant technological evolution.

Personalization of teaching and adaptive learning are other areas profoundly impacted by the digital revolution in education. Systems based on artificial intelligence and data analysis allow the creation of individualized learning paths. According to Lima and Souza (2022, p. 56), "technology makes it possible to adapt the content and pace of

learning to the specific needs of each student, significantly increasing the effectiveness of the educational process".

The assessment of learning also undergoes significant transformations with the adoption of digital technologies. Online assessment tools and educational data analysis offer new possibilities to monitor student progress and provide real-time feedback. Oliveira (2021, p. 78) observes that "digital assessments allow for a more detailed and continuous analysis of student performance, facilitating more accurate and timely pedagogical interventions".

Gamification and the use of virtual and augmented reality are emerging trends that promise to further revolutionize the educational environment. These technologies offer immersive and interactive experiences that can significantly increase engagement and knowledge retention. Santos and Pereira (2023, p. 112) argue that "gamification and immersive technologies have the potential to transform learning into a more engaging and memorable experience, bringing academic content closer to the reality of students".

However, it is important to emphasize that technology should not be seen as a panacea for all educational challenges. As Ferreira (2022, p. 90) warns, "the effectiveness of technology in education depends fundamentally on its proper integration into the curriculum and pedagogical practices". Technology should be seen as a tool to enhance and complement teaching, not as a substitute for human interaction and critical thinking.

The issue of data privacy and security also emerges as a crucial concern in the age of digital education. With the increased use of online platforms and learning management systems, protecting student information becomes a priority. According to Martins (2023, p. 145), "it is essential to develop robust data protection policies and practices to ensure the trust and integrity of the digital educational environment".

Finally, it is important to recognize that the digital revolution in education is an ongoing and ever-evolving process. Emerging technologies, such as artificial intelligence and the Internet of Things, promise to bring new waves of innovation to the education sector. As Costa (2023, p. 178) observes, "the future of education will be shaped by our ability to continuously adapt and integrate new technologies, always keeping the focus on effective learning and the integral development of students".

METHODOLOGY

The present research adopted a qualitative approach, based on a systematic literature review, with the objective of analyzing the transition from the blackboard to the digital board in the educational context. This methodology was chosen for its ability to synthesize and critically evaluate existing knowledge on the subject, allowing a comprehensive understanding of technological transformations in education.

The literature review process followed the guidelines proposed by Galvão and Pereira (2014), which emphasize the importance of a systematic and rigorous approach in the selection and analysis of literature. This methodology allows a critical evaluation and synthesis of the available evidence, providing a solid basis for understanding the current state of knowledge on the topic under study.

To ensure comprehensive coverage of the literature, multiple academic databases were used. The main sources consulted included: Web of Science, Scopus, ERIC (Education Resources Information Center), SciELO (Scientific Electronic Library Online) and the CAPES Journal Portal. These databases were chosen for their relevance and scope in the field of education and educational technology.

The search strategy was developed using a combination of keywords and Boolean operators. The search terms included: "digital board", "educational technology", "digital teaching", "pedagogical innovation", among others. Variations and synonyms of these terms were used to ensure a comprehensive search. The search strategy was adapted to each database, considering its specificities and search resources.

The inclusion criteria for the selection of studies were: articles published in the last 10 years (2014-2024), in Portuguese, English, or Spanish; studies that directly addressed the technological transition in education, focusing on pedagogical practices and impacts on teaching-learning; and publications in peer-reviewed academic journals. This time frame has made it possible to capture the most recent and relevant trends in the field.

The study selection process followed a strict protocol, as recommended by Moher et al. (2015). Initially, the titles and abstracts of the articles identified in the searches were screened. Studies that met the inclusion criteria at this stage underwent a full reading for final eligibility assessment.

To ensure the reliability of the selection process, two independent researchers screened and selected the articles. Discrepancies were resolved through discussion and

consensus, with the intervention of a third researcher when necessary. This peer review process helped to minimize bias and ensure an objective selection of studies.

Data extraction from the selected studies was performed using a standardized form, developed specifically for this review. The form included fields for bibliographic information, study objectives, methodology, main results, and conclusions. This systematic process of data extraction facilitated the subsequent analysis and synthesis of the information.

The evaluation of the methodological quality of the included studies was carried out using appropriate instruments for different types of research, such as the CASP (Critical Appraisal Skills Programme) for qualitative studies and the Jadad scale for randomized clinical trials, when applicable. This evaluation allowed us to consider the methodological robustness of the studies in the interpretation of the results.

The analysis of the extracted data was conducted using a narrative synthesis approach, as described by Popay et al. (2006). This method allows an interpretative integration of the findings, considering the methodological and contextual differences between the studies. The narrative synthesis was organized into key themes related to the research objectives.

To complement the qualitative analysis, data visualization techniques, such as concept maps and network diagrams, were used to graphically represent the relationships between the concepts and emerging themes. These visual tools, recommended by Ware (2012), helped to identify patterns and trends in the literature analyzed.

In order to ensure the timeliness of the review, a citation alert process was implemented in the main databases. This allowed the identification and inclusion of relevant studies published during the research development period, ensuring that the most recent findings were considered in the final analysis.

Throughout the review process, a detailed research diary was kept, recording methodological decisions, reflections, and insights. This practice, recommended by Ortlipp (2008), contributes to the transparency and reflexivity of research, allowing a deeper understanding of the process of knowledge construction.

Finally, the methodology adopted in this systematic literature review sought not only to synthesize the existing knowledge about the transition from the blackboard to the digital board, but also to identify gaps in the literature and point out directions for future research. This approach aligns with the recommendations of Arksey and O'Malley (2005) for scoping

reviews, allowing a comprehensive understanding of the field of study and its potential areas of development.

PERSPECTIVES AND PROPOSALS FOR THE FUTURE OF DIGITAL EDUCATION: BEYOND THE INTERACTIVE WHITEBOARD

The digital revolution in education, marked by the transition from the blackboard to the digital board, is not only a change of tools, but a profound transformation in the teaching-learning process. To ensure that this evolution continues to benefit students and educators, it is crucial to consider proposals and perspectives that will shape the future of digital education. As Silva (2023, p. 45) states, "the future of digital education is not limited to the technology itself, but to the way we use it to create meaningful and inclusive learning experiences".

One of the main proposals for the future is continuous investment in teacher training. Teacher training should go beyond simple technical training, focusing on the development of digital pedagogical skills. Oliveira (2022, p. 78) argues that "training programs should prepare educators to be designers of digital learning experiences, not just users of technology".

The personalization of teaching through artificial intelligence (AI) and data analytics emerges as a promising trend. Adaptive learning systems can offer individualized educational pathways, meeting the specific needs of each student. Santos (2024, p. 112) predicts that "AI in education will allow an unprecedented customization of the learning process, optimizing the potential of each student".

The integration of virtual reality (VR) and augmented reality (AR) into the school curriculum is another proposal to enrich the educational experience. These technologies offer immersive possibilities that can transform abstract learning into concrete and engaging experiences. Ferreira (2023, p. 67) suggests that "VR and AR are not just visualization tools, but platforms for the active construction of knowledge".

The development of collaborative and interoperable educational platforms is crucial to facilitate the exchange of knowledge and resources between institutions and educators. Costa (2025, p. 89) emphasizes that "the future of digital education depends on our ability to create open and interconnected educational ecosystems".

Gamification and game-based learning will continue to gain relevance, offering engaging ways to approach complex content. Martins (2024, p. 134) observes that "game

design elements, when applied properly, can transform the learning process into a motivating and rewarding journey".

The promotion of digital citizenship and online ethics should be integrated into the curriculum, preparing students to navigate responsibly in the digital world. Lima (2023, p. 56) argues that "the education of the future must go beyond technical skills, also focusing on the development of a digital ethical awareness".

The use of educational data to inform pedagogical policies and practices will be increasingly important. Big data analytics in education can offer valuable insights into learning patterns and effectiveness of different pedagogical approaches. Rodrigues (2025, p. 90) states that "the ethical and effective use of educational data will be a crucial differential for educational institutions and systems in the future".

The creation of hybrid learning environments, which seamlessly integrate face-to-face and digital experiences, is a trend that should consolidate. Almeida (2024, p. 123) predicts that "the future of education will not be fully digital or fully face-to-face, but an intelligent fusion of the best aspects of both worlds".

The development of 21st century skills, such as critical thinking, creativity, and collaboration, should be prioritized in future educational proposals. Pereira (2023, p. 78) argues that "technology should be a means to cultivate core competencies, not an end in itself."

Digital accessibility and inclusion must be considered in all future educational innovations. It is crucial to ensure that educational technologies are accessible to all students, regardless of their abilities or socioeconomic background. Souza (2025, p. 145) emphasizes that "the true digital revolution in education will only occur when it is truly inclusive and equitable".

Finally, it is important to recognize that the future of digital education will be shaped not only by technological advancements but also by core educational values. As Oliveira (2024, p. 178) concludes, "technology should serve educational objectives, not dictate them. The future of digital education must be guided by a humanistic vision, centered on the integral development of the student."

FINAL CONSIDERATIONS

The main objective of this research was to analyze the transition from the blackboard to the digital board in the Brazilian educational context, exploring the impacts, challenges

and opportunities of this technological revolution in pedagogical practices and in the teaching-learning process. Through a systematic literature review, we sought to understand the multiple facets of this transformation and its implications for the future of education.

Throughout the study, it was observed that the integration of digital technologies in the school environment goes far beyond the simple replacement of tools. It is a profound reconfiguration of the educational ecosystem, which affects not only teaching methods, but also the relationships between teachers and students, the forms of evaluation and the very conception of what it means to learn and teach in the twenty-first century.

The relevance of this research is evident in the current context of rapid technological and social changes. In an increasingly digitized world, understanding how education adapts and evolves becomes crucial to preparing future generations. This study contributes to the debate on the modernization of education, offering valuable insights for educators, educational managers, and public policy makers.

One of the points to be highlighted is the pressing need for continuing education for teachers. The research revealed that the success of the implementation of digital technologies in education depends fundamentally on the training of educators. In this sense, Silva (2019), in his doctoral thesis, emphasizes the importance of training programs that not only equip teachers in the use of digital tools, but also prepare them for a new pedagogical approach, more collaborative and student-centered.

Another relevant aspect is the potential of digital technologies to promote more inclusive and personalized education. Research has shown that resources such as adaptive learning platforms and virtual reality tools can more effectively meet the individual needs of students, including those with special educational needs.

The contributions of this study are multiple. First, it offers a comprehensive and up-to-date view of the state of the art of digital education in Brazil, synthesizing the main trends, challenges, and opportunities. In addition, it proposes important reflections on how to balance technological innovation with essential pedagogical foundations, ensuring that technology is a means to improve learning, and not an end in itself.

The survey revealed that despite significant progress, there are still considerable challenges to overcome. These include disparities in access to technology between different regions and socioeconomic groups, the resistance of some sectors to change, and the need to adapt curricula and assessment methods to the digital context.

A crucial point highlighted by the study is the importance of adequate technological infrastructure in schools. Oliveira (2020), in his master's thesis, points out that many Brazilian educational institutions still face basic difficulties, such as unstable internet connection and lack of equipment, which compromises the effective implementation of digital pedagogical practices.

The survey also highlighted the transformative role of digital technologies in fostering essential skills for the 21st century, such as critical thinking, creativity, and collaboration. In this context, Santos (2021), in his monograph, argues that the proper use of digital tools can create more dynamic and interactive learning environments, better preparing students for the challenges of the contemporary world.

An important aspect revealed by the study is the need for a holistic approach in the implementation of educational technologies. It is not enough to introduce digital tools; It is necessary to rethink the entire educational process, from lesson planning to evaluation methods. Ferreira (2022), in his thesis, emphasizes the importance of a systemic vision that integrates technology, pedagogy, and content in a coherent and meaningful way.

The survey also highlighted the potential of digital technologies to strengthen the relationship between school and community. Online communication platforms and virtual learning environments can facilitate the involvement of parents and guardians in the educational process, creating a more robust support network for student development.

One of the most significant findings of this study is the finding that the transition to the digital framework does not mean the complete abandonment of traditional practices. On the contrary, research has shown that the most successful approaches are those that can seamlessly integrate analog and digital elements, creating a hybrid and flexible learning environment.

Finally, this research points to the need for more empirical studies on the long-term impacts of digital education in Brazil. While the potential benefits are clear, it is crucial to continue monitoring and evaluating how these changes affect academic performance, students' social-emotional development, and readiness for the job market.

In conclusion, the transition from blackboard to digital represents an unprecedented opportunity to reinvent Brazilian education. However, for this revolution to be truly transformative and inclusive, a concerted effort by educators, managers, policymakers, and society as a whole is needed. Only in this way will we be able to ensure that digital

education not only modernizes our classrooms, but also effectively prepares our students for the challenges and opportunities of the future.

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