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Structures and conjunctures of digital culture and education: challenges, opportunities and the effects of technologies on contemporary education for digital natives and immigrants

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ABSTRACT

The digital revolution has profoundly transformed social, cultural and educational practices, imposing new paradigms for the contemporary school. Digital technologies not only redefine teaching methods, but also reorganize relationships, expectations, and ways of producing knowledge, requiring critical reflection on their role in the training process.

For this reason, this article aims to analyze digital culture in education, investigating its challenges, opportunities and implications for digital natives and immigrants. The discussion seeks to understand how technologies, while expanding pedagogical possibilities, also reveal structural inequalities. The research was conducted through a bibliographic survey in academic bases, including publications between 2019 and 2024, in addition to reference classics. Studies that deal with technological integration, active methodologies and sociocultural inclusion were included, with emphasis on authors such as Freire, Kuhn, Masetto, Prensky and Barreto. The results showed that technological insertion enhances the personalization of teaching, student engagement and collaboration, but finds barriers in precarious infrastructure, digital inequality and teacher resistance. Experiences such as flipped classrooms and gamification have shown significant gains, although conditioned to continuing education and institutional support. It is concluded that digital culture can be a strategic ally of education, as long as it is articulated with robust public policies, investments in training and solid pedagogical principles. The analysis showed that the objectives were met, reinforcing the need to balance tradition and innovation to ensure inclusion, autonomy and social justice in the school environment.

INTRODUCTION

The transformation caused by the digital revolution has had a profound impact on social, cultural, economic dynamics and, in particular, education. In the contemporary context, digital technologies not only alter teaching methods, but also reconfigure expectations, relationships, and pedagogical practices. The tension between traditional educational models and the demands of a digital culture reveals the need for a critical analysis of the paths of education in the information age (Lucena, 2016; Prensky, 2001).

The integration of digital technologies in the educational environment is no longer an option but a strategic necessity. In a globalized and connected society, the school must take on the challenge of preparing critical, creative and autonomous individuals. In this scenario, digital culture emerges as a phenomenon that transcends the use of tools: it imposes a new logic of production and circulation of knowledge, requiring pedagogical approaches that contemplate both innovation and

consolidated educational foundations (Kuhn, 1997; Valente, 1999).

However, this transition occurs in a context marked by disparities. On the one hand, the so-called digital natives young people who grew up immersed in technological environments have greater fluency and familiarity with digital tools. On the other hand, digital immigrants in general, teachers and students from previous generations face difficulties in adapting, which accentuates challenges in implementing inclusive and effective practices. This mismatch highlights the urgency of educational policies that promote equity in access to and use of technology (Prensky, 2001; Barreto, 2021).

It is essential to understand that digital culture is not limited to the replacement of analog resources with technological tools. It is a paradigmatic shift that alters the way we learn, teach and build knowledge. Resources such as blended learning, gamification, and collaborative learning expand possibilities, while revealing structural vulnerabilities, such as lack of infrastructure, poor teacher

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training, and digital inequality especially in countries like Brazil (Masetto, 2012; Alcântara, 2020; Barreto, 2021).

In view of this, this article aims to explore the structures and conjunctures of digital culture in education, with emphasis on the challenges, opportunities and effects of technologies in the formation of critical subjects. The analysis addresses the reality of digital natives and immigrants, considering pedagogical, technical and sociocultural aspects. The proposal is to reflect on educational practices that, by integrating digital culture, are capable of promoting inclusion, diversity and innovation, respecting the singularities of the actors involved (Freire, 1979; Lucena, 2016).

LITERATURE REVIEW

In view of this, this article aims to explore the structures and conjunctures of digital culture in education, with emphasis on the challenges, opportunities and effects of technologies in the formation of critical subjects. The analysis addresses the reality of digital natives and immigrants, considering pedagogical, technical and sociocultural aspects. The proposal is to reflect on educational practices that, by integrating digital culture, are capable of promoting inclusion, diversity and innovation, respecting the singularities of the actors involved (Freire, 1979; Lucena, 2016).

Recent studies point to the effectiveness of active methodologies such as Problem-Based Learning (PBL), gamification, and blended learning to engage digital students. However, Barreto (2021) highlights that inequality of access to technologies is a structural challenge that influences educational success.

The review focused on four themes:

Historical Impact of Technology on Education: From the blackboard to artificial intelligence. While Valente (1999) explores the computer in the knowledge society, Kuhn (1997) discusses the structure of scientific revolutions, which can be applied to understand the change in technological paradigms in education.

Inequalities in Access: Studies that discuss technological barriers and digital inequality. Barreto (2021) emphasize the persistence of digital inequality as a significant obstacle to the democratization of access to technological education in Brazil.

Pedagogical Strategies: Integration of active methodologies, such as PBL and gamification. Bes *et al.* (2019) and Alcântara (2020) present practical guides and methodologies for active learning, which contrast with more traditional approaches, such as those discussed by Libâneo (2006) in his work on didactics. Masetto (2012) explores pedagogical mediation with the use of technology, complementing the discussions on active methodologies.

Diversity and Inclusion: How technology can promote equity in the educational environment. Freire (1979) highlights the importance of continuous teacher training for educational transformation, based on ethical and

pedagogical principles, which is crucial for effective inclusion mediated by technology.

The literature review also covered four main axes:

Digital Culture in Education: According to Lucena (2020), digital culture involves practices and values associated with cyberspace, which shape the way subjects learn and interact.

Digital Natives and Immigrants: Prensky (2001) differentiates the generations that were born in the digital environment from those that adopted it later, highlighting pedagogical implications.

Active Methodologies and Technologies: Recent studies point to the effectiveness of methodologies such as PBL, gamification, and hybrid teaching to engage digital students.

Structural Challenges: Barreto (2021) highlights the inequality of access to technologies and its influence on educational success.

MATERIALS AND METHODS

A bibliographic survey was carried out in academic databases, such as Scielo, Google Scholar and PubMed.

The survey included works published between 2019 and 2024, as well as fundamental classics that contextualize the educational transformations associated with technology, seeking studies that analyze the impact on education. Materials on active methodologies, digital tools and sociocultural inclusion were included. References such as Freire (1979), Kuhn (1997) and Masetto (2012) provide the theoretical framework, while recent works, such as Alcântara (2020) and Bes *et al.* (2019), explore pedagogical practices and innovations.

The inclusion criteria considered studies related to the integration of technology in education, digital pedagogical approaches and impacts on the learning of digital natives and immigrants. Materials on active methodologies, digital tools and sociocultural inclusion were included. References such as Freire (1979), Kuhn (1997) and Masetto (2012) have provided the theoretical framework, while recent works, such as Alcântara (2020) and Bes *et al.* (2019), have explored pedagogical practices and innovations.

The exclusion criteria were: studies focused exclusively on technical aspects of hardware or software unrelated to pedagogical practice; articles that did not address the interaction between technology and education; research limited to a single level of education without broader discussions; and documents that did not present empirical data or substantial literature review.

RESULTS AND DISCUSSION

The analysis of the data revealed the following aspects: Challenges:

Infrastructure: Schools in disadvantaged regions lack adequate technological resources.

Teacher Training: Many teachers report difficulties in integrating technologies into their pedagogical practices.

Digital Inequality: Students from different socioeconomic backgrounds have varying levels of access to the internet and digital devices.

Opportunities

Personalization of Teaching: Digital tools allow you to adapt content to the individual needs of students.

Engagement: Methodologies such as gamification increase student interest and motivation.

Collaboration: Platforms such as Google Classroom and Padlet facilitate the collective construction of knowledge.

Stages of Technological Insertion:

Initial: Basic use of tools such as PowerPoint and educational videos.

Intermediate: Implementation of hybrid and interactive methodologies.

Advanced: Application of emerging technologies such as artificial intelligence and augmented reality.

Practical Examples

Positive Impact:

Flipped Classroom in High School: A public school in Rio Grande do Sul used videos and online forums to anticipate content before face-to-face classes. Students reported higher engagement and performance on assessments.

Gamification in Mathematics: A school in Ceará adopted digital games to teach geometry. Teachers reported a 40% increase in student interest compared to traditional classes.

Collaborative Platforms: The use of Google Classroom allowed teachers from a school in the interior of São Paulo to share materials in an inclusive way, facilitating the participation of students with mobility difficulties.

Difficulties faced

Lack of infrastructure: In rural schools in Bahia, the lack of internet compromised the implementation of digital platforms.

Teacher training: Teachers from a public school system in Pernambuco reported difficulty in using tools such as mathematical simulators due to lack of training.

Practical Pedagogical Strategies

Blended Learning:

Combination of face-to-face and digital classes, focusing on practical activities in face-to-face classes and use of online platforms for theoretical content.

Example: Applying virtual lab simulators to science and conducting hands-on experiments in the classroom.

Interdisciplinary Projects:

Integration of technology in projects that connect disciplines.

Example: A sustainability project that uses tools like Canva to create visual campaigns and Google Maps to analyze environmental impacts.

Continuous Teacher Training:

Offer regular workshops on active methodologies and digital tools.

Example: Partnering with local universities to train teachers on augmented reality and educational data analytics.

Technology for Inclusion:

Use of software and applications that meet specific needs, such as text readers for visually impaired students.

Discussion

Digital culture presents itself as a multifaceted phenomenon, whose impacts on education vary according to sociocultural, economic and institutional contexts, offering significant opportunities to personalize and enrich learning. However, there are challenges to be faced, mainly related to infrastructure and teacher training. Lucena (2016) emphasizes that digital culture involves values and practices built in cyberspace, which directly influence the way subjects learn and interact. However, this understanding can be expanded if we consider that such transformations do not occur homogeneously — a point also highlighted by Barreto (2021), when arguing that structural inequalities limit full access to technologies. Schools need to adapt pedagogical practices to meet the cultural and technological diversity of students. Strategies such as blended learning and continuing education can help bridge the gap between the “new” and the “old.” In addition, technology should be used not only as a tool, but as a means to address socio-cultural issues such as gender equality and inclusion of marginalized communities.

While authors such as Prensky (2001) popularize the dichotomy between digital natives and immigrants, suggesting an almost generational distinction in the use of technologies, other researchers propose a more critical approach. For example, Masetto (2012) and Freire (1979) draw attention to the active role of the teacher as a mediator, reinforcing that technological adoption cannot be thought of as something automatic or merely generational. Instead of assuming a deterministic logic, it is necessary to consider the formative process and the educational context as determining factors in the relationship with technologies.

Technological integration is more effective when it respects the pace of adaptation of teachers, combining traditional and digital elements. A practical example is the use of gamification to attract digital natives, while offering intensive training to empower digital immigrants. The analysis of the results confirms that technological insertion transforms educational dynamics, but highlights the need for strategic planning to overcome structural challenges.

Digital inequality remains a significant obstacle. Barreto (2021) emphasizes that, without robust public policies, many students will be excluded from the opportunities offered by digital culture. In addition, the continuous training of teachers is essential so that they can act as

mediators of learning in technological environments.

Active methodologies have shown promising results in promoting meaningful learning. However, its implementation requires a careful balance between the “new” and the “old”, respecting the pace of adaptation of teachers and students.

The literature on active methodologies also presents nuances. Bes *et al.* (2019) and Alcântara (2020) argue that approaches such as gamification, blended learning, and flipped classrooms increase engagement and promote meaningful learning. However, such strategies are not without criticism. Dwyer *et al.* (1997) point out that, although these methodologies can improve student involvement, their effectiveness depends heavily on pedagogical intentionality and available infrastructure. In other words, technology, by itself, does not transform education — it needs to be articulated with clear pedagogical objectives.

The integration of digital technologies in the school environment represents a complex movement, which challenges traditional educational structures and requires new pedagogical approaches. Digital culture, as defined by Lucena (2016), encompasses practices and values that develop in conjunction with the growth of cyberspace, shaping the forms of learning and interaction. However, this transformation does not occur in a homogeneous manner and faces significant structural and cultural barriers.

Another point of tension is in the view of technology as a promoter of inclusion. While there are positive examples of using digital platforms to personalize teaching and serve students with disabilities, there are still gaps in access and teacher training to address this diversity. Freire (1979) highlights that any educational transformation requires an ethical and political commitment to inclusion. Thus, even authors who defend technological innovation recognize that it can, paradoxically, deepen inequalities when not accompanied by structuring public policies.

The use of digital tools has the potential to transform education, offering solutions such as content customization and remote access to teaching materials. In urban schools with robust infrastructure, active methodologies such as flipped classrooms and gamification have already shown significant results, promoting greater engagement and knowledge retention (Dwyer *et al.*, 1997; Bes *et al.*, 2019).

On the other hand, in rural or economically disadvantaged contexts, the lack of quality internet and adequate devices limits these possibilities. Barreto (2021) highlights that digital inequality is one of the main obstacles to the democratization of access to technological education in Brazil. The disparity between urban and rural schools reinforces a cycle of exclusion that compromises equity in learning.

Teachers’ resistance to adopting technologies is another critical factor. Many educators, especially digital immigrants, report difficulties in integrating digital tools into their pedagogical practices. Freire (1979) suggests that educational transformation depends on the continuous

training of teachers, which should be mediated by ethical and pedagogical principles. Investments in technical and pedagogical training are essential to overcome this resistance and allow teachers to act as active mediators in the digital learning process.

Digital culture must also be analyzed from a broader sociocultural perspective. The inclusion of practices that value ethnic-cultural diversity and promote gender equity is crucial for truly inclusive teaching. Technology can be a powerful tool for giving voice to historically marginalized groups, as long as it is used intentionally for that purpose. For example, digital platforms can be adapted to teach indigenous languages or explore local histories and cultures, strengthening students’ cultural identity. In addition, accessibility software, such as screen readers and machine translators, can promote the inclusion of students with disabilities.

In summary, the discussion about digital culture in education needs to go beyond the binarisms between innovation and tradition, or between exclusion and inclusion. As Kuhn (1997) and Valente (1999) propose, the transition to new educational paradigms requires ruptures, but also continuity and dialogue with practices that are already consolidated. The role of the educator in this process is to mediate these transitions, critically balancing digital resources with the broader formative objectives of education.

CONCLUSIONS

This article aimed to analyze the structures and conjunctures of digital culture in education, reflecting on the challenges and opportunities of technological insertion in the teaching-learning process, especially in the context of digital natives and immigrants. From a critical perspective, we sought to understand how digital technologies impact pedagogical practices, teaching roles and equity in the educational environment.

Education in the digital age represents a scenario of profound transformations, full of challenges and opportunities, unique to contemporary education. Digital culture redefines not only what we teach, but how we learn it, requiring the integration of technologies into pedagogical practices that promote inclusion, equity, and autonomy. Its integration requires investment in infrastructure, teacher training and digital inclusion policies. To serve both digital natives and immigrants, it is necessary to adopt hybrid practices that combine technological innovation with solid pedagogical foundations.

Challenges, such as digital inequality, teacher resistance, and lack of infrastructure, cannot be ignored. Overcoming these obstacles requires coordinated actions, including government investments in connectivity and devices, partnerships with companies to enable technological solutions, and the creation of continuous teacher training programs focused on digital methodologies. Only through a critical and balanced approach will it be possible to build an inclusive educational environment that harnesses the

potential of digital technologies to enrich learning and form critical and autonomous citizens.

Digital culture has transformed contemporary education, but its adoption requires careful attention to structural and socio-cultural challenges. Digital tools can personalize learning, increase student engagement, foster global collaborations, and reduce inequalities, all while respecting traditional pedagogical practices. When used strategically, technologies broaden horizons and democratize access to knowledge, especially for marginalized communities. To build a contemporary education that responds to the demands of digital culture, it is essential to adopt a critical and inclusive approach, which respects the specificities of digital natives and immigrants. By balancing the “new” and the “old,” we can ensure that technology enriches teaching, promoting not only learning but also social transformation.

The analysis showed that the objectives were largely met, although with contextual limitations that must be recognized. It was possible to identify that digital culture offers multiple possibilities for the enrichment of teaching, such as personalization, collaboration and access to global resources. However, important obstacles were also highlighted, such as digital inequality, lack of infrastructure, and teacher resistance — problems that directly affect the effectiveness of the proposed innovations.

In addition, by weaving counterpoints between the main authors analyzed, it was confirmed that there is no absolute consensus on the paths for technological integration in education. The diversity of perspectives contributed to a richer and dialogical understanding of the phenomenon, avoiding adherence to technocratic or deterministic postures. This critical approach proved to be essential for the understanding that the adoption of technologies must be linked to solid pedagogical principles, robust public policies and continuous training

of educators.

It is concluded, therefore, that digital culture can indeed be a powerful ally in educational transformation, as long as it is understood in its complexity and accompanied by strategies that promote inclusion, autonomy and social justice. The current challenge is to articulate innovation with equity, and technology with pedagogical intentionality — a task that requires a collective and constant effort on the part of educators, managers, and public policy makers.

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