

DIGITAL TECHNOLOGIES IN TEACHING AND LEARNING: IMPACTS ON PEDAGOGICAL PRACTICES IN MOZAMBIQUE

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Abstract

The use of digital technologies in the teaching and learning process has become increasingly common in many parts of the world, including Mozambique. The Mozambican educational context faces significant challenges, such as a shortage of teaching resources and a need for innovative pedagogical methodologies. In this context, digital technologies emerge as promising tools to enrich the learning environment and facilitate access to information. The overall objective of this study is to analyze the impacts of integrating digital technologies into pedagogical practices in Mozambique, seeking to understand how they influence both teaching and learning. The research adopts a qualitative methodology, using various physical and digital/electronic repositories, documentary reports, and direct observations in classrooms that incorporate digital technologies. Data analysis was performed through content analysis, allowing for the identification of patterns and perceptions about the effectiveness of these tools. The results provide an in-depth understanding of the benefits and challenges associated with the use of digital technologies in education, as well as recommendations for their effective implementation in Mozambican classrooms. It is hoped that the study will contribute to the development of more integrated educational policies, promoting more dynamic teaching that is adapted to the needs of students in an increasingly digital world. Thus, it is hoped that a path will be created for the continuous improvement of pedagogical practices in Mozambique, with benefits for educators and students.

Keywords: Digital technologies in education; Teaching and learning in Mozambique; Innovative pedagogical practices; Challenges and benefits of educational technologies.

TECNOLOGIAS DIGITAIS NO ENSINO E NA APRENDIZAGEM: IMPACTOS NAS PRÁTICAS PEDAGÓGICAS EM MOÇAMBIQUE

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Resumo

O uso de tecnologias digitais no processo de ensino e aprendizagem tornou-se cada vez mais comum em muitas partes do mundo, incluindo Moçambique. O contexto educativo moçambicano enfrenta desafios significativos, como a escassez de recursos didáticos e a necessidade de metodologias pedagógicas inovadoras. Nesse cenário, as tecnologias digitais surgem como ferramentas promissoras para enriquecer o ambiente de aprendizagem e facilitar o acesso à informação. O objectivo geral deste estudo é analisar os impactos da integração das tecnologias digitais nas práticas pedagógicas em Moçambique, buscando compreender como elas influenciam tanto o ensino quanto a aprendizagem. A pesquisa adopta uma metodologia qualitativa, utilizando diversos repositórios físicos e digitais/electrónicos, relatórios documentais e observações directas em salas de aula que integram tecnologias digitais. A análise dos dados foi realizada por meio de análise de conteúdo, o que permitiu a identificação de padrões e percepções sobre a eficácia dessas ferramentas. Os resultados envolvem uma compreensão aprofundada dos benefícios e desafios relacionados ao uso de tecnologias digitais na educação, bem como sugestões para sua implementação efectiva em salas de aula moçambicanas. Espera-se que o estudo contribua para o desenvolvimento de políticas educacionais mais integradas, promovendo um ensino mais dinâmico e adaptado às necessidades dos alunos em um mundo cada vez mais digital. Assim, espera-se que se crie um caminho para a melhoria contínua das práticas pedagógicas em Moçambique, com benefícios para educadores e alunos.

Palavras-chave: Tecnologias digitais na educação; Ensino e aprendizagem em Moçambique; Práticas pedagógicas inovadoras; Desafios e benefícios das tecnologias educativas.

TECNOLOGÍAS DIGITALES EN LA ENSEÑANZA Y EL APRENDIZAJE: IMPACTOS EN LAS PRÁCTICAS PEDAGÓGICAS EN MOZAMBIQUE

Resumen

El uso de tecnologías digitales en el proceso de enseñanza y aprendizaje se ha vuelto cada vez más común en muchas partes del mundo, incluyendo Mozambique. El contexto educativo mozambiqueño enfrenta desafíos significativos, como la escasez de recursos didáticos y la necesidad de metodologías pedagógicas innovadoras. En este escenario, las tecnologías digitales emergen como herramientas prometedoras para enriquecer el entorno de aprendizaje y facilitar el acceso a la información. El objetivo general de este estudio es analizar los impactos de la integración de las tecnologías digitales en las prácticas pedagógicas en Mozambique, buscando comprender cómo influyen tanto en la enseñanza como en el aprendizaje. La investigación adopta una metodología cualitativa, utilizando diversos repositorios físicos y digitales/electrónicos, informes documentales y observaciones directas en aulas que incorporan tecnologías digitales. El análisis de

datos se realizó mediante análisis de contenido, lo que permitió identificar patrones y percepciones sobre la efectividad de estas herramientas. Los resultados implican una comprensión profunda de los beneficios y desafíos relacionados con el uso de las tecnologías digitales en la educación, así como sugerencias para su implementación efectiva en las aulas mozambiqueñas. Se espera que el estudio contribuya al desarrollo de políticas educativas más integradas, promoviendo una enseñanza más dinámica y adaptada a las necesidades del alumnado en un mundo cada vez más digital. De este modo, se espera sentar las bases para la mejora continua de las prácticas pedagógicas en Mozambique, con beneficios para educadores y estudiantes.

Palabras clave: Tecnologías digitales en la educación; Enseñanza y aprendizaje en Mozambique; Prácticas pedagógicas innovadoras; Desafíos y beneficios de las tecnologías educativas.

1. Introduction

In recent years, the incorporation of digital technologies into the educational context has promoted profound changes in teaching and learning practices. The increase in the use of digital tools allows for the development of new pedagogical approaches aimed at meeting the diverse needs and abilities of students, in addition to expanding access to knowledge.

In Mozambique, the use of digital technologies in the educational process has advanced, although it faces several challenges. Taking these advances and challenges into account, this research aims to answer the following initial question: How does the integration of digital technologies into the teaching and learning process impact pedagogical practices in Mozambique? It aims to analyze the impact of the integration of digital technologies into the teaching and learning process in Mozambique on pedagogical practices. To this end, we present the following specific objectives: to identify the technologies that facilitate and make the teaching-learning process more flexible, adding value to it, and to evaluate the application of digital technologies in educational institutions in Mozambique.

The research is relevant, first of all, because we are teachers and school managers and, secondly, because we are students of the Educational Innovation course, an area of knowledge that is interested in the study and deepening of techniques, methods, and methodologies conducive to an education aligned with contemporary challenges and enriching the existing literary source, allowing its consultation by all those interested in the subject.

Through this research, based on a literature review, we hope to contribute to a deeper understanding of the challenges and potential of using Digital Technologies in the educational process, providing the theoretical and practical foundation that can support educators, administrators, and educational

policymakers in fully integrating these technologies into their curricula and teaching practices.

2. Digital technologies in the teaching and learning process

2.1. Definition of key concepts

Generally, research starts from certain assumptions or theories formulated around key content by previous researchers or theorists (Triviños, 2003). This task avoids unsubstantiated triumphalism, as an early and in-depth reading of works or documents related to the subject helps not only to gain solid knowledge about the research topic but also to lend credibility to the study's results. This study begins with the conceptual framework of the key terms: Pedagogical Practices, Teaching-Learning Process, and Digital Technologies.

2.1.1. Teaching Practices

The term “pedagogical practices” leads us to reflect on all the actions and strategies used by teachers to promote effective teaching and learning. In this sense, they go beyond the simple transmission of content, as they seek to actively involve students in the educational process. According Libâneo (2013), talking about pedagogical practices means talking about knowledge built on the relationship between theory and practice, in which the teacher is a simple mediator of knowledge and a means to quality education. According to Marra and Almeida (2016), student activity in the teaching-learning process contributes to the construction of solid knowledge, developing critical and reflective skills that are essential for the formation and development of citizenship.

Another important aspect of teaching practices is inclusion. Inclusive education seeks to address the diversity present in classrooms, ensuring that all students, regardless of their particularities, have access to quality education. Pinto (2020) highlights that pedagogical practices that prioritize inclusion have the potential to promote respect for differences and value the uniqueness of each student, creating a more equitable learning environment. In turn, pedagogical practices play a fundamental role in promoting teaching that values interaction, inclusion, and the collaborative construction of knowledge. In this context, teachers play an important role in providing meaningful, transformative experiences for students.

2.1.2. Teaching-Learning Process

The Teaching-Learning Process (TLP) is a central theme in education that seeks improvements not only in the transmission of knowledge but also in the construction and reconstruction of knowledge in an interactive environment. Classical pedagogues such as Freire and Piaget highlight the importance of

dialogue, interaction, and active understanding of knowledge, where the student is an active participant and builder of their learning, rather than just a passive receiver of information. Furthermore, the process should be seen as an integrated relationship between teaching and learning that complements and depends on each other.

Currently, technology has played a fundamental role in transforming education, offering new forms of interaction and enabling learning outside traditional classrooms. Resources such as mobile technologies promote personalized learning, encouraging student autonomy and engagement. However, it is important to consider the individualities, motivations, and particularities of each student, as advocated by Vygotsky (1984), who emphasizes the role of sociocultural context in the construction of knowledge through social interaction and mediation.

Finally, assessment in PEA should be viewed as continuous and formative and as a process that helps students to understand students' progress and adapt teaching to their needs. It should not be limited to assigning grades but should provide feedback that promotes progress and the achievement of learning objectives. Thus, PEA is a complex and multifaceted process that involves interaction, sociocultural environment, use of technology, and continuous assessment, all of which are essential elements for more meaningful, lasting, and effective knowledge construction.

2.1.3. Digital Technologies in Education

Digital technologies represent components of technological infrastructure that facilitate connections between people and environments through devices, software, and digital media, expanding the possibilities for communication and interaction. (Dutra; Mueller, 2024). In the context of the Teaching-Learning Process (TLP), these technologies play a role in facilitating and making interaction between teachers and students more flexible, allowing for a combination of face-to-face classes with distance learning modalities, both synchronous and asynchronous. Governments must keep pace with this "technological revolution" to ensure that the entire population can participate in this transformation and avoid being left behind by globalization (Maia; Costa; Costa, 2022).

Digital technologies include hardware, such as computers and smartphones, as well as the internet and software, which are reshaping the way teachers and students interact in the educational process. These tools are essential in Virtual Learning Environments (VLEs), where they enable the implementation of new teaching methods, as evidenced during the COVID-19 pandemic, when many institutions adopted VLEs to continue remote teaching. The preference for online learning is growing due to its advantages in terms of flexibility and accessibility, allowing classes to be held synchronously or asynchronously, breaking down barriers related to travel and physical limitations (Severo, 2008; Bellodi; Silva, 2020).

Finally, digital technologies also play a crucial role in promoting inclusive education by offering specific resources, such as alternative communication software, screen readers, and access devices, which ensure equal opportunities for students with disabilities. Lima, Ramalho, and Ramalho (2023) emphasize that these tools enable more equitable participation, contributing to a more inclusive and democratic education, reinforcing the importance of their integration into pedagogical practices for the development of a more just and accessible society.

2.2. Public Policies and Programs for Integrating ICT in Education in Mozambique

The incorporation of Information and Communication Technologies (ICT) in education has been globally recognized as a fundamental strategy to promote digital inclusion, improve teaching quality, and expand learning opportunities. In developing countries like Mozambique, the adoption of these technologies is linked to public policies aimed at overcoming structural, social, and economic challenges, as well as establishing partnerships with international actors and NGOs that contribute to the development of digital school environments. This section aims to discuss the main policies, programs, and partnerships guiding the integration of ICT in Mozambican education, contextualizing their advances, challenges, and future perspectives.

Since 2013, Mozambique has adopted a strategic approach to digital inclusion, reflected in official documents such as the ICT Action Plan for Education. The goal is to promote the effective use of technologies in classrooms and strengthen the institutional capacity of the education system. The Mozambican government, aligned with recommendations from the International Telecommunication Union (ITU) and the country's Digital Inclusion Policy, seeks to use ICTs as tools for social and educational transformation (Mozambique Ministry of Education and Human Development [MINEDH], 2013).

One notable government initiative is the National Action Plan for ICT in Education, which includes actions on infrastructure, teacher training, digital content development, and expanding access to technologies in rural areas. The government also promotes continuous teacher training programs focused on pedagogical integration of ICTs, aiming to foster innovative and participative practices in the classroom (MINEDH, 2019).

However, the implementation of these policies faces obstacles such as inadequate infrastructure, limited technological training for teachers, and disparities in access to ICTs between urban and rural areas (KACHINGWE et al., 2020). These challenges highlight the need for more organized and sustainable inclusion strategies.

2.2.1 International Partnerships and the Role of NGOs in Promoting ICT in Mozambique

The development of educational technologies in Mozambique has been significantly boosted by partnerships with international organizations such as UNESCO, the World Bank, the European Union, and the Mozambique Digital Foundation. These institutions provide financial resources, technical expertise, and support in formulating integrated policies (OECD, 2019).

For example, UNESCO has promoted teacher training programs and digital content development across various regions of the country, as well as facilitated the implementation of virtual learning environments (UNESCO, 2018). The World Bank has financed projects aimed at establishing public access centers for ICTs, strengthening access to technologies in rural communities.

NGOs play a crucial role in consolidating these efforts by implementing digital inclusion projects, training teachers, installing computer laboratories, and raising community awareness about ICT use. Notable organizations such as the Mozilla Foundation promote youth digital training projects and digital literacy initiatives targeted at school communities (Mozilla Foundation, 2020).

Additionally, public-private partnerships involving technology and telecommunications companies have been vital in expanding internet access and equipment in schools, especially in rural regions. This multi-sectoral approach underscores the importance of coordinated efforts for the success of digital inclusion policies in the Mozambican context.

Despite progress, significant challenges remain inadequate infrastructure, low levels of teacher training, unequal access between urban and rural areas, and financial sustainability limitations are among the main difficulties faced in implementing these initiatives. As Kachingwe et al. (2020) highlight, overcoming these barriers requires a coordinated strategy involving effective governance, continuous investment, and social inclusion that prioritizes vulnerable populations.

Looking forward, we can expect an expansion of international partnerships and NGO support to develop relevant and contextualized digital content, along with strengthened capacity-building for teachers and school leaders. Moreover, the integration of mobile technologies such as smartphones and affordable tablets could help broaden the reach and impact of digital inclusion initiatives.

In this context, public policies and ICT integration programs in Mozambique represent an important step toward a more inclusive, innovative education that is aligned with the demands of the 21st century. However, their success depends on ongoing implementation, strengthening international partnerships, and mobilizing various stakeholders, especially in overcoming regional inequalities. To consolidate an effective transformation, government actions must be aligned with local realities, aiming for sustainable and equitable digital inclusion.

2.3 Contributions of Digital Technology Integration

One of the fundamental advantages of digital technologies in education is the ease of access to a wide variety of information and educational resources. The internet, for example, offers a huge amount of material, ranging from academic articles to free online courses (Open Educational Resources). According to UNESCO (2020), the use of these technologies can help reduce barriers to access to knowledge, creating opportunities for lifelong learning for all.

This helps students obtain up-to-date and diverse information, contributing to a more complete and critical education. Examples of this are the various platforms that enable the democratization of learning, allowing anyone with an internet connection to access content that was previously restricted to educational institutions. Another significant impact of digital technologies is the possibility of personalizing learning. In fact, educational tools allow teachers to tailor the teaching process to the needs of each student. Hattie (2020) conducted a study and concluded that personalization in teaching significantly increases student engagement and motivation.

Cumulatively, digital technologies enable teachers to monitor student progress as it happens and adjust teaching strategies/pedagogical practices, providing more efficient learning. This diversification of methodologies has been one of the effective strategies for increasing student motivation and engagement, as it transforms learning into a more interactive and playful experience.

Digital technologies also promote innovative forms of collaboration and social learning. Online communication tools, such as virtual forums, social networks, and videoconferencing software, facilitate the exchange of ideas and experiences between students, teachers, and experts, even when they are in different geographical locations.

Riel and Polin (2004) highlight the importance of conducting regular and methodical assessments of the impact of digital technology to recognize its advantages and difficulties, as well as to verify how effective they are in facilitating the learning process of students.

2.4. Challenges of Integrating Digital Technologies

Despite the numerous benefits brought by digital technologies, their integration into education also presents significant challenges. One of the main problems is the inequality in access to technologies, known as the "digital divide". According to Matias, Castro, and Gonçalves (2024), "approximately 3.7 billion people still do not have access to the internet, which creates a challenge for education on a global scale".

The use of digital technologies in Mozambique faces considerable obstacles. According to the United Nations (2021), these challenges include differences in

access to the internet and insufficient training for teachers, which compromise the effectiveness of using these technologies in the educational context.

In the words of Nhantumbo (2020), it is necessary that when adopting technologies in the educational process in Mozambique, the local context is considered, promoting inclusion and understanding among students.

Digital technologies are leaving a lasting mark on education in Mozambique. Their impact is felt in increasing access to knowledge, personalizing teaching, and creating innovative and inclusive educational opportunities. However, for this transformation to be successful, it is essential to overcome infrastructure challenges and provide adequate training for teachers to balance the use of these technologies with traditional teaching methods. By adopting technologies consciously and strategically, Mozambique has the potential to develop a more inclusive and dynamic education system, empowering students to face and keep up with today's challenges (Maia, Costa; Costa, 2022).

Furthermore, we understand that information overload can make it difficult to select content that is relevant to student learning. The ability to navigate and discern useful information in the digital environment has become essential, but it is not a skill that all students possess. Training faculty to work with these new technologies is also a crucial aspect that is often neglected, as supported by Matias, Castro e Gonçalves (2024, p. 48), when stating that "although in Mozambique there is already some investment in computer equipment, it is important that there is a greater focus on teacher training and education so that they can acquire the necessary skills to use digital technologies in teaching effectively".

For the effective materialization and better use of the opportunities that digital technologies present, the teacher, more than being a simple mediator and facilitator of the teaching-learning process, is challenged to have solid knowledge of the existence of these tools and their functionalities so that he can integrate them into his pedagogical practices, to provide students with significant and transformative experiences leading to the development of skills necessary for the formation of an active citizen (critical and participatory) of the environment that surrounds him.

One of the challenges that is no less important for Mozambique in general is linked to the lack of infrastructure and the lack of appropriate digital technological equipment to meet the much discussed and desired inclusive education. In this country, there are only 3 Inclusive Education Resource Centers (CREI), aimed at children with disabilities, distributed across the 3 regions: North, Center, and South. The one in the North, located in Nampula, welcomes children from this city/province and those from the provinces of Cabo Delgado and Niassa. The one in the Center, located in the province of Tete, welcomes children from this province and those from Zambézia, Sofala, and Manica. And finally, the one in the South, located in the province of Gaza, district of Macia, which welcomes children from Gaza, Inhambane, Maputo city, and Maputo province.

These centers, in addition to being few for the vast country of around 32.97 million inhabitants, of which 7% have disabilities according to the 2022 Census, are not properly equipped with the necessary digital technologies, such as those mentioned above by Lima, Ramalho and Ramalho (2023), important to respond to the specificities of each child with disabilities, constituting a limitation for their application in pedagogical practices by their teachers.

3. Materials and Methods

Framed within the interpretative paradigm, typical of social science research, this research is qualitative because, according to Triviños (2003), it seeks to understand the meaning of facts, aiming to perceive the phenomenon within its context.

The interpretative paradigm has been gaining prominence in scientific research, especially in the social and human sciences, due to its particularity of focusing on understanding the meanings and interpretations that individuals attribute to their experiences. According to Mapalala (2020), the interpretative paradigm aims to understand social experience from the point of view of the participants themselves, offering a deeper and more contextualized understanding of the phenomenon analyzed. On the other hand, it seeks to capture the appearance of the phenomenon, its essences, explaining its origins, relationships, and changes, and intuiting the consequences. Denzin and Lincoln (2011) state that this approach works with the analysis and interpretation of social phenomena, describing their complexity, analyzing the interaction of variables to understand the particularities of human behavior.

This paradigm was chosen for this research because of its ability to explore the complexity of human experience and to allow for a deeper analysis of cultural and social nuances. Furthermore, the interpretative paradigm values the subjectivity and voice of participants. This favors not only the inclusion of diverse perspectives but also the construction of collaborative knowledge.

In terms of nature, it is basic research, since its scope is to expand human knowledge about a specific subject, in this context, the integration of digital technologies into pedagogical practices (Oliveira; Souza; Costa, 2016) and Gil (2008)

Basic, or fundamental, research is essential for the advancement of scientific knowledge, since it seeks to understand natural phenomena without an immediate application in mind. This approach focuses on fundamental questions, exploring theories and principles that can lead to innovative discoveries. According to Trevisol Neto (2017), basic research plays a crucial role in "expanding scientific knowledge, forming the basis for future practical applications" (p. 39). Many technological and medical innovations arise from original questions investigated in basic research, highlighting their importance for the progress of science (Trevisol Neto, 2017).

Likewise, basic research provides a deep understanding that can challenge and replace existing theories, fostering an environment of inquiry and discovery. "The findings of basic research are often unexpected and have the potential to shift paradigms" (Harlow, 2005, p. 51). This type of research not only contributes to academic knowledge but also inspires new approaches in applied fields, reflecting the interconnection between theory and practice in science.

In terms of objectives, this is an exploratory study, in that the research topic can be analyzed from different aspects, providing an overview of it.

In fact, exploratory research is an essential approach in scientific research, especially in the early stages of a study, when researchers seek to better understand a phenomenon or problem that is still little known. Exploratory research aims to identify relevant variables, formulate hypotheses and establish directions for future studies (Aiken, 1996). According to Robson (2002), exploratory research "helps researchers develop an initial understanding of the topic, allowing for data collection that can be both qualitative and quantitative." This phase is critical because it provides a basis for formulating more specific questions and more in-depth research.

In addition, exploratory research can reveal new dimensions and concepts that have not been previously considered, facilitating theoretical and practical innovations. According to Stebbins (2021), "this method is particularly useful in areas where literature is scarce or where existing theories need to be revisited" (p. 12). By adopting a flexible and open-ended approach, exploratory research allows scientists to practice more dynamic and adaptive inquiry, responding to emerging knowledge needs and better understanding the complexity of the phenomena they study.

Regarding the bibliographic survey, publications from 2014 to 2024 were selected to ensure the information was up to date, totaling 39 sources relevant to the objectives of this study. The search was conducted in recognized databases such as Scopus, Web of Science, SciELO, and Google Scholar, using combinations of keywords such as "digital technologies," "pedagogical practices," "technological integration in teaching," and "digital education." The results were filtered based on language (prioritizing publications in Portuguese), nature of the study (empirical or theoretical), and thematic relevance. Relevant information was extracted considering the methodological quality of each study and then organized into categories or themes to identify patterns, differences, and gaps in literature. Furthermore, the distribution of the publications by year, the research methods employed, and the main findings of each work were analyzed to provide a critical and contextualized view of the field's evolution. This qualitative analysis supported the discussion of results in relation to the research questions and objectives, as well as the assessment of the study's contributions, limitations, and possibilities for future research.

4. Results and Discussion

Overall, the study revealed that digital technologies provide access to a wide range of educational resources, including interactive content and online courses. This has contributed to the democratization of education and increased access to information. It was observed that the use of digital platforms, such as educational apps and games, has contributed to greater student engagement in class. In addition, resources such as videos, quizzes, and discussion forums encourage student participation.

The research also revealed that the integration of digital technologies into teaching helps develop essential skills, such as digital literacy, online collaboration, and problem-solving, which are vital for today's job market.

Despite the benefits identified, many teachers and students face challenges related to the lack of adequate infrastructure (such as internet access and devices) and the need for ongoing training to use technologies effectively.

It was also found that digital technologies require educators to adapt their pedagogical approaches, promoting the need for active methodologies, where students are encouraged to be protagonists of their learning process.

4.1. Technologies that Facilitate, Increase Flexibility, and Add Value to the Teaching-Learning Process

The integration of digital technologies into the teaching-learning process has proven to be a promising strategy for transforming pedagogical practices in various contexts, including Mozambique. This study identified the technologies that facilitate and make this process more flexible, adding value to education and contributing to the development of students who are better prepared for contemporary challenges. One of the main results identified with the use of digital technologies was the personalization of teaching. Adaptive learning platforms, such as Khan Academy and Google Classroom, allow educators to adjust activities and content according to the needs and learning pace of each student. According to Creswell (2014, p. 45), "personalizing learning not only improves student engagement but also promotes greater autonomy in their educational trajectory". This autonomy is essential in contexts such as Mozambique, where cultural and socioeconomic diversity demands more inclusive pedagogical approaches.

Another significant result concerns increased student motivation and engagement. Tools such as educational games and interactive applications have proven effective in promoting a more dynamic and stimulating environment. According to Lima and Carreira (2022), "Gamification and the use of social media

in the educational context have a positive impact on student motivation, leading to greater engagement in the proposed activities” (p. 78). This approach may be especially relevant in Mozambique, where external factors such as economic inequality can affect student motivation. In addition, digital technologies facilitate collaboration between students and educators. Platforms such as Zoom and Microsoft Teams enable remote classes and real-time interaction, breaking down geographical and temporal barriers. Thus, collaboration extends beyond the physical classroom, providing richer and more diverse learning. Oliveira and Silva (2023, p. 112) say that “Collaboration mediated by digital technologies enhances the exchange of experiences and knowledge between students and teachers, creating a more robust learning community”. Finally, training educators in digital technologies is a determining factor for the success of this integration.

4.2. Application of Digital Technologies in Educational Institutions in Mozambique

The increasing inclusion of digital technologies in educational institutions in Mozambique has had a significant impact on pedagogical practices, as it provides new opportunities and challenges. Considering one of its specific objectives, to analyze the application of these technologies and their effects on the teaching and learning process, the study presents, as a result, the improvement of access to knowledge. In fact, the application of digital technologies in educational institutions in Mozambique results in the expansion of access to knowledge. The use of online platforms and digital resources allows students from remote areas to have access to quality teaching materials, which “facilitates the democratization of knowledge and contributes to the reduction of educational inequalities” (Santos, 2021, p.45). In addition, through virtual classes and content made available on the internet, teaching becomes more inclusive, allowing students from different socioeconomic backgrounds to access relevant information.

Another significant impact to be assessed is the promotion of interactivity and collaboration between students and teachers. Tools such as discussion forums, videoconferencing, and real-time collaboration applications have proven effective in engaging students. Cunha and Oliveira (2020) say that “the interactivity provided by digital technologies encourages active student participation, leading to more meaningful learning” (p. 112). This engagement not only improves classroom dynamics but also favors the development of social and collaborative skills. It is important to emphasize that the incorporation of digital technologies into pedagogical practices also promotes the development of digital skills, essential tools for the 21st century. By using technological tools, students not only consume information but also learn to produce and share knowledge. “The inclusion of digital technologies in the school curriculum is essential to prepare students for the job market and for active citizenship” (Silva; Freitas, 2021, p. 30) [38]. This development of digital skills is crucial, considering the growing demand for technological skills in various sectors.

4.3 Discussion

The analysis of the research results reveals a significant contribution of digital technologies in the transformation of education in Mozambique, in line with several international studies and experiences from other sister contexts. The following explores, interprets, and discusses these results, considering previous studies, the research objectives, the broad implications, and possible future directions.

4.3.1. Advances in Democratization and Educational Inclusion

The results demonstrate that digital technologies expand access to knowledge, especially for students in remote or marginalized areas, corroborating studies such as that by UNESCO (2022) on the role of digitalization in reducing educational inequalities. This inclusion is a fundamental step towards achieving the goals of equity and democratization; when well implemented, these technologies can contribute to more accessible and inclusive education. Previous studies, such as those by Creswell (2014), also highlight the potential of ICTs to promote social inclusion, especially in contexts of socioeconomic inequality.

4.3.2. Engagement, Motivation, and Active Learning

The procedures for this result indicate an increase in student engagement, motivation, and collaboration through resources such as educational games, videoconferencing platforms, and forums. These results are in line with the literature by Lima and Carreira (2022), who emphasize the impact of gamification and social media on student motivation, especially relevant in environments with demotivating factors, such as economic inequalities. In addition, the emphasis on active learning, based on student participation, reflects contemporary pedagogical trends, such as active methodologies, which promote autonomy and protagonism - central objectives of their study.

4.3.3. Developing Skills for the 21st Century

Another important point is the strengthening of digital skills, a priority on the global education agenda, advocated by international organizations such as UNESCO and the World Bank. The emphasis on digital literacy, online collaboration, and problem-solving shows that digital technologies go beyond the simple transmission of content, forming citizens and professionals who are better

prepared for the digitalized job market, reinforcing the recommendations of studies such as those by the United Nations (2021).

4.3.4 Results and Discussion of the Observation

The observation conducted across the three Mozambican schools revealed distinct patterns in the use of digital technologies in teaching, highlighting the influence of the socio-spatial environment and teachers' characteristics. In urban schools, the more robust technological infrastructure facilitated the diversified and frequent use of digital resources, regardless of teachers' age groups. Particularly, younger teachers demonstrated greater familiarity and willingness to incorporate these tools into their pedagogical practices, reflecting increased awareness and practice of technology use, possibly due to more intensive contact with digital resources during their initial training and social environment.

In schools located in peri-urban outskirts and rural areas, the results indicated significant limitations in implementing digital technologies in the teaching process. Equipment shortages, limited internet access, and insufficient technical support hindered teachers' adoption of digital resources. However, it was observed that teachers aged 25 or younger showed a greater willingness to use digital tools even amidst access restrictions, suggesting that familiarity with technology, stemming from their generation, can serve as a facilitator for adopting innovative practices, even in more challenging contexts.

The analysis also pointed out that professional experience and teachers' age played an important role in their interaction with digital resources. Teachers over 45 years old, even in more favorable environments, demonstrated more limited or conservative use of these technologies, possibly due to less familiarity or resistance to technological changes. Conversely, younger teachers tended to explore and integrate digital resources more frequently and diversely, confirming the conclusions of Ertmer and Ottenbreit-Leftwich (2010).

These findings support the hypothesis that the combination of geographical, demographic, and professional training factors differently influences pedagogical practices related to digital technologies. Additionally, they highlight the importance of implementing targeted training strategies and technical support for more experienced teachers, especially in rural and peri-urban areas, to overcome access barriers and promote greater digital inclusion. This information is essential for guiding the development of more targeted educational policies capable of fostering pedagogical innovation and improving teaching quality across different environments in Mozambique.

4.4 Limitations and Possibilities for Research on the Use of Digital Technologies in Education in Mozambique

Conducting studies on the impact of digital technologies on Mozambique's education system faces several challenges. Firstly, the inadequate technological infrastructure across many regions of the country presents a significant barrier. Limited access to reliable internet, continuous electricity, and available digital devices hampers data collection and the implementation of studies at a national level.

Furthermore, the training of education professionals constitutes another relevant obstacle, as many teachers and administrators still lack the proper preparation to effectively integrate digital technologies into their pedagogical practices, which affects the quality and depth of the data collected. The scarcity of systematic and up-to-date information regarding the use of ICTs within school settings also restricts the possibility of conducting comparative analyses and longitudinal studies.

Another aspect to consider involves linguistic and cultural barriers. The absence or inadequacy of universal research instruments influences the interpretation of results. Additionally, resistance to change among some teachers or school communities—often motivated by cultural factors or infrastructural limitations—may restrict the implementation of new pedagogical practices mediated by technology, thereby complicating the understanding of their actual impact.

On the other hand, the field of investigation into digital technologies in Mozambican education presents several promising opportunities. First, there is potential to conduct in-depth assessments of how these technologies influence pedagogical practices, student motivation, engagement, and learning outcomes. Studies analyzing how digital resources modify school routines can provide valuable insights for the development of more effective policies and educational strategies.

Another promising direction involves researching innovative teaching methodologies that incorporate digital resources, such as active learning approaches, collaborative methodologies, project-based learning, or gamification. These strategies can promote educational inclusion and reduce disparities.

Additionally, there is scope to evaluate teachers' training processes in ICT, identifying facilitators and barriers to the effective integration of these technologies into daily school activities. Research can also explore disparities in access and usage between urban and rural regions, contributing to a better understanding of existing gaps and suggesting equitable solutions.

Another relevant research avenue pertains to the role of locally developed or culturally adapted technologies, aiming to find sustainable and contextually appropriate solutions to promote ICT use in education.

Finally, studies assessing the impact of public policies aimed at digital inclusion can provide crucial insights for guiding strategies to develop digital skills and strengthen the national education system.

In summary, despite the obstacles, research in this field holds an enriching potential that can significantly contribute to improving pedagogical practices and promoting a more inclusive, innovative, and contextually adapted education in Mozambique

5. Final considerations

The research indicates that, when properly implemented, digital technologies can have a significant positive impact on teaching practices and learning outcomes in Mozambique. To this end, it is crucial to invest in continuing education for educators and infrastructure to ensure that the use of technology is not just an addition, but a central component of education.

For this to succeed, governments and educational institutions must develop public policies that encourage the integration of technologies into the curriculum and the education system by creating partnerships between educational institutions, government organizations, and the private sector, which is essential for developing better conditions for the use of digital technologies in education.

Digital technologies, such as e-learning platforms, educational applications, online collaboration tools, and multimedia resources, play a key role in transforming teaching practices.

Such technologies not only expand access to knowledge but also make the learning process more active and interactive. The flexibility offered by these tools allows students to learn at their own pace, promoting personalized teaching and meeting their specific needs. In addition, the incorporation of digital technologies helps in the development of fundamental skills, such as digital literacy and the ability to work in teams, preparing students for the challenges of the 21st century.

An assessment of the application of these technologies in educational institutions in Mozambique reveals a complex scenario, marked by significant advances and persistent challenges. Although progress has been made in the integration of digital tools, there are still gaps in terms of infrastructure, teacher training, and equitable access for all students.

In the context of the target discipline, the analysis of the literature and the study findings point to concrete strategies for effective integration of digital technologies: (a) adopting blended learning models to combine face-to-face and online activities, increasing flexibility and access; (b) incorporating gamified activities and interactive digital platforms to sustain motivation and engagement; (c) using collaborative tools such as shared documents, discussion forums, and project management platforms to foster teamwork and peer learning; (d) integrating open educational resources and multimedia content to diversify instructional materials and adapt them to different learning styles; and (e) applying formative assessment tools, such as online quizzes and feedback applications, to monitor progress and personalize instruction. Digital technologies can enhance the teaching process, making it more dynamic and accessible; however, for their effect to be truly effective and have a broad impact, it is essential to invest in professional

training, adequate infrastructure, and educational policies that promote their use. Implementing the above strategies in the discipline will help maximize the pedagogical benefits of technology, ensuring that its integration responds to the specific cultural, social, and economic realities of Mozambique.

However, for their effect to be truly effective and have a broad impact, it is essential to invest in professional training, adequate infrastructure, and educational policies that promote their use. This will make it possible to take full advantage of the benefits of these technologies and drive the transformation of the education system in Mozambique.

The observation conducted across three Mozambican schools revealed that the use of digital technologies in teaching varies significantly depending on the environment and teachers' characteristics. In urban schools, where technological infrastructure is more developed, teachers—regardless of age—use digital resources frequently and diversely. In contrast, in peri-urban and rural areas, the adoption of digital technologies is limited by shortages of equipment, internet access, and technical support, although younger teachers still show interest in using these tools.

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