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Information and Communication Technologies as Promoters of Educational Quality: The Educational Reality in Mozambique

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Abstract
The mixed-method, descriptive paradigm study was conducted in ten secondary schools in rural areas, with the aim of assessing the use of digital tools in an educational context. Thus, 500 self-administered questionnaires in physical format were distributed to students attending 12th grade, and 416 responses were returned. This approach was chosen due to the reported lack of computer equipment in these schools and the absence of an Internet connection. In addition to the questionnaires, five interviews were conducted with key informants, by telephone and recorded, including school principals and teachers. The districts were selected based on the availability of teachers to participate in the study as collaborators, in order to administer the questionnaires and return them with responses by physical mail. These collaborators were included due to the researcher's difficulty in traveling to all study locations, given the size of the country, logistics, and the time required and available. SPSS 22.0 statistical software was used to analyze the data from the questionnaires, and content analysis was used for the interviews. The results of the study indicate that the integration of Information and Communication Technologies into the curriculum is in its infancy in Mozambican schools. This is due to the country's financial constraints, coupled with inadequate policies and limited support infrastructure and human resources for use in an educational context. These limitations compromise the quality of learning, school results, and, above all, the development of individual skills in the context of the 21st century. These skills stimulate transformative initiatives in education and innovation for quality.

Introduction

Information and Communication Technologies (ICT) are part of everyday life and constitute an important lever for economic and social development. These technologies facilitate integration into the global computer network to obtain quality information. Access to information drives and improves people's quality of life, stimulates the development of education, and overcomes problems. For these and other reasons, developed and developing nations have become aware of their use, especially in education (Kiru, 2018; MNEDH, 2019).

Despite the importance of integrating and using ICT in education, in Mozambique, it is still underused at all levels of education. This is due to the country's weak economic capacity, the lack of clarity in the definition of ICT policies, and/or disruption and non-integration into the national education system (Eldardiry & Elmonghzy, 2018; Lagarto, 2018; Samussone, Silveira, Júnior, Alexandre & Reis, 2021; Zamir & Thomas, 2019).

These limitations hinder the development of individual skills, which are important in all social contexts and in education, where they enhance learning and stimulate new teaching methodologies for the improvement and transformation of education (António & Coutinho, 1998; INE, 2019; Joanguete, 2011; MINTRA, 2017; Mitano, Aparecida; Ventura & Palha, 2016; Quicardete & Sambo; Muchangos & Lino, 2016).

Therefore, considering the potential of technology in education, the country must strive to integrate it into this sector in order to better prepare young people and adults for the teaching-learning process (PEA) and for life in the 21st century. Better preparation requires individual skills, critical thinking, creativity, abilities, qualities, and knowledge that enable individuals to compete in the labor market (Joanguete, 2011; MINTRA, 2017; Mitano et al., 2016).

It is because of this lack of integration of ICT in education that this article has been written, with a view to influencing the authorities to integrate them into education in an effective, appropriate, and necessary manner. Since they constitute an important transformative and innovative strategy in that area.

1. Literature Review

1.1 Information and Communication Technologies in Mozambique

The integration and use of ICT in Mozambique began in the 1990s with Internet services offered by the Computer Center at Eduardo Mondlane University. During that decade, the relevance of these digital tools for reducing poverty, stimulating the country's development, and improving the living conditions of the population became apparent.

Thus, the development of telecommunications infrastructure began in cities, districts, and localities. At the same time, a broadband network was established, especially in large urban centers, to increase the flow of communications and information. In addition, an IT policy was created in 2000 to ensure access to the benefits of global knowledge. It is true that the implementation and expansion of ICTs present challenges, as mentioned (Joanguet, 2011).

Despite these challenges, Telecenters were developed with the aim of planning, acquiring, and installing computer equipment; Gov-Net for the expansion of e-governance; community multimedia centers to offer community radio services; SchoolNet to introduce computer rooms in the second cycle of general secondary education; and NEPAD e-School to provide technologies for education, namely hardware, software, including Internet connection and technical support. In addition, there is the “one computer per student” project and MoRENet, which established a data network to interconnect research and higher education institutions.

Despite these projects, most educational institutions, secondary schools, universities, and higher education institutes do not have access to MoRENet or free Internet, nor do they have equipped computer rooms or laboratories. For this and other reasons, limitations in access to and use of ICT prevail in these educational institutions. Perhaps this situation may lead to less development of individual skills and lower quality of learning and school results (António & Coutinho, 1998; Cuamba, 2022; Joanguete, 2011; Salimo & Gouveia, 2017).

1.2 Information and Communication Technologies in Educational Context

Digital tools can influence changes in educational systems management, in the development and flexibility of curricula. They support teachers to create high-quality multimedia contente, that stimulates learning and increases learner motivation. These tools also improve the skills and abilities necessary for modern society through new ways of learning to learn with ICT.

These technologies facilitate the acquisition of information for the production and expansion of knowledge, both inside and outside the classroom. This information can be used to produce high-quality work and, therefore, achieve better academic results. In addition, ICTs facilitate access to open and distance education from anywhere with Internet access. This possibility contributes to the massification of inclusive educational opportunities, including the development of hybrid and lifelong learning through the use of virtual platforms (Fojtík, 2018; MNEDH, 2019).

Virtual platforms host content and facilitate learning, stimulating the quality of teaching through synchronous/asynchronous interaction. Synchronous interaction occurs with the support of chat tools, videoconferencing, audioconferencing, and teleconferencing. Asynchronous interaction occurs through email, discussion groups, downloads, video, and audio. Among the most widely used platforms in education are AulaNet, Amadeus, Eureka, e-Proinfo, e-Learning, Moodle, Space, TelEduc, and WebCT. Educational platforms are important sources of information for learning. These platforms encourage flexibility (students can study anywhere, anytime, at their own pace), personalize learning, provide real-time feedback, facilitate digital inclusion and accessibility, and, above all, make content available to students with disabilities (Ordenes & Ferneda, 2022).

The integration of digital technologies in an educational context is a transformative and innovative process in the (PEA). Furthermore, teaching today is characterized by the intensive use of digital technologies to improve teaching, prepare lessons, and facilitate quality learning (Valeria, Caliari, Ary & Perez, 2017).

1.3 Prerequisites For Quality Education

The concept of “quality of education” has various nuances from country to country, due to its relationship with education policy objectives (Saraiva, Reis & Roldão, 2006). Mozambique continues to face challenges that compromise the process, despite the advances observed in the last decade.

Despite these advances, the quality of education in Mozambique may be compromised by overcrowded classrooms, especially at the early levels, where teachers have between 60 and 70 students per class. It is at this level of education that students should develop the foundations for subsequent levels. In addition, school infrastructure is inadequate, lacking laboratories, libraries, cafeterias, gymnasiums, etc., and there is a shortage of various teaching materials. In fact, there is a lack of adequate and necessary initiatives for investment in the sector on the part of policy makers. These and other reasons contribute to the lower quality of education in the country (Fumo, 2025).

The quality of education is linked to effectiveness, efficiency, improved cognitive outcomes, increased success rates, the adequacy of the PEA, teacher training, and equipping educational institutions with furniture, learning resources, laboratories, libraries, and digital technologies.

The availability of these resources and services in the school context allows students to be prepared with quality and, therefore, to participate in the labor market in the 21st century. Teaching programs and methods are also crucial to the quality of education, without neglecting continuous and formative assessment (Saraiva, Reis & Roldão, 2006).

Pswarayi-Riddihough (2024) concurs with Saraiva, Reis & Roldão (2006) in considering that achieving quality education requires human resource training, cognitive development of trainees, promotion of the use of digital technologies, along with other requirements. Thus, based on the needs and conditions that stimulate quality education, it is clear that in Mozambique, quality education is still invisible at the "end of the tunnel." This presupposes the need to redouble efforts, involve partnerships and civil society, with due flexibility.

2. Methodology

The study is mixed in nature (quantitative and qualitative) and based on a descriptive paradigm. Quantitative study is based on the hypothetical-deductive model, while the qualitative study is based on the inductive method. The research aimed to verify whether educational institutions had and used digital technologies in an educational context. To this end, it was decided to apply self-administered questionnaires to 12th grade students and conduct five interviews with key informants, school principals, and their respective pedagogues by telephone with recording.

These methods are used to obtain various sources and amounts of information. In a study with intentional sampling, for convenience, already established groups were used. It was random, since all classes at that level had the same probability of being part of the study (Coutinho, 2015). The study was conducted in ten districts of Mozambique and an equal number of secondary schools, where 500 questionnaires were distributed in physical format and 416 responses were obtained. The study was limited to this number of districts and schools due to the size of the country and the limited time available, including logistics.

The use of physical questionnaires was due to the lack of digital technologies in the schools under study, the lack of Internet connection, and digital illiteracy. To carry out the fieldwork, education professionals in these districts who participated in the study as collaborators were identified. Thus, electronic contacts were used to deliver the questionnaires to the collaborators, and physical mail was used to return them with the answers. SPSS 22.0 statistical software was used to analyze the data from the questionnaires, and content analysis was used for the interviews (Coutinho, 2015).

3. Results and discussion

Results

a) ***Internet infrastructure*** - it is not yet evenly distributed or robust, and the electricity supply is poor quality.

b) ***The Mozambican population and the Internet*** - a significant part of the population is not connected due to economic, technical, and cognitive factors. The Internet is characterized by frequent signal fluctuations and outages. In addition, it is slow and expensive. The study also found that of 83.2% of respondents, only 44.5% said they used the Internet to supplement their learning.

c) ***Digital technologies in educational institutions in Mozambique*** - the availability and use of digital technologies in secondary schools is non-existent, as is the case in higher education. If it does exist, it is obsolete and/or insufficient to meet the needs of the school community.

d) ***Digital education during COVID-19*** - during the pandemic, it became clear that educational institutions, teachers, and students were not prepared, either in terms of digital literacy or digital equipment, to facilitate and attend technology-based education.

e) ***Mobile phones and their potential in an educational context*** - The study revealed that 88.7% of the students surveyed were proficient in using mobile phones. However, only 44.5% of them used this equipment to support the PEA.

f) ***School results in teaching without digital technologies*** - The institutions visited did not have computer equipment and were not connected to the Internet. This is probably why 67.5% of the students surveyed in this study moved up to 11th grade with grades in the range of 10-12, when they could have achieved better results.

Table 1: Passing grade range

Passing grade range in 11th grade	(%)
10-12	67.5
13-15	30.2
16-20	2.3

Source: Questionaries

g) ***Policy on Information and Communication Technologies –*** these are weak, lack clarity, are discontinued, and there is less capacity to manage specific projects on ICT in education and exclusion of social majorities.

h) ***Human resources –*** high levels of basic and digital illiteracy and lower purchasing power for digital technologies**.**

Discussion

a) *Internet infrastructure*

The infrastructure supporting the Internet is neither evenly distributed nor robust. The Internet is slow and unstable, characterized by frequent signal drops, yet it is expensive. For this reason, the majority of society tends to be excluded from the digital world. In addition, the technology plan has shortcomings, as it does not clearly present either a vision or a mission. It is true that the nation's financial limitations influence the slower expansion of the support infrastructure and its robustness, but visible strategies to mitigate this situation were to be expected (Joanguete, 2011; Samussone et al., 2021).

Thus, to mitigate this situation, the Mozambican government, the World Bank, and other partners are establishing agreements for digital transformation. The implementation of these agreements is expected to lay solid foundations for a cohesive, prosperous, transformative, and innovative nation (Torgusson, 2022). These agreements and partnerships aim to: a) Strengthen ICT policy in order to attract more investors in the sector; b) expand the mobile broadband network to reach two million people, especially in rural areas; c) ensure training for the comfortable use of ICT; d) invest in support infrastructure, ensure cybersecurity, and data protection (World Bank, 2022).

b) *The Mozambican population and the Internet*

In Mozambique, Internet access doubled between 2015 and 2021, from 15% to 32% respectively. Even that, more than two-thirds of Mozambicans remain excluded from the digital world due to the slower expansion of support infrastructure, digital illiteracy, lack of and/or poor quality of electricity, high cost of the Internet and the equipment that facilitates access to it, such as smartphones and computers (World Bank, 2022; Cuamba, 2022).

According to the World Bank (2022), in Mozambique, one-third of the population not connected to the Internet lives in rural areas and/or does not have the purchasing power to access the Internet. In addition, they have little or no knowledge of how to use it, including mobile phones. For these and other reasons, they do not access the Internet on their devices. These limitations are most visible in female-headed households, low-income households, and other vulnerable groups. The expansion of digitization could influence robust, equitable, and resilient growth for the Mozambican nation.

c) *Digital technologies in educational institutions in Mozambique*

Educational institutions in Mozambique, at all levels, including higher education, show lower availability and use of digital technologies in an educational context. This situation was observed in a total of ten rural districts where the study was conducted and in an equal number of secondary schools (Cuamba, 2022).

In accordance with Mozambique's ICT policy, the SchoolNet Project was planned for secondary education institutions with a view to introducing computer rooms in schools, starting at the pre-university level, teacher training centers, including general secondary and primary education. However, little is known about the continuity of this project. For higher education, the MoRENet Internet was planned to facilitate research in 25 higher education institutions, at the time with high-speed Internet. The aim was also to transform qualitatively and quantitatively the capacity for searching and sharing information, knowledge production, national and international cooperation, including access to libraries (Joanguete, 2011).

In general, educational institutions in Mozambique do not have the technology for use by students or teachers. It is also true that they do not provide computer equipment, such as notebooks or tablets, to teachers for use in an educational context. As a result, along with other factors, there is less use of digital tools to stimulate creative and transformative initiative and pedagogical innovation. It is worrying that educational institutions still lack digital tools in the 21st century, when students already demand them in order to learn how to learn with technology (Roatilav, 2018; Samussone et al., 2021).

d) ***Digital education during COVID-19 Pandemic***

During the COVID-19 pandemic, in order to reduce contamination by the virus, the Mozambican government decreed in April 2020 the temporary closure of educational institutions at all levels. To continue the PEA, for example in secondary education, the implementation of distance learning (DL) with the support of digital technologies was recommended. This recommendation presupposes the availability of equipment, such as a computer, tablet, smartphone, and Internet access. However, as mentioned in this paper, "a significant part of the population does not have access to the Internet or computer equipment due to low purchasing power and also lacks autonomy" (Joanguet, 2011).

Lagarto (2018) corroborates Joanguet (2011) by stating that the digital world is unlikely to be appropriated by the social majority. For this reason, the recommendation to continue the PEA through distance learning did not materialize. However, the high levels of social inequality that mark the country and encourage exclusion, as was the case during the COVID-19 pandemic, were taken into account. It is understood that this decision would have been made without observing the real context of the country and its population (Culimua and Figueiredo, 2020). It is worth reiterating that the World Bank continues to show interest in supporting the country so that by 2028, digital technology will be a reality for innovation in the country (World Bank, 2022; Godoy & Silva, 2020; INE, 2019; Lagarto, 2018; MINEDH, 2019).

e) Mobile phones and their potential in an educational context

Mobile phones are the most widely used digital devices among the Mozambican population. In this study, 88.7% of students had access to such devices and used them proficiently—this is the digital generation. Considering that mobile phones are capable of performing multiple functions, they can be used to mitigate limitations related to computer equipment such as computers.

It so happens that the use of this mobile equipment in the classroom is not allowed, allegedly because it distracts students and, therefore, leads to poor academic results. This belief is not true. The reality is that these devices can help students obtain information for their studies and, as a result, produce high-quality work and achieve better academic results (Kiru, 2018; Zamir & Thomas, 2019). It is therefore urgent to intercede with policy makers on the relevance of using ICT in the PEA, including mobile phones. On the other hand, it is important to encourage the training of teachers, as the main actors in stimulating the use of ICT in the classroom, rather than prohibiting it (Loiola, 2016).

f) ***School results in education without digital technologies support***

Probably due to the fact that educational institutions lack computer equipment and Internet connection to support learning, passing grades in 11th grade were not better. With the world and Mozambique undergoing globalization, one would expect these students to have greater contact with digital technologies. And therefore, to obtain information and also produce quality knowledge to support the PEA. However, as mentioned in this study, the situation in the country regarding the availability and use of ICT is still deficient (Joanguet, 2011; Cuamba, 2022). This lack of digital technologies is similar among developing countries (Khan & Clement, 2012).
Perhaps this is why the average grades in 11th grade, as seen in this study, are far below what is desired, when one would expect better results from students whose mission is to study. Therefore, it is urgent to improve the situation. To this end, students must apply themselves

more to their studies and use ICT to learn how to learn with digital technologies, increase their motivation, and achieve better academic results (Rostilav, 2018).

g) *Information and Communication Technology Policy*

ICT policies in Mozambique were developed in the 1990s to promote national development. These policies were updated in 2018 with the aim of adopting the so-called Information Society (IS), implementing the Strategic Plan for the IS and the Operational Plan with the following vision: "to make Mozambique a country where all citizens have access to ICT for their own benefit and that of society." These policies also aimed to "promote the development of the Information Society, modernize the state apparatus, and develop individual skills that stimulate productivity and the country's socioeconomic development." Even so, access to ICT remains distant for citizens due to factors already mentioned, including their limited familiarity with the English language in which the content is made available (Lagarto, 2018).

In secondary schools, when computers are available, their use is only permitted for students in the 11th and 12th grades, to the detriment of others (MNEDH, 2019). In primary education, ICT is not included in the curriculum and is used exclusively for administrative tasks, when it is at this level of education that children should begin to familiarize themselves with it (Joanguet, 2011; MINEDH, 2019).

h) Human Resources

The proper use of ICT requires basic skills, so it is necessary to develop literacy programs for all and prepare people for digital literacy, as already mentioned. This training should begin in communities, educational institutions, at the primary level, and in homes. Ramos (2016) states that training is necessary to generalize the use of ICT, and that Provincial Digital Resource Centers should play an important role in this process. At the same time, technical and institutional support must be made available for the adequate development of individual skills, along with other requirements. Above all, there must be integrated development of the nation so that the entire population, or at least the majority, has access to digital tools with an Internet connection (António & Coutinho, 1998; Lagarto, 2018).

Final considerations

ICTs are important tools for transforming the world and promoting the economic and social development of nations and, therefore, reducing poverty. However, in Mozambique, these digital tools are little or not used in the educational context, as much as necessary in the present 21st century. In addition, educational institutions lack basic resources that stimulate the quality of education. For this reason, along with other factors, the quality of education is still in its infancy, and the development of individual skills is minimal and/or non-existent for the majority of the population.

Therefore, to mitigate this situation, the country must identify partners to support the development of education and the integration of digital technologies on a national scale. In addition, it is necessary to expand high-quality telecommunications infrastructure, as well as the electricity grid and the Internet. Reducing illiteracy levels and the cost of the Internet, while improving its quality, adds to the need to train human resources in digital matters. Finally, there is a need to stimulate the integrated development of the nation in order to increase the

purchasing power of the Mozambican population. In this way, it may be possible to develop emerging, transformative, innovative strategies for quality education with technologies for all.

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