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The urgency of modernizing and innovating in technical vocational education in Mozambique: contributions to reflection

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Abstract
One of the major current concerns of the Mozambican government is related to the quality of vocational technical education, measured in the quality of its graduates. With this in mind, this qualitative case study was designed to discuss the urgent need to modernize and innovate in technical vocational education in Mozambique. The data was obtained through a structured interview and questionnaire survey applied to 32 subjects (managers, teachers and students) and was analyzed using the categorical content analysis technique. The results indicate the urgent need for modernization and innovation in technical vocational education in Mozambique, characterized by the intensive use of digital resources in the teaching-learning process and ongoing training for those involved, in order to ensure the best use and maintenance of these resources. Thus, despite the existence of some technologies in these institutions, there are still a number of challenges to overcome if integration is to be effective and relevant

Key words
technical vocational education; innovation; modernization; teaching-learning process.

A urgência de modernizar e inovar no ensino técnico profissional em Moçambique: contributos para a reflexão

Resumo
Uma das grandes preocupações atuais do governo moçambicano está relacionada com a qualidade do ensino técnico profissional mensurável na qualidade dos seus graduados. Dentro desta perspectiva, foi elaborado este estudo de caso qualitativo que objetiva discutir a urgência de modernizar e inovar no ensino técnico profissional em Moçambique. Os dados foram obtidos através da entrevista estruturada e do inquérito por questionário aplicados a 32 sujeitos (gestores, professores e estudantes) e foram analisados com auxílio da técnica de análise categorial de conteúdo. Os resultados indicam a necessidade urgente de modernização e inovação no ensino técnico profissional em Moçambique, caraterizada por uso intensivo de recursos digitais no processo de ensino-aprendizagem e formação permanente dos envolvidos, de modo a garantir o melhor uso e manutenção desses recursos. Assim, apesar de existirem algumas tecnologias nessas instituições, ainda vários aspectos se consubstanciam em desafios a ultrapassar para que a integração seja efetiva e relevante.

Palavras-chave
ensino técnico profissional; inovação; modernização; processo de ensino-aprendizagem.

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La urgencia de modernizar e innovar en la educación técnica profesional en Mozambique: aportes a la reflexión

Resumen
Una de las mayores preocupaciones actuales del gobierno mozambiqueño está relacionada con la calidad de la educación técnica profesional, medida en la calidad de sus graduados. Desde esta perspectiva, se diseñó este estudio de caso cualitativo para debatir la urgente necesidad de modernizar e innovar en la enseñanza técnica profesional en Mozambique. Los datos se obtuvieron mediante una entrevista estructurada y un cuestionario aplicado a 32 sujetos (gestores, profesores y estudiantes) y se analizaron mediante la técnica de análisis de contenido categórico. Los resultados indican la necesidad urgente de modernización e innovación en la enseñanza técnica profesional en Mozambique, caracterizada por el uso intensivo de recursos digitales en el proceso de enseñanza-aprendizaje y la formación continua de los implicados, con el fin de garantizar el mejor uso y mantenimiento de estos recursos. Por lo tanto, aunque existen algunas tecnologías en estas instituciones, todavía hay una serie de retos que superar para que la integración sea efectiva y relevante.

Palabras clave
educación técnico profesional; innovación; modernización; proceso de enseñanza-aprendizaje.

1 Introduction

The Mozambican educational market is becoming increasingly competitive as a result of the significant increase in private educational institutions, especially those providing professional technical education in recent years. This increase is a consequence of the implementation of Law No. 6/92, of May 6, which allows private, community and business entities to participate in the education system. It is therefore imperative and extremely necessary that this process of expanding vocational technical education in the country be accompanied by innovations and modernization that ultimately make the teaching-learning process more effective, efficient and comprehensive. In this sense, the use of digital technologies is indispensable in this long and gradual process.

An innovation process is always associated with the development of new products, processes or methods within an organization. In the context of education, innovation is the production of novelties in educational environments, known as educational innovation (Campolina, 2012). It is from this perspective that this article is

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written, with the aim of reflecting on the urgency of modernizing and innovating in vocational technical education in Mozambique, and specifically by:

(i) to characterize technical vocational education in Mozambique;

(ii) identify innovations in technical vocational education;

(iii) discuss the urgent need to modernize and innovate in the context of technical vocational education in Mozambique;

(iv) to assess the contribution of modernization and innovation in technical vocational education.

Therefore, to paraphrase Teixeira (2010), it can be seen that introducing educational innovation implies a planned change with the aim of including new knowledge in the organization to meet the objectives that motivate the innovation itself. In this case, educational innovation can be seen as the search for answers to the challenges present in the dynamics of school processes.

Today, in the national educational context, we often see a scenario in which the same models predominate for everyone, with the same activities and the same forms of assessment, gaining in scale and economy, but losing out on flexibility, innovation and adapting to different rhythms and ways of learning. In this respect, there are few differences between courses with similar curricula, as well as copies of curricular structure, methodology, projects and, ultimately, little creativity (Valente, 2011).

The above scenario characterizes the current expansion of technical vocational training institutions throughout the country and specifically in Nampula province. They operate in both education and health, offering similar courses with the same curricular structure, which means little creativity, a lack of innovation and only opportunities for those who can afford it to train and demand the job market, with relative competitiveness.

Another factor that makes this approach relevant is the fact that it provides an opportunity to explore the vast literature in order to justify the urgent need for modernization and innovation in technical vocational education, which, by its very nature, is more demanding in the field of applied knowledge, or simply know-how. Innovation, therefore, will make these institutions more competitive and train increasingly competent professionals, with professional skills that allow them to be employed beyond Mozambique's geographical borders.

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The topic is topical and relevant to education, especially in Mozambique. It is believed that studying innovative strategies is extremely important, because it will allow institutions or their leaders to increasingly look for assertive strategies to better fit in and become relevant players in the market, which is currently increasingly demanding and competitive.

Based on the facts mentioned above and with the interest in awakening the need for modernization and innovation in the context of education in Nampula, the following question was asked: "*What is the urgency of innovating and modernizing in relation to the quality of professional technical education in Mozambique?*".

In organizational terms, the article has five essential points, the first being the introduction, which describes the main idea of the work, including the central research question; then the methodology, which describes the procedures to be followed in its approach, sampling and data collection instruments; then the presentation and discussion of the results; and finally, the final considerations and indication of the references consulted.

2 Methodology

The aim of this study is to provide an understanding of the urgent need to innovate and modernize the quality of technical vocational education in Mozambique. In order to obtain answers from a technical-scientific point of view, a case study was used, involving two technical vocational education institutions in Nampula.

A multiple case study was carried out, with data collected from two technical vocational health education institutions in the city of Nampula, one private and the other public, referred to in this study as IETP1 and IETP2, respectively, Instituto de Gestão e Ciências de Saúde de Nampula and Instituto de Ciências de Saúde de Nampula, both of which have been in operation for more than five years.

A multiple case study was chosen because it offers greater support in terms of representativeness, due to the variety of respondents, but without dispersing the variable under study. It also offers the possibility of understanding the sensitivity of the subject in a public and private context, with scientific evidence - the data collected. From the point of view of the approach, this study is qualitative. Therefore, in qualitative research,

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interviews and questionnaires are the main instruments used to collect data (Prodanov; Freitas, 2013). In this case, 32 participants were interviewed, chosen at random from two technical vocational education institutions in the city of Nampula, based on their willingness to take part in the study. This was a non-probabilistic, stratified sample, with the collaboration of two managers, 10 trainers and 20 students from the technical vocational training institutions. It is on the basis of these participants that we sought to identify contributions to reflection on the urgent need to innovate and modernize technical vocational education in Mozambique in general and specifically in the city of Nampula.

Following on from the data collection, two face-to-face interviews were carried out separately, one for each manager of the technical vocational training institution, subdivided into two main blocks, the first referring to sociodemographic information, in which the characterization of the technical vocational education institutions was highlighted and a second block corresponded to aspects related to digital technologies and the teaching-learning process, totaling 23 questions, open and multiple choice.

The participating students were given a questionnaire, also characterized by two blocks, the first on sociodemographic data and the other referring to digital technologies and the teaching-learning process, totaling 17 direct and multiple-choice questions.

Participation in this study was not compulsory, much less remunerative, but was based on the availability of the participants. In this sequence and as a way of guaranteeing the confidentiality of the research subjects, coding was carried out as one of the procedures in data processing, which consisted of assigning codes to the participants, in this case, G1 (Manager of institution 1) and G2 (Manager of institution 2); P1 (Teacher 1), P2 (Teacher 2), successively, for each participating teacher; E1 (Student 1), E2 (Student 2), successively, for each student participating in the study. This coding, in addition to facilitating the organization of information processing, also served to guarantee the confidentiality and protection of the information source.

Data processing, inference and interpretation consisted of grouping the data into five categories, namely: a) The relationship between digital technologies and teaching-learning; b) The need to include new digital technologies in the teaching-learning process; c) The main technological resources available in professional technical education institutions; d) How digital technologies have affected student involvement in the learning process; e) The use of digital technologies in the classroom context. Finally,

the results were inferred by means of induction (interview script), which made it possible to visualize the main (un)satisfactory aspects most pointed out by the participants.

Data analysis was based on the thematic content analysis technique proposed by Bardin (1977), as it is quick and effective when applied to direct (manifest meanings) and simple discourses, with the help of the literature consulted and according to the author's own arguments.

3 Discussion of results

According to G1, the main resources available at this institution are:

> Laboratories equipped with realistic simulators; a computer room with internet access; a virtual library; datashows, a smart board and 3D anatomical study software, as well as integrated management, which includes everything from academic record management and financial management to laboratory management.

These are resources used by students (in simulations and experiments) and by the institute's administration (as a means administrative and financial management). In terms of classification, only one of our interviewees (G1) rated the level of adherence to the use of these technological resources at the level of the institution as excellent. According to the same source, the technological resources listed are subject to quantitative and qualitative evaluation as one of the management mechanisms.

3.1 The relationship between digital technologies and teaching and learning

The aim in this case is to understand the relationship between digital technologies and teaching and learning, taking Sousa's (2020, p. 21) ideas as a starting point:

> When we talk about technologies and innovations, we know that society has undergone major transformations, and that these changes have a direct impact on various areas, including education, which has gone through several phases and is always undergoing major changes. In this respect, it is worth pointing out that these major transformations have brought about changes in the profile of students and teachers and in the way, teaching is done. Increasingly, schools will adopt practices that can enable learning experiences to meet current demands, thus working on students' socio-emotional competence, collective work and

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learning by doing. (hands-on) maker culture will be present in curricula, meeting a growing and emerging demand for continuous student improvement.

According to this author, a culture of innovation is present in companies that have a vision of the business and the market and are thinking of growing, expanding, increasing their results and, above all, remaining in a competitive and qualified market. From this perspective, the data from G1 and G2 indicates that the use of technological resources does not mean that usual teaching practices are abandoned, i.e., old practices continue to be used in a symbiosis of complementarity, but they believe that technological resources improve teaching at this institution and cite laboratory simulations, which operate 90% in reality, as examples. In this case, teachers receive adequate support and training for the effective use of digital technologies in their teaching practices. The integration of technologies in the teaching context presupposes modernization and must be accompanied by the updating of the authors, in this specific case the teachers.

Using the words of Brito and Santos (2023, p. 2), we realize that:

> Technological innovations have enabled a new way for people to relate, interact, learn and share knowledge. Education, and more specifically the teaching profession, is constantly facing challenges driven by growing access to digital technologies

Thus, according to Brito and Santos (2023), it is remarkable that digital technologies are associated with teaching to make it efficient, effective and modern, bringing its players closer to the globalization of teaching, one of the demands of modernization.

According to Moçambique (2011, p. 10):

> The introduction of Information and Communication Technologies, aligned with school infrastructure and the necessary reforms in the education system, will transform the development opportunities of countries that opt for this paradigm shift and accept the challenge of making the right investments.

According to the same source, the introduction of information and communication technologies into the education system will achieve results that go beyond education and the education system, extending to society and the economy:

- *in education*, will make it possible to improve the quality of teaching-learning processes and school management, promote access to education, helping to overcome the blockages created by the lack of qualified teachers and promote

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their training, enrich school content and make it more accessible, increase the absorption capacity of students using distance learning with technological support;

- *in the economy*, will promote economic development by empowering citizens for local economic challenges and the global economy. In addition, the very process of integrating information and communication technologies generates economic activity, jobs, entrepreneurial opportunities and revenue for the state. The integration of information and communication technologies into the education system will create opportunities for telecommunications companies (due to the increase in traffic on the communication networks it will generate), for service and equipment supply companies, for the banking sector and for the emergence of a local content supply industry (Mozambique, 2011);

- *in society*, will have a major social impact, not only through the *info-inclusion* of pupils and the contagion to parents, institutions and the surrounding community, but also through the promotion of gender equality and between urban and rural populations. Information and communication technologies at the service of education are a structural commitment, with a stronger impact in the medium and long term, which will contribute to sustainable development, the achievement of the millennium goals and poverty reduction (Mozambique, 2011).

3.2 Integrating digital technologies into the teaching-learning process

In Mozambique, information and communication technologies were integrated through the approval in 2000 of a National Policy on Information Technologies and communication and, as early as 2006, the Strategy for Innovation in Science and Technology was based on the following vision: all Mozambicans have the right to access and equity in the availability of the use of science, technology, innovation and information and communication technologies with a view to accelerating the process of wealth creation, the eradication of poverty and thus accelerating the improvement of their quality of life; in the same year, the Action Plan for the design and implementation of strategic information and communication technology projects in all sectors and institutions was also approved (Mozambique, 2006).

According to G1 and G2, in general the use of modern technological resources improves the teaching-learning process and helps the trainer to identify gaps in the process. To this end, effective strategies are needed to integrate such technologies into the teaching-learning process, namely: continuous training for trainers and managers; making the internet available to the entire student community, also considering that the technical laboratories of Medicine and Nursing are the specific areas that should benefit most from the use of digital technologies. And finally, they totally agree that the use of digital resources in teaching is indispensable in the acquisition of knowledge during classes, in carrying out the tasks and activities proposed by teachers in the development of group work, in the assessment process in complementary study and in student flexibility and autonomy.

Drawing on the ideas of Martinho (2021), we understand that the Covid-19 pandemic has awakened in us the importance of accelerating the acquisition of new skills, especially those with a technological component, as well as the urgent change in the way we work, teach and learn.

As an integral and relevant part of the study, the teachers also contributed to the study by answering the interview. These were men and women, aged between 25 and 50, most of whom had a degree and between three and 11 years' professional teaching experience. Teachers bear the greatest responsibility in the teaching-learning process, as they are the ones who guide the process, so they must be equipped with multiple skills.

According to Fernandes (2014, p. 414):

> Today's new challenges require increasingly different skills and qualifications, which are not the focus of regular education. Vocational schools are thus a response more focused on the performance of a profession, developed with a view to using teaching/learning methodologies other than lectures: we are talking about active pedagogies, collaborative or cooperative learning and on-the-job training. Teacher and student redefine their roles in this process and 'learning' is no longer a reductive transmission of knowledge, but an active process in which student and teacher share responsibility.

The transition to technology-supported teaching, with widespread access to the internet and digital content, has led to an evolution in the teaching paradigm. The teacher adds a strong pedagogical aspect to their in-depth knowledge of their field. The curriculum now identifies key concepts, the application of which to solve multidisciplinary problems is encouraged by the teacher. Technologies are a learning tool; multimedia

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content and simulations are used to deepen knowledge and networks allow knowledge and experiences to be shared between students, teachers and the community. The aim of the education system is to promote an increase in the country's productivity by deepening knowledge (Mozambique, 2011).

In the same vein, the last stage of evolution is considered to be interactive teaching. In this model, teachers with extensive professional experience challenge students to innovate and create knowledge, while at the same time-sharing experiences and supporting the development of their colleagues. The curriculum is flexible and adapted to the local context and the students' objectives, and assessment is the result of public *feedback* on students' research, presentations and creative work. Technologies supported by social networks are the vehicle for creating, collaborating and sharing knowledge, and knowledge communities involving teachers and students are created.

The education system is aimed at school communities that share a common vision and objectives, within which teachers have a high level of autonomy and accountability. The aim of the education system is to foster innovation and the creation of knowledge. This is an idea of the levels of teaching models so that we can better understand their evolution. In practice, there will be no pure models, with countries traditionally being at more than one level.

3.3 Technological resources in technical vocational education institutions

According to the results of the study, the main technological resources available at the institution are: the humanities laboratory, the anatomy laboratory, the multidisciplinary laboratory, the IT laboratory, the computer, the internet, wi-fi, the datashow, the printer and the TV. The data shows that 100% of those interviewed use technological resources such as computers, the internet and *datashow* more frequently when teaching or preparing lessons, as well as when assessing the teaching-learning process.

The results of the interviews with teachers at the two institutions (I1 and I2) indicate that 99% of the data shows that there are no difficulties in using digital technologies in the classroom. On the other hand, the data shows that 1% of those interviewed still face difficulties in using these technologies due to a lack of training.

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3.4 Impact of digital technologies on the involvement of students and teachers in the learning process

"Technologies alone do not educate anyone" (Nóvoa, 2023, p. 100). This idea leads us to think that, although there are various and appropriate digital resources available, the role of the teacher in handling/using them in the educational context is necessary and indispensable, since they are primarily responsible for mediating knowledge in this environment based on these resources.

In order to understand from the participants how digital technologies have affected the students' involvement in the learning process, questionnaire surveys were administered to them and the testimonies are as follows:

> As far as modern teaching is concerned, it has helped positively, although it is making students lazy in their investigations of the subject; sometimes they get sleepy because of the datashow (P1).
>
> Technology has had a significant impact on their involvement, as it helps them acquire skills and competencies (P2).
>
> They have had a positive effect in that they help us to move from the abstract to reality; they have been a tool for acquiring knowledge (P3).
>
> I think they have made it easier to research thematic content and, consequently, to make the most of it (P4).
>
> In terms of assessment, it's good for students who are interested in academic development; the others, due to social networks, end up interfering in this process (P5).
>
> Weak internet when the activity involves it. Students' poor internet skills and difficulties in completing assignments (P6).
>
> To the extent that they are appropriate to the type of lesson and the teacher's ability to use it (P9).

Analyzing the data, there is no doubt that the majority of those interviewed understand that the use of digital technologies in the context of teaching has a certain impact on the way we deal with learning, in the sense of including dynamism and quality in it. There are, therefore, challenges in the process of assimilating the use of these resources, challenges associated with the asymmetries in the development of cyber culture in the different areas where the students come from, including students who had

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their first contact with the internet when they entered professional technical training. A study on "Teaching reinvented" developed by Microsoft in partnership with New Pedagogies for Deep Learning concluded that:

> Students who have thrived in the remote environment during the pandemic have demonstrated skills such as critical thinking, creativity, resilience, independence as learners, self-regulation, cognitive flexibility and perseverance. These are attributes considered essential for future employability in all sectors and geographies (Martinho, 2021).

With regard to the question about internet access in I1 and I2, respectively, the data from the interviews with teachers indicated that most of them had a good connection (with restrictions on some *sites*) and preferred to use their own internet. One of the questions in this context aimed to explore teachers' skills and competences for the appropriate use of digital technologies in teaching and, as a result, the data indicated that 80% lacked specific training, as opposed to 20% of those interviewed, who were trained and proficient in handling these resources.

Having analyzed the demographic data of the teachers surveyed, it can also be concluded that the largest number of teachers with poor skills in the use of digital technologies correspond to digital emigrants, i.e., those professionals who were in the teaching profession before the introduction of simulators and computer systems in health sciences training.

In order to assess the effectiveness of digital technologies in supporting students in understanding content and developing practical skills, we sought to gather the experience of teachers, and the results are described in the testimonials below:

> *They have helped positively, because the technologies have facilitated the teaching-learning process* (P1).

> *Technologies currently contribute significantly to the acquisition of CHA* (P2)

> *The evaluation is positive* (P3).

> *Good. It's helped a lot* (P4).

> *Good. But what is needed is to invest in the spirit of correct use* (P5)

> *It's very effective and indispensable, as it helps with the delivery of lessons and projections of some content. It's a good tool for developing students' skills, as they already have early contact with these technologies* (P6)

> *Very good* (P7).

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> *Positive, because thanks to technology, students have access to subjects* (P8)
>
> *Very good, as long as the trainer manages to involve everyone* (P9).

Analyzing the data from the teachers transcribed above, it can be seen that the use of digital technologies is efficient in achieving learning results, since most of them are already known to the students and, therefore, they are more familiar with them, stimulating interest and motivation to study. In addition to allowing students greater autonomy in the search for knowledge, they also allow greater accessibility and flexibility in the use and systematization of information in the teaching-learning process.

Finally, in order to find out which strategies were considered most effective for integrating digital technologies into the teaching-learning process, we obtained a diversity of opinions among the interviewees, as shown in the transcript below:

> *One of the strategies would be to train students in the subject so that they don't have difficulties* (P1).
>
> *Student involvement, training for trainers and trainees, updating* (P2).
>
> *To train students in the first few weeks of first-year classes in how to use, research, acquire information and knowledge with digital technologies* (P3).
>
> *The availability of internet for everyone at the Institute would be an asset* (P4).
>
> *Permanent encouragement to use digital technologies for academic purposes, and not for fun or other non-academic purposes* (P5).
>
> *Integrating them into this process, making them aware of the devices and forms of research during the teaching-learning process, and intensifying computer classes* (P6).
>
> *Dialogued lectures* (P7).
>
> *That all students have access to these technologies* (P8).
>
> *Training trainers in digital technologies, adapting digital technologies to the classroom and training trainees in good practices in the use of digital technologies* (P9).

The involvement of everyone in the use of digital technologies in teaching is based on Mozambique (2011, p. 12), in the following terms:

> This new collaborative era opens up a number of opportunities for developing countries to catch up with developed countries, since, with the proliferation of internet access, knowledge is 'just a click away' and equal for all. In this new era, in which economic activities increasingly incorporate innovation and knowledge, education systems play a key role, along with connectivity, in e-inclusion and in

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preparing citizens equally not only for the challenges of the community and the local economy, but above all for the new challenges of the global economy.

The evolution of the teaching model is underpinned by a new student-centered learning paradigm, which will lead to a new dynamic in the way the classroom works and in the teacher-student relationship. In the 21st century, with the evolution of technologies and easy access to knowledge, the channels and sources of learning have multiplied. In the collaborative era, the channels and sources of knowledge have multiplied. Technology makes it possible to access a wider and more flexible set of learning channels that go beyond the classroom, as well as connecting with a range of educators beyond teachers, parents, experts and peers. The new learning channels and sources allow for greater individualization and differentiation of educational experiences according to the target group (Moçambique, 2011).

3.5 Using digital technologies in the classroom

The aim in this context is to understand how digital technologies are used in the classroom and, to this end, questionnaire surveys were administered to students, coded as "Ex". These were students of both sexes, mostly aged between 14 and 30, representing students from all the courses at the IFTPs in question. The data from the study reveals the most frequently mentioned digital technologies available these technical vocational training institutions, namely: laboratories, computers, internet, Wi-Fi, datashow, multimedia projector, sound system, printer, TV, digital camera and camcorder.

In order to make efficient use of these technological resources, digital competence is required, which, according to Pedro, Santos and Mattar (2023), originated from the social need to define the essential competences for a knowledge society. As an evolving concept, it has been related to the development of digital technology itself, as well as the expectations associated with exercising citizenship in today's increasingly digital society (Pedro; Santos; Mattar, 2023).

Considering the vision of the European Commission (2020, p. 1), according to which "[...] digital technology, when used efficiently, equitably and effectively by educators, can contribute significantly to inclusive, high-quality education and training for

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all". To this end, schools need to modernize and introduce digital technologies into their curricula, making sure that teachers and students become familiar with these new means for the purposes of training/education.

According to Pereira (2022, p. 194), there are currently countless applications, many of them with free versions, available for teachers and students to use in the context of remote teaching:

> In view of the pedagogical objectives defined in the subjects, we used the following tools: Google Classroom - for sending and publishing activities, Blackboard - an online platform that allows both the posting of activities and the holding of videoconferences and the showing of slides and videos, and Google Meet - which also allows online video conferencing, as well as the showing of slides and videos, as well as the following online applications: Kahoot, Socrative, Mentimeter and Padlet, chosen because they are free and easy to use.

The data shows that 100% of the respondents use some form of digital technology in the classroom, with regular use in most cases. They agreed that the use of digital technologies improves the teaching-learning process, as it attracts the attention and interest of students, stimulates student learning, makes the teaching-learning process more flexible, saves time and resources, and improves teaching performance. At least 60% of those surveyed had benefited from training in the use of digital technologies in teaching, and the training was in the context of initial classes.

From the perspective of Sousa, Brasileiro and Lopes (2023, p. 154), another important advantage of digital technologies in lifelong learning is:

> [...] the possibility of connecting educators with other professionals in their field, which can bring opportunities for collaboration. This can be especially valuable for educators working in remote areas or regions where access to face-to-face learning resources is limited [...]. In short, digital technologies offer a lot of potential for lifelong learning and the education of educators and their pedagogical practice. It is important, however, that educators are aware of their limitations and are trained to use technologies effectively and pedagogically to improve the efficiency and effectiveness of teaching, as well as offering new possibilities for student learning. Digital technologies can be used to personalize teaching according to students' individual needs, make teaching more interactive and engaging, and provide students with access to additional resources and information that can help broaden their understanding. In addition, digital technologies allow educators to work more collaboratively and exchange ideas and resources with other educators around the world.

In order to explore the students' awareness of the ways in which technologies can improve the quality of vocational technical education, we obtained the results transcribed below:

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> *In order to improve the quality of technical vocational education, good conditions are needed, i.e. laboratories (multidisciplinary, humanistic, anatomical and computer laboratories)* (E2)

> *They can improve the conditions of vocational technical education by having a lot of contact and skills in the use of these technologies, making it easier to understand the subject, which would help in teaching* (E3)

> *They improve technical vocational education in the following ways: depth and detailed research of work, as well as provisional classes* (E4).

> *We need the online system to work so that students can access the institution's platform* (E5)

> *To the extent that it makes it easier to acquire textbooks for reading* (E6).

> *These ways enable students to improve their skills through research and bring more knowledge* (E8).

> *Improved student awakening; improved student focus and performance* (E11).

> *Digital technologies can improve the quality of technical vocational education when they are always in the best condition to be used* (E12).

> *It can improve technical vocational education by bringing in more digital educational resources* (E14).

> *It can improve in many ways* (E15).

> *Flexibility in the teaching-learning process and resolving the difficulties that the technician will have to face in their teaching process* (E17).

> *Technologies can improve in a positive way if students have more skills in using them and have more experience with them, as they help with teaching* (E18).

> *We, as students, need the online system to work so that the student can facilitate the teaching-learning process* (E19).

The data indicates that material conditions (especially those related to practical classes) in laboratories and computer rooms are ways of stimulating the teaching- learning process in vocational technical education.

With regard to the main challenges faced by the students who completed the questionnaire, the following stand out:

> *Competence, learning, teaching* (E1).

> *To arouse students' attention and interest* (E2)

> *Maintenance of equipment and frequent updating of systems and constant training in their use for better application and efficiency in their use* (E3).

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Poor use by consumers, in this case research on cases outside the context of teaching (E4)

The equipment must be maintained, and the internet must be efficient (E5).

Lack of writing skills (E6).

Internet difficulties, lack of electricity and lack of updates (E7)

It's about understanding the digital world, where technology plays a fundamental role in almost every area (E8).

The quality of the electric current for its proper functioning (E10).

Difficulties handling datashows (E11).

Time of use and frequency are scarce (E14).

Lack of the system designed for the teaching system. Lack of programming of the same devices, lack of equipment needed for the teaching process (E17).

The new forms and strategies of research (E18).

Using the internet and wi-fi (E19)

Some of the challenges mentioned are directly related to the students (for example, when they don't show interest or mastery in using digital technologies); to the teachers (insofar as they don't have sufficient digital competence to then guide the students in the same direction); and to the management of vocational technical education institutions (when they don't make the necessary resources available and within a reasonably useful timeframe for their use and exploitation to make the teaching-learning process viable).

We then identify technological suggestions for improving the teaching-learning process in the context of technical vocational education:

That the institution should acquire tablets to provide to students for a fee for efficient transmission and use of this technological medium (E5)

That they provide various manuals that can facilitate the teaching-learning exercise (E6)

The institute should include wi-fi for use in its research (E11).

The case of wi-fi use: I would like the institution to regularize the issue of capacity so that it has the capacity to access a large number of students (E12)

Making it easier for the student to understand the subject (E13)

Tablets (E14).

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Bringing in more technologies that professionals can use on a frequent basis (E15).

System maintenance to check for system programming faults (E17).

Yes. I think there should be a space or once a week that classes should be research using technology (E18).

Lack of materials and reagents in laboratories for practical classes (E19).

Despite being characterized by a lot of subjectivity, the data above indicates that vocational training institutions in the Mozambican context, like all developing countries, face a number of challenges related to financial constraints and their frequent budget deficits. In this sense, investment in education and health is preferred to operating costs. It is in this way that their technological development remains on the periphery, lagging behind the developed countries, which invest heavily in research and technological development. These assumptions mean that institutions in these countries invest the minimum required by law in order to operate or to teach a technical or vocational skill or course.

4 Conclusions

The conclusion of this study is that educational innovation can be seen as the search for answers to the challenges present in the dynamics of school processes, and not necessarily the abandonment of paradigms in the teaching-learning process. Therefore, in the context of this study, the results indicate that there is an urgent need to modernize and innovate technical vocational education in Mozambique, with a view to meeting current demands in terms of professional qualifications that include comprehensive and technical-vocational training; the scientific conception of the world and the development in young people and workers of the basic qualities of a socialist personality that characterize the New Man.

In the context of education, innovation is the production of new things in educational environments, known as educational innovation. It is imperative that this innovation constantly characterizes the educational environment in technical vocational education, as it is a basic prerequisite for trainees to acquire the expected skills. To this end, the continuous training of teachers and the management of educational

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establishments and their mastery of modern technologies geared towards teaching and beyond are fundamental, since it is they who are responsible for leading the teaching-learning process.

Therefore, despite the fact that these technical-vocational training institutions have shown some commitment to the ongoing search for ways to integrate the use of technological resources, there are still some aspects that urgently need to be improved in order for integration to be effective. Some of these aspects seem to be the provision of equipment and distribution to students (e.g. *tablets*), the availability of quality internet, staff training for proper use and the constant updating of technological resources, given the speed of their obsolescence due to the rapid technological advances the world is facing.

What we have seen today in our teaching context is a scenario in which the same models for everyone predominate, with the same forms of action and assessment, in which the presence of new digital technologies is not strongly felt, a scenario proven by the onset of the Covid-19 pandemic in 2020, in which several educational establishments around the world had to interrupt the teaching-learning process until the situation was minimized. This scenario and the complaints from employers, specifically industries, about the weak capacity of the national workforce, characterized by the poor professional quality of the candidates, prove the urgency of modernizing and innovating in vocational technical education in Mozambique.

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