Nature and Information Engineering Publishing

Innovations in Pedagogy and Technology

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The Role of ICT in the Educational Inclusion of Children in Conflict: A Study in the Northern Provinces of Mozambique

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ABSTRACT

This study examines the impact of Information and Communication Technologies (ICT) on the educational inclusion of children displaced by conflict in the northern provinces of Mozambique, analyzing how these technologies contribute to their learning. The research explores disparities in access to and use of ICT in schools, emphasizing the challenges faced by displaced children. Employing a mixed-methods approach, data were collected from a sample of 35 participants through questionnaires administered to students, teachers, and school administrators; semi-structured interviews with educators and Non-Governmental Organizations (NGOs); focus groups with displaced children; and classroom observations. The analysis identifies three key findings: (i) ICT availability differs markedly between urban schools (70% with access) and rural/conflict-affected areas (30% with limited or no infrastructure); (ii) displaced children show strong interest in ICT but face low levels of digital literacy, hindering effective use; and (iii) teacher training substantially enhances the

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ARTICLE INFO

Received: 2 August 2026 | Revised: 14 October 2026 | Accepted: 19 October 2026 | Published Online: 26 October 2026
DOI: https://doi.org/10.63385/ipt.v2i4.100917

CITATION

Tomás, D.E., Tahane, T.M., Daúda, N.A., et al., 2026. The Role of ICT in the Educational Inclusion of Children in Conflict: A Study in the Northern Provinces of Mozambique. Innovations in Pedagogy and Technology. 2(4): 146–165. DOI: https://doi.org/10.63385/ipt.v2i4.100917

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success of ICT-based methodologies, although ongoing support remains insufficient. The study underscores the urgent need for investment in infrastructure and continuous professional development to address regional inequalities and strengthen pedagogical practices. While ICT demonstrates clear potential, educational inclusion ultimately depends on overcoming disparities in access and adapting methodologies to the specific needs of displaced children.
Keywords: Education; Educational Inclusion; Information and Communication Technologies; Conflict Situations; Mozambique

1. Introduction

Access to education for children displaced by conflict poses a significant challenge, particularly in crisis contexts such as those experienced in the northern provinces of Mozambique, Cabo Delgado, Nampula, and Niassa. These territories, severely affected by armed violence and forced displacement, are facing an educational crisis that compromises not only the present and future of these children but also their full reintegration into society. In such fragile settings, education is not merely a right but also a pathway for resilience, social cohesion, and reconstruction.

International studies have shown that displaced children often suffer a double exclusion: the immediate loss of access to structured schooling and the long-term difficulties of reintegration due to systemic inequalities, scarcity of resources, and the psychological impacts of violence. While much of the existing literature has focused on refugee populations and large-scale humanitarian responses, there remains a limited research base on the specific role of ICT in fostering educational inclusion in internal displacement contexts, particularly in Sub-Saharan Africa. This study, therefore, fills a critical gap by examining how ICT is being used or could be used to mitigate educational exclusion among internally displaced children in Mozambique, where research on this subject remains scarce.

In this scenario, ICT emerges as a promising tool for promoting educational inclusion, providing opportunities to expand access to knowledge and enabling innovative approaches to teaching and learning.

The central question of this research is: How are ICTs contributing to the educational inclusion of children displaced by conflict in the northern provinces of Mozambique? To address this question, the study examines the impact of ICT on both the quality of education and the overcoming of barriers faced by displaced students.

The research is guided by four specific objectives: (i) to identify the degree of availability and use of ICT in schools in Cabo Delgado, Nampula, and Niassa; (ii) to explore the perceptions of displaced children regarding the use of ICT in learning; (iii) to measure the adequacy and effectiveness of pedagogical methodologies that employ ICT to meet these children's needs; and (iv) to verify the impact of ICT on the inclusion and quality of education offered to them.

Methodologically, the study combines qualitative and quantitative approaches to provide a comprehensive understanding of the phenomenon. Structured questionnaires with students, teachers, and administrators captured data on ICT access and use, while semi-structured interviews with educators and NGOs allowed for insights into pedagogical practices and systemic barriers. Focus groups with displaced children provided first-hand accounts of their experiences, and participant observation enriched the data with concrete evidence of classroom practices.

The findings reveal stark inequalities, while urban schools present relatively better conditions, rural and conflict-affected schools lack basic infrastructure, such as electricity and connectivity. Displaced children show enthusiasm for ICT but face challenges due to limited prior exposure and digital literacy. The effectiveness of ICT-based pedagogies is uneven, largely depending on teacher training and the availability of resources. These results reinforce the urgent need for integrated interventions that combine investment in infrastructure, continuous teacher training, and curricular adaptation to local realities.

The originality of this study lies in its context-specific contribution: unlike much of the existing literature that examines refugee education in international or camp-based settings, this research focuses on internally displaced children in Mozambique and explores how ICT can act as both a bridge and a barrier in their educational inclusion. It highlights not only the structural inequalities that hinder ICT use

but also the agency and perspectives of displaced children themselves, an aspect often underrepresented in academic studies. By giving voice to these children, the study provides novel insights into how ICT can promote inclusive, high-quality education in conflict-affected regions of Sub-Saharan Africa.

The article is organized as follows: the introduction presents the context and objectives of the study; the literature review discusses concepts and prior studies on educational inclusion, ICT, and conflict; the methodology details the mixed methods applied; the results provide empirical findings; the discussion connects them to the literature; and the conclusion synthesizes the main contributions and policy implications.

2. Literature Review

The educational inclusion of children in conflict situations represents one of the greatest challenges in the field of global education. Conflict zones, often marked by forced displacement, destruction of infrastructure, and disruption of basic services, create significant barriers to access and quality of education. In this context, ICTs emerge as promising tools to mitigate these barriers and promote educational inclusion.

2.1. Pedagogical and Theoretical Foundations

Pedagogical reflection on the role of ICT in fostering the educational inclusion of children in conflict-affected contexts has evolved significantly, following the emergence of complementary theoretical frameworks. The literature reveals an intellectual trajectory that extends from classical constructivism, through sociocultural theory, to trauma-informed pedagogies, illustrating a deepening understanding of the impact of ICT on inclusive education.

Constructivism, grounded in Piagetian and Freirean thought, serves as a foundational lens for understanding the pedagogical potential of ICT. Allen [1] observes that "constructivism is based on the idea that people actively construct or make their own knowledge, and that reality is determined by their experiences as learners." This conception places the learner at the centre of the process, emphasising agency and active knowledge construction. Similarly, Piaget highlighted that "learning is only possible when there is active assimilation" [1], suggesting that experience is inseparable from cognitive development. In parallel, Freire argued that education should not be "detached from reality" but rather rooted in learners' existential experiences [1]. Together, these perspectives indicate that, in situations of social instability and conflict, ICT can act as privileged mediators to promote meaningful and socially contextualised learning.

Subsequently, the sociocultural approach shifts the focus from individual learning to relational and historical contexts. Murphy and Ivinson [2] argue that, within this perspective, "thinking occurs within the relationship between the individual and the environment, where the environment encompasses both the physical surroundings and their historical and social dimensions." This understanding is particularly critical when applied to forcibly displaced children, whose educational trajectories are deeply shaped by environmental and social conditions. The authors also warn against hegemonic pedagogies that "perpetuate inequalities of power/knowledge" [2], highlighting the need for inclusive and diversity-sensitive pedagogical practices.

Within the same field, Lantolf and Poehner [3] introduce the notion of Vygotskyan praxis, stressing that "practice is the research laboratory where theory is tested." According to these authors, "the sociocultural environment is the main source of human development," implying that educational interactions should be understood as socially situated practices. This perspective aligns with the use of ICT as mediating instruments that can enhance collaboration among peers and teachers. Indeed, the concept of the Zone of Proximal Development (ZPD), revisited by the authors, demonstrates that "cooperative activity undertaken by teachers and students enables individuals to function beyond their actual capabilities" [3]. Applied to conflict contexts, these insights suggest that ICT can facilitate collaborative processes that transcend individual and structural limitations.

Recent pedagogical literature further reinforces and updates these premises, emphasising mediation and active participation. Mutekwe [4] argues that "the adoption of a multifaceted strategy that includes authentic learning conversations, learning tools (material, psychological, and semiotic), and situated learning experiences contributes significantly to effective teaching and learning." This perspective strengthens the relevance of ICT as cultural and cognitive mediators, enabling authentic interactions and contextualised experi-

ences. Similarly, Robertson[5] highlights the formative value of digital pedagogical practices such as video production, contending that "the significance of the video production process for learning is a major finding." Accordingly, digital learning should be understood not merely through its end products but through its participatory and collaborative processes, aligning with Vygotsky's notion of scaffolding.

In the same vein, Shah[6] reinforces this understanding by asserting that "constructivism is an epistemology which holds that knowledge is constructed by learners as they attempt to make sense of their experiences," challenging transmissive methodologies that diminish student agency.

More recently, the literature has drawn attention to trauma-informed approaches, which have gained prominence in educational settings affected by war and displacement. Choudhuri[7] defines trauma as "any experience in which a person's internal resources are insufficient to cope with external stressors," emphasising that trauma-sensitive pedagogy should "fully integrate knowledge about trauma into education, training, supervision, research, and self-reflection." This approach repositions ICT from a merely instrumental dimension towards a socio-emotional one, as it can contribute to creating safe learning environments responsive to students' needs.

Complementarily, Clervilet et al.[8] note that forced displacement exposes individuals to "complex challenges as they leave their homelands and attempt to establish a home in a new world," with trauma being "central to their experience before, during, and after migration." For the authors, trauma-informed care represents "a strengths-based framework grounded in understanding and responsiveness to the impact of trauma." Applied to education, these principles imply that ICT integration should serve a dual function: on one hand, to mitigate the fragmentation caused by displacement through the creation of safe and culturally responsive digital spaces; and on the other, to strengthen individual and community resilience by providing opportunities for expression, educational continuity, and identity reconstruction.

2.2. Information and Communication Technologies and Digital Literacy

The incorporation of ICT into teaching is now recognised as one of the pillars for promoting educational inclusion in contexts of vulnerability and conflict. Their importance extends well beyond the provision of equipment, encompassing infrastructure, teacher mediation, and pedagogical integration. UNESCO IITE[9] highlights that "the guiding principle of ICT integration to promote inclusion is to minimise gaps in access to education for learners with special educational needs and to maximise their opportunities to reach typical developmental milestones." This demonstrates that technology should be understood as part of a broader ecosystem of public policy, methodology, and resources adapted to learners' actual needs.

However, the literature also shows that the mere presence of ICT does not guarantee meaningful learning. UNESCO[10] warns that although digital solutions reached more than one billion students during the pandemic, about "31% of students worldwide and 72% of the poorest were excluded from remote learning opportunities." This finding illustrates how structural inequalities constrain digital inclusion and how technological infrastructure must be accompanied by equitable pedagogical strategies.

In analysing ICT integration in classrooms, Ramnarain et al.[11] emphasise that "teachers' pedagogical beliefs are a crucial construct influencing ICT integration, and research is recommended to focus on this construct to understand technology use in classrooms." In other words, teachers' digital literacy, together with their pedagogical orientations, is decisive in transforming digital resources into instruments for critical and meaningful learning. At the same time, teachers face considerable obstacles, such as "security issues, students without digital devices, connectivity problems, technical failures during classes, vandalism, school policies, and power cuts"[11]. These barriers underscore the need for continuous professional development and investment in infrastructure to ensure the sustainability of digital inclusion.

Regarding skill development, digital literacy has evolved beyond mere technical proficiency. According to Ilomäki et al.[12], it is now conceived as a multidimensional construct encompassing critical evaluation of sources, awareness of personalisation mechanisms, and reflection on the social and ethical implications of technology. The authors stress that "criticality" manifests across different levels from self-reflection to an understanding of the political and economic interests embedded in technologies, making it essential to educate citizens capable of dealing with phenomena such as surveillance, data manipulation, and misinformation.

At the curricular level, Vuorikari, Kluzer, and Punie [13] provide a taxonomy of digital competences—including data literacy, communication and collaboration, content creation, safety, and problem-solving—allowing the measurement of differences across age groups and educational levels. This framework also incorporates contemporary dimensions such as interaction with artificial intelligence, sustainability, and accessibility, thus enabling the adaptation of teaching and assessment tools to local contexts and diverse student profiles.

Comparative analyses across populations reveal that age, gender, and educational attainment are structural factors shaping the distribution of digital competences. According to Tinmaz et al. [14], there is strong methodological heterogeneity among studies, yet evidence consistently indicates persistent inequalities in access and use that "tend to reproduce social divides related to age, gender, and socioeconomic status." These disparities extend beyond access to devices or connectivity, encompassing differences in operational, informational, and strategic competencies.

In parallel, the positive impacts of pedagogical ICT use are widely documented. Frasseto et al. [15] demonstrate that active digital methodologies "improve students' engagement and help them develop skills to plan processes and procedures related to their learning." Likewise, Fernández-Otoya et al. [16] confirm "a direct relationship between digital and information literacy and digital competence", reinforcing the idea that investing in digital literacy means investing in inclusion and educational achievement.

International experiences demonstrate that technology produces meaningful results only when coupled with pedagogical intentionality. In China, the provision of high-quality recorded lessons to rural students improved learning outcomes by 32% and reduced disparities between urban and rural areas by 38% [10]. Conversely, in Peru, the distribution of over one million laptops without pedagogical integration did not yield learning gains [10]. These examples highlight that digital literacy should be understood as a systemic process in which infrastructure, competencies, and pedagogy are inseparably intertwined.

2.3. The Concept of Educational Inclusion and ICT

Educational inclusion is a concept aimed at ensuring equal access to education for all individuals, regardless of their personal or social characteristics. The use of ICT is fundamental in this process, as it provides tools and resources that help overcome educational barriers and promote a more accessible and adaptable learning environment [17]. In this regard, ICT not only facilitates access to education but also enables the creation of personalised strategies that address the individual needs of each learner, an essential feature of an inclusive learning environment.

As emphasised by Demo (as cited in Sousa [17]), research and knowledge are crucial to adapting the educational process to social needs. Through ICT, it is possible to collect and analyse data to identify best practices and necessary adjustments that respond to the diverse profiles of learners. This reinforces the notion that technologies are powerful instruments for the personalisation of learning. ICT play a critical role in enabling such personalisation by providing resources that cater to the specific needs of each student. As Sousa [17] points out, a qualitative approach is particularly suitable for analysing the interaction between ICT and educational inclusion processes, as it allows a deeper understanding of the dynamics involved.

The pedagogical use of ICT introduces an interactive dynamic that can enrich the learning experience by overcoming physical barriers and enabling engagement with a broader and more diverse world. Educational inclusion is therefore strongly supported by the integration of ICT, which contributes to creating more flexible and accessible learning environments.

In the context of war, educational inclusion faces even more complex challenges. Children in conflict situations often encounter multiple barriers—including psychological trauma and interruptions in educational access—that extend beyond physical or cognitive disabilities. Glat [18] proposes a participatory and collaborative school model that promotes inclusion through the restructuring of the Political-Pedagogical Project (PPP) and the adaptation of curricula to meet students' diverse needs. The restructuring of the PPP should take into account the adversities faced in wartime contexts, adapting strategies and methodologies to create safe and accessible learning environments for all students [19, 20].

ICT play a crucial role in this process by providing adaptive pedagogical resources that help overcome physical and cognitive barriers. ICTs drive global transformations in communication and education, expanding interactions,

access to information, and new ways of teaching and learning (Pinho and Hornink, 2018 [21]). While Silva e Maran (as cited in Ricci et al. [22]) argue that digital ICTs constitute an emerging field of educational intervention by fostering the formation of active, creative, and critical students, capable of consciously interacting with different technologies and integrating them into their educational paths, promoting new ways of learning, teaching, and producing knowledge.

In wartime scenarios, the capacity of ICT to provide adaptive resources becomes even more relevant. Technologies such as educational software, communication boards, and accessibility devices are essential to ensure that all children—regardless of their conditions can access knowledge and participate actively in learning. The Salamanca conference further reinforces the importance of using ICT to promote an inclusive and equitable school environment [23].

Beyond curricular adaptation, ICT offer a platform for social inclusion and for building a more equitable educational community. As Mantoan [24] argues, digital literacy is a prerequisite for social inclusion in contemporary society, and access to ICT is vital to ensure that all students, particularly those in conflict situations, can participate fully in school life.

The role of teachers is equally crucial in this context. Educators must be flexible and innovative, adapting their practices to meet the needs of all learners, especially in challenging environments such as those affected by war. Continuous professional development in the use of ICT and inclusive pedagogy is essential to ensure that teachers can employ these tools effectively in supporting the learning of students with special needs [24].

2.4. ICT and Education in Conflict Situations

In contexts marked by armed conflict or social crises, education faces significant challenges that compromise both children's access to schooling and the quality of learning experiences. Schools may be destroyed, teachers displaced, and families forced to migrate, resulting in frequent and prolonged interruptions in the educational process. Moreover, fear and emotional insecurity can have negative effects on students' engagement and academic performance. Within such circumstances, ICT emerge as a strategic instrument capable of offering alternative solutions for ensuring educational continuity, even under conditions of instability. As Sousa [17] emphasise, ICT acts as a form of educational safety net, providing flexible and adaptable means that enable learners to remain connected to knowledge even when the physical conditions for teaching are disrupted.

The relevance of ICT goes beyond overcoming physical or logistical barriers. They offer new pedagogical possibilities, enabling the teaching–learning process to become more interactive, personalised, and learner-centred. Fonseca et al. [25] highlight that the use of digital resources fosters autonomy and learner agency, key factors in emergency contexts where the presence of teachers or complete school infrastructures may not be possible. Through digital platforms, multimodal content, and online communication tools, educators can maintain meaningful connections with students, facilitating continuity in learning and enabling individualised follow-up, even from a distance.

Another crucial aspect of ICT concerns their contribution to educational inclusion. In conflict situations, vulnerable groups, including children with disabilities, girls in high-risk regions, and displaced children, often face additional barriers to accessing education. INEE [26] notes that digital technologies not only provide access to information but also foster cognitive, communicative, and psychomotor development among these learners. Through adapted educational software, interactive applications, and multimedia resources, it becomes possible to design more equitable learning experiences in which all students can participate actively, regardless of their limitations or the severity of the surrounding context.

Furthermore, the use of ICT helps strengthen the relationships between students, their families, and educators. Digital platforms and educational social networks enable constant communication, resource sharing, and collaboration in pedagogical activities an especially valuable when traditional school systems are fragmented or inaccessible. This relational continuity plays a crucial role in offering emotional and social support to students, helping to mitigate the traumatic effects of conflict and fostering resilience.

It is also worth noting that the implementation of ICT in conflict contexts requires thoughtful planning, teacher training, and curricular adaptation. Mere access to computers or the internet does not guarantee effective learning; teachers must be adequately prepared to integrate these tools meaningfully into their pedagogical practice, tailoring content to

students' needs and circumstances. International organisations have repeatedly emphasised the importance of continuous teacher training programmes to enable educators to use ICT as instruments of inclusion and innovation, transforming adversity into opportunities for learning.

Thus, the role of ICT in conflict settings transcends the mere substitution of in-person classes. They represent an opportunity for educational transformation, capable of creating more accessible, participatory, and inclusive learning environments. By reducing barriers and inequalities, digital technologies provide children with the means to continue learning even amid extreme adversity, fostering not only knowledge acquisition but also holistic development, autonomy, and hope. As a result, ICT-mediated education emerges as a form of social resistance and future reconstruction, demonstrating that even in contexts of conflict, meaningful and equitable educational opportunities can indeed be achieved.

2.5. Teacher Training and Professional Development

Teacher training and professional development in conflict-affected contexts require innovative approaches that employ Information and Communication Technologies (ICT) as mediating tools in the educational process. Recent studies indicate that ICT can enhance educational inclusion by enabling flexible, collaborative, and context-responsive pedagogical practices.

According to UNESCO[27], "teacher training and continuous, relevant, and appropriate professional development are essential if the benefits of ICT investment are to be realised." This statement highlights that technology alone does not guarantee transformation; its impact depends largely on teachers' preparedness. Therefore, investment in digital infrastructure must be accompanied by robust capacity-building strategies; otherwise, it risks leading to a waste of resources and opportunities.

Minea-Pic[28] reinforces this argument, stating that "new technologies offer immense potential to transform teachers' learning and the provision of professional development activities throughout their careers." The author argues that technological integration expands not only access to materials but also the collaborative and personalised dimensions of lifelong learning. This indicates that ICT-mediated teacher training can transcend rigid models and foster more interactive and adaptive learning processes.

Complementarily, Wolfenden et al.[29] emphasise that "teacher professional development is an essential component in transforming teaching and learning to achieve the goals of the Sustainable Development Goals." The direct link between teacher development and the global commitments of the 2030 Agenda highlights the strategic importance of teacher training, particularly in regions where conflict undermines educational structures. In such contexts, the use of ICT is not merely desirable but essential to ensuring equity and sustainability in teachers' continuous development.

Another crucial point is the conception of teacher training as a lifelong process. As UNESCO[27] stresses, "teacher development should be a process of lifelong learning... from initial training to continuous professional growth throughout one's career." This continuous approach is particularly useful in unstable environments, where rapidly changing conditions require teachers to constantly adapt and innovate to meet emerging needs.

In this discussion, MacDonald[30] provides a significant contribution by examining the role of communities of practice. The author notes that "a community of practice can be an effective way to promote collaborative professional development." This notion of peer support among teachers suggests that learning should not be reduced to content transmission but understood as a process of collective knowledge construction. Such support is even more crucial where local realities hinder face-to-face interaction and access to resources.

MacDonald[30] further observes that "the principles and characteristics that enhance the effectiveness of traditional professional development can also inform the design and evaluation of online teacher learning." Rather than viewing digital training as a substitute or inferior mode, the author advocates recognising it as a modality capable of extending effective in-person practices, fostering environments of experimentation and pedagogical innovation.

Similarly, MacDonald[30] adds that "when members of a community of practice share their experiences and knowledge, the benefit to the community may exceed the sum of its parts." By mediating exchanges among teachers from different locations, technology contributes to the creation of a collective pedagogical capital—essential for addressing

shared challenges in conflict-affected zones. The author further observes that, with online support, teachers can remain in their schools while simultaneously sharing their experiences, thereby overcoming professional isolation.

Wolfenden et al.[29] extend this reasoning by emphasising that "ICT plays a role in creating, maintaining, and continuously improving the architecture and functioning of professional development systems." This underscores that digital training should not be perceived merely as an emergency measure, but as part of a sustainable educational ecosystem that ensures teachers' ongoing professional growth.

As UNESCO[27] highlights, particularly in challenging contexts, teachers must be able to "continuously develop, experiment, guide, innovate, and share best practices to determine how technology can best serve the school." Here, technology is not an end in itself but a critical tool for transforming the educational process. Teachers must therefore adopt reflective, creative, and resilient attitudes that transcend technical mastery and translate into pedagogical innovation with tangible social impact.

2.6. Challenges in ICT Implementation

The implementation of ICT in education faces multiple challenges, particularly in inclusive and conflict-affected contexts. These include inadequate infrastructure, the need for continuous teacher training, and the adaptation of curricula to new technologies.

Alves Guimarães et al.[31] note that student motivation and adaptation to new methodologies are among the major challenges in distance education. These challenges are especially acute considering that distance learning often requires a fundamental shift in how learners interact with both content and instructors. Unlike traditional classroom environments, where physical presence and direct interaction play vital roles, distance learning heavily depends on students' ability to self-regulate and remain engaged within virtual settings.

In this regard, Garrison, Anderson, and Archer[32] propose the Community of Inquiry model, which emphasises the integration of social, cognitive, and teaching presence as essential components of an effective online learning environment. Furthermore, Moore[33] stresses the importance of reducing "transactional distance", defined as the psychological and communicative gap between students and teachers, to promote richer and more engaging learning experiences.

According to Berge[34], the role of the facilitator in distance education is crucial, involving not only content delivery but also the creation of learning environments that foster interaction and motivation. Similarly, Keegan[35] argues that distance education requires appropriate technologies that are accessible and effective in transmitting knowledge and supporting learners. Finally, Palloff and Pratt[36] point out that student engagement is closely tied to the establishment of strong virtual communities, where collaboration and experience-sharing foster meaningful learning.

To overcome these challenges, it is essential to ensure that teachers are well-prepared and up to date with emerging technologies, which demands ongoing training and regular review of pedagogical practices. Continuous professional development is vital not only for mastering new digital tools but also for adapting pedagogical strategies to the specific demands of distance learning. Well-trained professionals can create more effective and dynamic online learning environments that foster active participation and sustain learner motivation.

Additionally, both technical and pedagogical support for teachers are crucial. Training should extend beyond the technical use of tools to include the development of skills for creating interactive content and engagement strategies fundamental for distance education. The adoption of adaptive methodologies and the incorporation of continuous feedback are also key to maintaining student motivation and ensuring the effectiveness of the learning process.

Thus, adequate teacher preparation and the continuous updating of pedagogical practices are essential to addressing the challenges of distance learning. While students require support to navigate and adapt to new methodologies, educators must be equally equipped to provide high-quality learning experiences. A proactive approach to teacher training and pedagogical adaptation can therefore not only mitigate the challenges identified by Alves Guimarães et al.[31] but also foster a more effective and engaging distance learning environment.

The integration of ICT, according to Malta et al.[37], should promote collaborative learning, considering the characteristics of the students. In contexts of social fragility, these technologies promote interaction, engagement, and the reconstruction of inclusive and participatory educational en-

vironments. However, its effective implementation requires sensitivity and contextual adaptation.

In this sense, educators must be committed to overcoming these challenges and adopting pedagogical practices that value diversity. Inclusive education should not be regarded merely as a legal obligation but as an ethical and pedagogical commitment to building a fairer and more equitable society. Consequently, the use of ICT should be guided by an educational vision that fosters active participation, empathy, and respect for diversity integrating all learners regardless of their individual circumstances.

2.7. Success Stories and Lessons Learned

Several successful cases illustrate the positive impact of ICT on educational inclusion in conflict-affected contexts. For instance, distance learning programmes implemented in such regions have demonstrated that ICT can facilitate access to education and support continuous learning.

INTERSOS and the Secondary Education for Peace Programme in Colombia represent two effective approaches to addressing educational challenges in conflict contexts. INTERSOS implemented various Conflict-Sensitive Education activities, including teacher training and community engagement. Positive outcomes included the inclusion of over 6000 children in educational programmes and teacher training on critical topics such as child protection and psychosocial support[26]. These initiatives highlight the importance of a holistic approach that not only focuses on formal education but also considers the emotional and social contexts of children affected by conflict.

Teacher training in child protection and psychosocial support is vital to creating a safe and nurturing environment that promotes resilience and well-being. Moreover, community engagement has been fundamental to INTERSOS's success, ensuring that educational interventions remain culturally relevant and sustainable. Collaboration with local communities facilitates the adaptation of programmes to emerging needs and strengthens local ownership and support. Lessons learned—such as the importance of community coordination and continuous programme adaptation—illustrate that flexibility and sensitivity to local dynamics are essential to the effectiveness of educational responses in crisis contexts.

In Colombia, the Norwegian Refugee Council (NRC) and the Peace Observatory (Observatorio para la Paz) developed a curriculum tailored for internally displaced youth, incorporating conflict resolution and psychosocial support. The programme's success was evidenced by its official adoption by the Ministry of Education and by the empowerment of young people to become agents of change in their communities[26].

This example demonstrates the effectiveness of integrating conflict resolution and psychosocial support into the curriculum, preparing young people not only for continued education but also for active roles in community peacebuilding and reconstruction. The adaptation of curricula to students' cultural realities and the involvement of local communities in the educational process are critical lessons drawn from this programme. The contextualised and inclusive approach adopted by the NRC and Peace Observatory (Observatorio para la Paz) underscores the need to tailor educational strategies to learners' social and cultural specificities, thereby promoting more relevant and impactful learning experiences.

3. Materials and Methods

3.1. Methodological Approach

This study adopted a mixed-methods approach, integrating both quantitative and qualitative dimensions, with the aim of analysing the role of ICT in the educational inclusion of children displaced by armed conflict in three northern provinces of Mozambique: Cabo Delgado, Nampula, and Niassa. The combination of these approaches enabled the quantification of ICT usage patterns, while simultaneously exploring participants' perceptions and narratives. This integration enriched the interpretation of findings and captured the contextual factors underlying the phenomenon.

This study employs a mixed-methods approach with a sequential explanatory design, aiming to understand how ICTs influence the educational inclusion of children displaced by conflict. Initially, questionnaires were administered to students, teachers, and school administrators to map access to and usage of ICTs. Subsequently, semi-structured interviews with educators and NGOs, focus groups with displaced children, and classroom observations were conducted to deepen the quantitative findings.

The research questions guiding this investigation are:

(1) In what ways do ICTs contribute to the learning of displaced children?
(2) What barriers hinder their effective use in crisis contexts?

The choice of a mixed-methods design is supported by recent studies (e.g., Gierus [38]) that highlight its growing prevalence and methodological rigor in educational journals, particularly in research addressing complex phenomena in challenging environments.

3.2. Sampling Strategy

The sampling strategy combined convenience and purposive sampling. Convenience sampling was adopted due to contextual constraints, including insecurity in conflict-affected regions and logistical challenges in reaching displaced populations. Purposive sampling, on the other hand, aimed to deliberately include participants who play central roles in the educational process, namely, displaced learners, teachers, school administrators, and representatives of non-governmental organisations (NGOs) operating in the school context. This approach was justified by the need to capture a diversity of perspectives essential to understanding the complexity of ICT implementation in vulnerable educational settings [39, 40].

Although the sample does not allow for statistical generalisation to the overall population of displaced children across the three provinces—which together comprise tens of thousands of individuals—it provided access to rich and detailed information on ICT integration and related challenges. The combination of these sampling strategies ensured a balance between operational feasibility, ethical considerations, and diversity of viewpoints.

3.3. Sample Determination and Composition

The sample size was determined based on logistical, ethical, and pragmatic considerations, resulting in the participation of 35 individuals. This decision reflected the humanitarian and security context, participant availability, and the need to conduct the study in a culturally and ethically sensitive manner.

The final sample included: 15 displaced children, 10 teachers, 5 school managers, and 5 NGO representatives. The composition was designed to ensure that the voices of direct beneficiaries, the children, were captured in depth, while also including those responsible for ICT implementation and educational management. This structure allowed for a multifaceted understanding of the phenomenon.

Although a sample of 35 participants is insufficient for statistical generalisation, it was deemed appropriate for an exploratory and preliminary study, providing rich data and valuable insights for future research. Subsequent investigations should employ larger and stratified samples to enhance representativeness and generalisability.

3.4. Data Collection Instruments

To ensure a comprehensive assessment, data were collected through four complementary instruments:

Structured Questionnaire

Administered to all participants, this instrument gathered information on the frequency of ICT use, availability of technological resources, pedagogical methodologies, and main barriers to technology integration in classrooms. The questionnaire was validated through a pilot study involving five teachers and five learners to ensure clarity and relevance of items.

Semi-Structured Interviews

Conducted with teachers, school administrators, and NGO representatives, these interviews sought to deepen understanding of perceptions and experiences regarding ICT integration. Open-ended questions allowed respondents to freely discuss challenges and successful practices, facilitating the identification of emerging thematic patterns.

Focus Groups

Focus groups were organised with displaced children, providing a collective space for expression and exchange of experiences concerning ICT use. This method was selected for its capacity to foster interaction, reveal shared perceptions, and uncover nuances in technology use that may not surface in individual interviews [40, 41].

Participant Observation

This method was used in classrooms to document actual ICT application practices, interactions between learners

and technologies, and daily obstacles. Observations were recorded in detailed field notes, complementing information obtained through other instruments.

Document Analysis

Document analysis encompassed the review of institutional records, pedagogical plans, project reports, and school documentation related to the implementation of ICTs. This process enabled the contextualization of observed practices, the identification of formal guidelines, and the assessment of coherence between institutional discourse and actual practices.

The combination of these instruments enabled data triangulation, enhancing the reliability and depth of analysis while mitigating bias associated with self-reporting [42, 43].

3.5. Data Analysis Procedures

Quantitative data were processed using SPSS software (version 29), through descriptive analyses including frequencies, means, and identification of response patterns. These results characterised the distribution of ICT use, resource availability, and the technological profile of schools and learners.

Qualitative data obtained from interviews, focus groups, and observations were fully transcribed and subjected to open coding to identify units of meaning and emerging categories. Data were subsequently organised into key themes such as technological barriers, innovative pedagogical strategies, perceptions of ICT effectiveness, and contextual challenges. Coding was independently performed by two researchers, followed by peer discussion to harmonise categories and strengthen the credibility of the analysis.

Triangulation among different data sources (questionnaires, interviews, observations, and focus groups) reinforced the validity of findings and enabled the integration of quantitative and qualitative results into a holistic interpretation [42, 43].

3.6. Ensuring Objectivity

Acknowledging the risk of bias, particularly due to reliance on self-reported data, specific strategies were adopted to ensure objectivity:

- Use of standardised and pre-tested instruments;
- Inclusion of multiple data sources for triangulation and cross-validation;
- Independent analysis by more than one researcher, followed by consensus discussions in cases of divergence;
- Direct classroom observations to complement and verify self-reported information from questionnaires and interviews.

These measures reduced the effects of social desirability, selective memory, and subjective interpretation, thereby strengthening the methodological robustness of the study.

3.7. Ethical Considerations

The study adhered to ethical principles for research involving vulnerable populations. All participants or their legal guardians provided informed consent after being made aware of the study's objectives, procedures, potential risks, and benefits. Confidentiality was ensured through data anonymisation and secure storage.

Interviews, focus groups, and observations were conducted with cultural and psychological sensitivity to avoid retraumatisation. Instruments were adapted to local conditions, employing simple and context-appropriate language to guarantee accessibility and full comprehension.

4. Results

The availability and use of ICT in schools across the provinces of Cabo Delgado, Nampula, and Niassa demonstrate considerable variability, reflecting significant inequalities in access to these resources. In urban areas, some schools have managed to establish basic computer laboratories and provide internet access, enabling a more effective integration of ICT into the educational process. These resources offer students valuable opportunities to access information, digital tools, and multimedia materials, thereby enriching learning and fostering broader interaction with knowledge.

4.1. Level of Availability and Use of ICT in Schools

The survey conducted in the three Mozambican provinces reveals marked disparities in the availability and use of ICT. While some urban schools have computer laboratories and regular internet access, schools in rural areas, particularly those heavily affected by conflict, face severe

challenges due to the lack of basic infrastructure, such as reliable electricity and stable connectivity.

Survey results indicate that 70% of urban schools have functional laboratories and internet access, whereas only 30% of rural schools possess even minimal ICT infrastructure (**Figure 1**). The scarcity of electricity, unstable connections, and insufficient equipment significantly restricts ICT use in rural areas, creating pronounced educational inequalities.

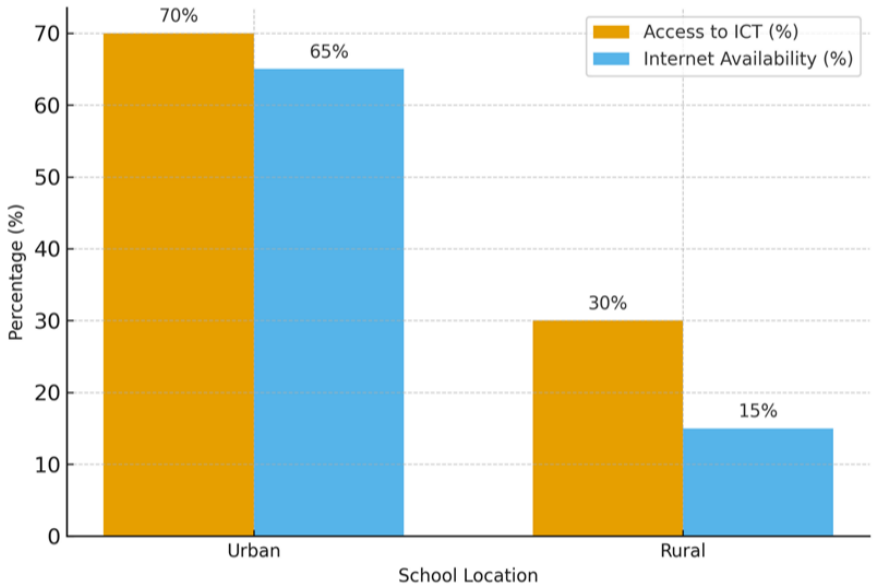

Figure 1. Access to ICT and Internet Availability by School Location.

The presence of ICT in urban schools is substantially greater, ranging from fully equipped laboratories to high-speed internet, often integrated into the school curriculum. This enables students to acquire essential digital skills, such as online research, multimedia presentation development, and the use of interactive educational platforms. Conversely, only 30% of rural schools have some level of ICT access, and even in those cases, use is limited due to challenges such as irregular electricity and unstable internet connections.

Beyond infrastructure, the effective use of ICT depends on teacher training and the availability of teaching materials adapted to technology. The lack of teacher training and adequate technical support in rural areas contributes to under-utilized or abandoned computer laboratories. Thus, the successful implementation of ICT requires a holistic approach, including investment in basic infrastructure, teacher training, and curricular adaptation to meaningfully integrate ICT.

4.2. Perceptions of Displaced Children Regarding the Use of ICT in Learning

Interviews and focus groups with displaced children revealed a strong interest in learning through ICT. Students perceived technology as making learning more engaging and interactive, introducing dynamic elements that stimulate motivation and participation. However, many of these students had limited digital literacy, reflecting a lack of prior exposure to computers and mobile devices (**Figure 2**).

Students reported that the presence of educational videos, games, and other multimedia resources significantly enhanced motivation and participation. However, irregular ICT access created frustration and disrupted learning continuity, demonstrating that maximizing ICT benefits requires continuous access and adequate pedagogical support.

4.3. Level of Adequacy and Effectiveness of ICT-Based Teaching Methodologies

The effectiveness of pedagogical methodologies that incorporate ICT is closely linked to teacher training and the quality of school infrastructure (**Figure 3**). In urban schools, where teachers received specific ICT training, displaced students performed better in digital activities, demonstrating that adequate teacher preparation is a key determinant for successful technology-mediated instruction.

In rural schools, the lack of continuous training and

technical support limits the effectiveness of teaching methodologies. Furthermore, the shortage of basic resources, such as reliable electricity and adequate devices, makes it difficult to implement ICT-based methodologies consistently and sustainably. Resource disparities between urban and rural areas reinforce educational inequalities, creating a scenario in which students in less advantaged regions have fewer opportunities for digital development. A rural teacher emphasized: "We do our best, but without devices and internet, ICT cannot be fully integrated."

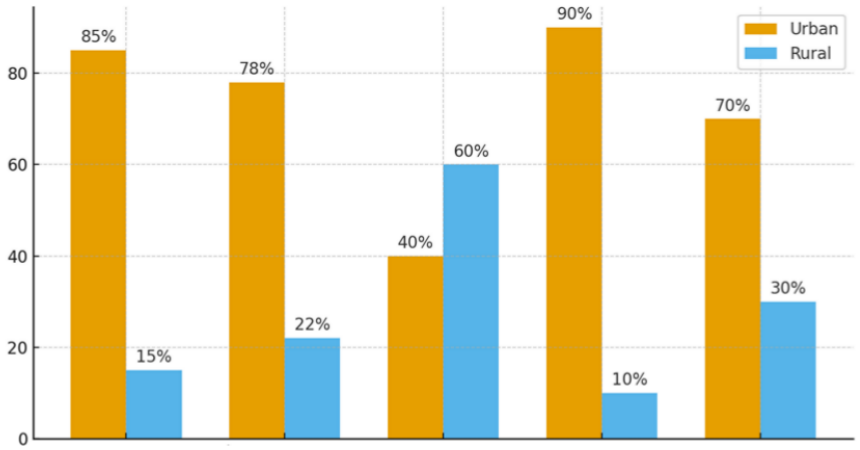

Figure 2. Perceptions of displaced children on the use of ICT in learning.

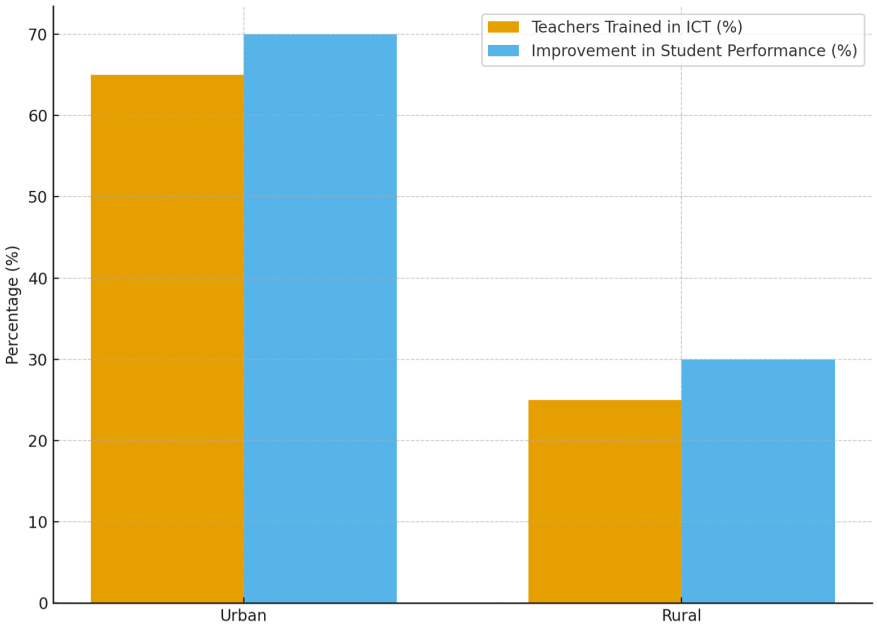

Figure 3. Teacher training and student performance in ICT-based learning.

4.4. Impact of ICT on Inclusion and Quality of Education

The findings indicate that ICT can help overcome barriers to access and promote a more inclusive and equitable educational environment, particularly for displaced children (**Figure 4**). A student stated: "Even having to leave my home because of the conflict, I feel that I can still learn and keep up with my peers thanks to ICT." Technology provides access to diverse teaching resources and enables personalized learning tailored to students' individual needs. Additionally, distance learning platforms offer educational continuity, even in contexts of instability or displacement.

In urban schools, adequate infrastructure and institu-

tional commitment to continuous training result in greater inclusion, higher teaching quality, and stronger learning continuity. In contrast, in rural schools, infrastructure limitations, lack of devices, and insufficient training undermine ICT effectiveness, highlighting the need for integrated policies to promote educational equity.

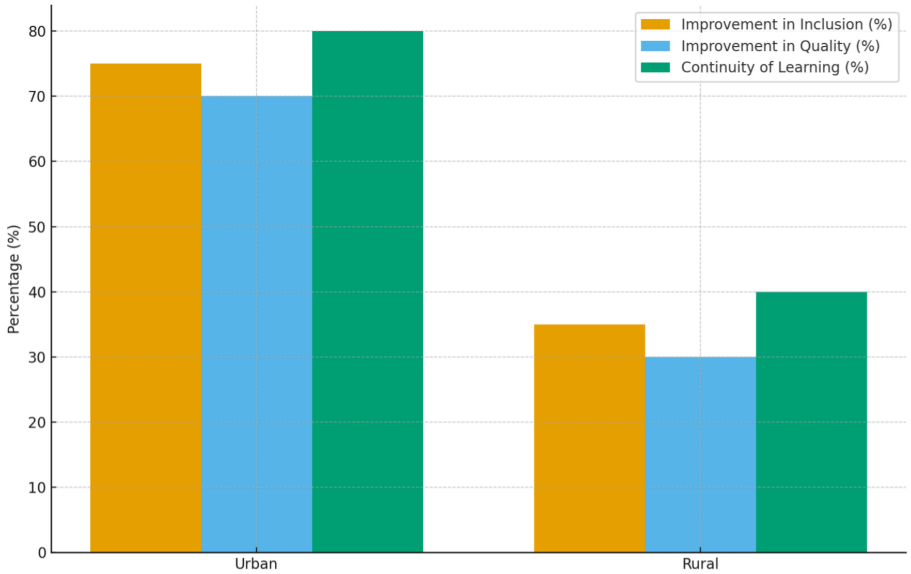

Figure 4. Impact of ICT on inclusion, quality, and continuity of learning.

Moreover, the data indicate that ICT use contributes to the development of essential digital skills, such as online research, virtual communication, multimedia presentation creation, and the ability to address complex problems. These skills are fundamental to preparing students for contemporary challenges and reducing digital inequality.

The results also underscore the importance of the motivation and engagement fostered by ICT. Multimedia resources make learning more dynamic; however, irregular access may generate frustration and affect performance. To maximize ICT benefits, it is necessary to combine infrastructure, teacher training, continuous technical support, and curricula adapted to local realities.

5. Discussion

5.1. Degree of Availability and Use of ICT in Schools

The findings of this study reveal significant disparities in the availability and use of Information and Communication Technologies (ICT) across schools in the provinces of Cabo Delgado, Nampula, and Niassa. In urban schools, approximately 70% have functional computer laboratories and high-speed internet access, enabling the effective integration of ICT into the school curriculum. These schools reflect the pattern identified by Vuorikari, Kluzer, and Punie [13], highlighting the strategic importance of ICT in fostering inclusive and adaptive learning environments. The use of ICT extends beyond mere access to devices, integrating into pedagogical processes by facilitating online research activities, multimedia presentation development, interactive platform use, and personalized learning, thus becoming an integral part of the curriculum.

In contrast, rural schools, particularly those located in conflict-affected areas, have only about 30% access to any level of ICT, and the use of these resources is often limited. Structural barriers such as unreliable electricity, unstable connectivity, and scarcity of technological equipment render continuous ICT use impractical. This situation reinforces the observations of Alves Guimarães et al. [31], which emphasize the challenges of implementing digital methodologies in vulnerable contexts. The lack of technical support and the absence of pedagogical materials adapted to ICT exacerbate educational inequalities, restricting learning opportunities and hindering digital inclusion.

These findings suggest that to promote equity in ICT access and use, educational policies should prioritize struc-

tural investments in rural and conflict-affected schools. This includes providing reliable electricity, stable connectivity, fully equipped laboratories, and ongoing equipment maintenance. Furthermore, integrating ICT into the curriculum must be accompanied by continuous teacher training programs, ensuring that educators are capable of effectively using technology to foster inclusive learning. Educational policy should, therefore, consider not only the provision of resources but also the necessary conditions for their effective use, including teacher training and permanent technical support, as suggested by Vuorikari, Kluzer, and Puni, Garrison, Anderson, and Archer [13, 32].

5.2. Displaced Children's Perceptions of the Use of ICT in Learning

Analysis of displaced children's perceptions revealed considerable enthusiasm for the use of ICT. Students recognized that digital resources made learning more engaging, dynamic, and interactive, corroborating Fonseca et al. [25], who highlights the role of ICT in crisis contexts by providing alternative learning pathways and promoting student autonomy. Many of these students exhibited strong motivation to learn using digital technologies, even when coming from regions with limited access to computers and mobile devices.

However, most children demonstrate low digital literacy due to limited prior experience with computers, tablets, and smartphones. This initial limitation reduces their capacity to fully exploit the benefits of ICT, creating obstacles in learning and adapting to digital methodologies. Irregular access to technology further increases student frustration and compromises the continuity of the educational process. Nonetheless, children with consistent access to ICT reported that learning became more engaging and personalized, enhancing both participation and motivation.

For ICT to have a significant impact on the educational inclusion of displaced children, policies must ensure continuous and predictable access to digital resources. Additionally, implementing digital literacy programs is crucial to equip children with the skills to effectively use computers and mobile devices. Adapted pedagogical strategies should integrate multimedia resources with inclusive methodologies, promoting personalized teaching, motivation, and engagement, even in vulnerable contexts. Literature suggests that with adequate support, ICT can transform the educational experiences of displaced children, contributing to the reduction of inequalities and fostering social and educational inclusion [13, 25].

5.3. Level of Adequacy and Effectiveness of Pedagogical Methodologies Using ICT

The study revealed significant differences in the effectiveness of ICT-mediated pedagogical methodologies between urban and rural schools. In urban schools, teachers who received specific ICT training were able to integrate technologies effectively, promoting personalized and interactive learning, consistent with Vuorikari, Kluzer, and Punie, Garrison, Anderson, and Archer [13, 32], who emphasize the need for well-structured learning communities to sustain digital education. In these schools, ICT not only complements the curriculum but enables differentiated teaching strategies, fostering student autonomy and stimulating complex problem-solving.

Conversely, in rural and conflict-affected areas, the implementation of digital methodologies faces severe obstacles, including electricity shortages, unstable connectivity, limited devices, and low teacher qualifications. These factors restrict the adequacy and effectiveness of ICT-mediated teaching, supporting the conclusions of Moore [33], who underscore the importance of student motivation and adaptation to new digital methodologies. The absence of technical support and ongoing training undermines the sustainable implementation of inclusive pedagogical practices.

Educational policies should prioritize continuous teacher development, equipping educators not only with technical ICT skills but also with the ability to pedagogically adapt content and digital teaching strategies. Furthermore, the successful implementation of digital methodologies requires appropriate pedagogical materials, stable infrastructure, and permanent technical support, ensuring that ICT becomes an effective tool for inclusion and personalized learning. Pedagogical approaches should consider the contextual needs and challenges of each region, promoting inclusive strategies that are sensitive to digital inequalities [13, 24, 33].

5.4. Contributions of ICT to Educational Inclusion and Quality in Displacement Contexts

The impact of ICT on educational inclusion and teaching quality for displaced children emerged as one of the most

significant findings of this study. ICT enables continuity of learning through digital platforms and distance education, allowing students in displacement contexts to maintain access to formal education, in line with Pinho, Ricci, Barros, and Hornink [21, 22]. Moreover, ICT-enabled personalized learning adapts instruction to individual student needs, promoting greater engagement and participation, particularly in contexts characterized by high diversity and educational inequality.

In urban environments, the availability of infrastructure and resources, combined with teacher training, contributes to higher inclusion and improved student performance. In contrast, in rural and conflict-affected regions, equipment scarcity, unstable connectivity, and lack of technical support significantly limit ICT's impact. This highlights persistent inequalities in access and use of technologies, reflecting the need for policies that promote educational equity.

To maximize ICT's potential in fostering educational inclusion, an integrated approach is necessary, including investments in infrastructure, continuous teacher training, and sustained technical support. Educational policies must address digital inequalities and ensure that all children, including displaced and conflict-affected learners, have equitable access to quality learning opportunities. Educational programs should incorporate adapted digital methodologies, multimedia resources, and inclusive pedagogical strategies, fostering personalized instruction and active participation of all students, in accordance with the recommendations of Vuorikari, Kluzer and Punie [13].

Additionally, ICT integration should be planned with consideration for the cultural and social context of communities, as suggested by Clervil et al. [8]. Technologies not only support learning but also contribute to social cohesion, inclusion, and the development of essential digital skills in the contemporary world. Promoting student motivation and engagement, alongside continuous and predictable provision of digital resources, is fundamental to ensuring the effectiveness of technology-mediated learning.

6. Conclusions

This research has provided concrete, albeit exploratory, evidence of the transformative potential of ICTs in promoting educational inclusion for displaced children in conflict-affected regions of northern Mozambique. Empirical findings indicate that, when appropriately implemented, ICTs can expand access to knowledge, enhance pedagogical practices, and facilitate learner engagement, thereby contributing to both cognitive and socio-emotional development. These findings demonstrate that ICTs are not merely supplementary tools but strategic instruments capable of mitigating some of the barriers inherent to education in contexts of forced displacement.

A key contribution of this study lies in documenting the stark disparities in ICT access and utilization between urban and rural schools. Approximately 70% of urban schools surveyed possess functional computer labs and reliable internet connections, whereas only 30% of rural and conflict-affected schools meet the minimum conditions for using such technologies. This quantitative evidence provides a concrete basis for understanding how structural inequalities perpetuate educational exclusion. The study also offers qualitative insights into how these inequities affect learner motivation, participation, and academic performance, highlighting the necessity of targeted policy interventions to ensure equitable access to technological resources.

Digital literacy emerged as another critical factor affecting the educational inclusion of displaced children. While children displayed enthusiasm and curiosity toward ICTs, their limited prior exposure and inconsistent access often resulted in frustration and hindered learning outcomes. This study contributes original insights by demonstrating the link between culturally contextualized digital literacy programs and increased learner engagement. The findings underscore the need for instructional interventions that not only teach technical skills but also incorporate local languages, cultural knowledge, and accessible pedagogical strategies tailored to the lived experiences of displaced populations.

Teacher preparedness and ongoing professional development were identified as decisive factors in the effectiveness of ICT-mediated learning. Schools where educators received systematic training in both technical competencies and technology-enhanced pedagogical strategies reported improved student engagement and performance. This observation reinforces the study's contribution to understanding the interplay between teacher capacity and ICT effectiveness, emphasizing that infrastructure alone is insufficient without skilled facilitation and continuous technical support.

Furthermore, the study illustrates the strategic role of ICTs in ensuring learning continuity during crises, supporting

remote instruction, personalized learning, and collaborative educational networks. By integrating quantitative and qualitative analyses, the research offers nuanced evidence of how ICTs can serve as instruments of resilience and inclusion in emergency education contexts. However, the study acknowledges its limitations, including a relatively small, non-representative sample of 35 participants, which restricts the generalizability of the findings. Future research employing larger and stratified samples, longitudinal designs, and cross-regional comparisons will be essential to validate and extend these exploratory insights.

Based on these findings, the study recommends concrete policy and practice actions: expansion of ICT infrastructure in marginalized areas, implementation of culturally and linguistically adapted digital literacy programs, continuous teacher training and technical support, development of low-connectivity educational platforms, and establishment of public-private partnerships for equipment provision and maintenance. Additionally, future research should investigate the long-term impact of ICT use on academic performance and psychosocial well-being, the role of mobile and low-cost technologies in resource-constrained settings, and the potential of ICTs to strengthen socio-emotional skills and community ties among displaced children.

Author Contributions

Conceptualization, D.E.T. and T.M.T.; Methodology, D.E.T.; Software, D.E.T.; Validation, D.E.T., T.M.T., and N.A.D.; Formal analysis, D.E.T.; Investigation, D.E.T.; Resources, D.E.T.; Data curation, D.E.T.; Writing and original draft preparation, D.E.T.; Writing and review, D.E.T. and B.M.F.G.; Visualization, D.E.T.; Supervision, B.M.F.G.; Project administration, D.E.T. All authors have read and agreed to the published version of the manuscript.

Funding

This work did not receive external funding.

Institutional Review Board Statement

This study was conducted by the ethical principles established in the Declaration of Helsinki, which guides research involving human beings, ensuring respect for the dignity, integrity, and rights of participants. This study was approved by the Catholic University of Mozambique. The research followed all necessary ethical procedures, prioritizing the free and informed consent of those involved, as well as the confidentiality of the information collected. No participant was exposed to physical, emotional, or psychological risks, and their participation was entirely voluntary, with the possibility of withdrawing at any time without prejudice. Scientific integrity was ensured at all stages of the process, from data collection and analysis to the presentation of results, in compliance with international standards of research conduct. Furthermore, whenever applicable, the guidelines of the institution promoting the study were followed, and national research ethics standards were observed. Its implementation was guided by a commitment to truthfulness, social responsibility, and the well-being of participants. Finally, all data obtained were treated anonymously, ensuring the privacy of the research subjects. This reaffirms the commitment to ethics and integrity in scientific development.

Informed Consent Statement

Informed consent was obtained from all study participants, ensuring their voluntary and informed participation, as well as their right to withdraw at any time without prejudice. All participants were fully informed of the study objectives, procedures, potential risks and benefits, and the confidentiality and anonymity of the collected data. Furthermore, written informed consent was obtained from participants for the publication of the results of this article, including any relevant information that, even if anonymized, could be used in the context of scientific dissemination. The research was conducted with rigor and transparency, observing the precepts of ethical and scientific responsibility. All procedures followed national research ethics standards and, where applicable, the guidelines of the sponsoring institution. This reinforces the authors' commitment to integrity, participant protection, and the scientific credibility of the work performed.

Data Availability Statement

The data supporting the results presented in this study are available upon reasonable request to the corresponding authors. This measure aims to ensure transparency and scientific reproducibility, allowing other interested researchers to

verify or further explore the analyses performed. However, by ethical principles and personal data protection standards, raw data containing sensitive or identifiable information about participants will not be made publicly available. This decision stems from a commitment to the privacy, anonymity, and security of those involved in the research, especially in contexts involving vulnerable populations. All information collected was treated with the highest degree of confidentiality, and any future sharing of data will be carefully evaluated to ensure that the rights and integrity of participants are not compromised. Access to aggregated or anonymized data may be considered, provided it complies with applicable ethical and legal criteria. This ensures a balance between research ethics and the dissemination of scientific knowledge.

Acknowledgments

We thank the District Education, Youth, and Technology Services of Cabo Delgado and Malema for their valuable authorization and logistical support during the data collection process. Institutional involvement was essential for the smooth running of field activities, enabling access to the schools and communities participating in the study. We equally acknowledge the dedicated work of local technicians who actively collaborated in administering the questionnaires and translating the research instruments into local languages, ensuring the clarity, comprehensibility, and reliability of the responses. Their contribution was crucial to guaranteeing the quality and validity of the data collected, respecting the cultural and linguistic specificities of the regions covered. This collaboration reinforces the importance of collaborative work between researchers, public institutions, and local communities to promote ethical, contextualized research that is committed to social reality. We reiterate our deep gratitude to all who, directly or indirectly, contributed to this study.

Conflicts of Interest

The authors declare that there is no conflict of interest related to this work. It is also clarified that no funders were involved in the study design, data collection, analysis, interpretation, writing of the manuscript, or the decision to submit the results for publication. The entire research process was conducted independently, with the authors assuming full scientific and ethical responsibility. We reiterate our commitment to transparency, integrity, and impartiality in the production and dissemination of knowledge.

References

[1] Allen, A., 2022. An introduction to constructivism: Its theoretical roots and impact on contemporary education. Journal of Learning Design and Leadership. 1(1), 1–11.

[2] Murphy, P., Ivinson, G., 2003. Pedagogy and cultural knowledge: A sociocultural perspective. Pedagogy, Culture and Society. 11(1), 5–9. DOI: https://doi.org/10.1080/14681360300200157

[3] Lantolf, J.P., Poehner, M.E., 2014. Sociocultural Theory and the Pedagogical Imperative in L2 Education: Vygotskian Praxis and the Research/Practice Divide. Routledge: New York, NY, USA. DOI: https://doi.org/10.4324/9780203813850

[4] Mutekwe, E., 2018. Using a Vygotskian sociocultural approach to pedagogy: Insights from some teachers in South Africa. Journal of Education. 71, 59–78. DOI: https://doi.org/10.17159/2520-9868/i71a04

[5] Robertson, D.J., 2022. Sociocultural pedagogy and the use of digital video in Higher Education [PhD Thesis]. The Open University: Milton Keynes, UK.

[6] Shah, R.K., 2019. Effective constructivist teaching and learning in the classroom. Shanlax International Journal of Education. 7(4), 1–13. DOI: https://doi.org/10.34293/education.v7i4.600

[7] Choudhuri, D.D., 2014. Trauma-informed teaching in higher education. Available from: https://www.emich.edu/facdev/documents/connect-23/Choudhuri%20-%20Trauma%20Informed%20Teaching.pdf (15 October 2025).

[8] Clervil, R., Guarino, K., De Candia, C.J., et al., 2013. Trauma-Informed Care for Displaced Populations: A Guide for Community-Based Service Providers. The National Center on Family Homelessness, American Institutes for Research: Waltham, MA, USA.

[9] UNESCO IITE, 2024. Digital Technologies for Inclusive Education: Recommendations for Promoting an ICT-Based Learning Environment for Resource Centres and Schools. UNESCO Institute for Information Technologies in Education: Moscow, Russia. Available from: https://iite.unesco.org/wp-content/uploads/2025/01/IITE_Publication-2_Recommendations.pdf

[10] UNESCO, 2023. Global Education Monitoring Report Summary 2023: Technology in Education: A Tool on Whose Terms? UNESCO: Paris, France. DOI: https://doi.org/10.54676/UZQV8501

[11] Ramnarain, U., Ncube, R., Teo, T., 2023. South African Life Sciences teachers' pedagogical beliefs and their influence on information communication and technology integration. Frontiers in Education. 8, 1217826. DOI:

https://doi.org/10.3389/feduc.2023.1217826

[12] Ilomäki, L., Paavola, S., Kallio, J., et al., 2023. Critical digital literacies at school level: A systematic review. Review of Education. 11(3), e3425. DOI: https://doi.org/10.1002/rev3.3425

[13] Vuorikari, R., Kluzer, S., Punie, Y., 2022. DigComp 2.2: The Digital Competence Framework for Citizens—With New Examples of Knowledge, Skills and Attitudes. Publications Office of the European Union: Luexmbourg. DOI: https://doi.org/10.2760/115376

[14] Tinmaz, H., Lee, Y-T., Fanea-Ivanovici, M., et al., 2022. A systematic review on digital literacy. Smart Learning Environments. 9(1), 22.

[15] Frasseto, L.S., da Silva, I.N., Bilessimo, S.M.S., et al., 2022. Pedagogical models focused on the integration of ICT in basic education: A systematic review. International Journal of Advanced Engineering Research and Science. 9(8), 129–136. DOI: https://doi.org/10.22161/ijaers.98.16

[16] Fernández-Otoya, F., Cabero-Almenara, J., Pérez-Postigo, G., et al., 2024. Digital and information literacy in basic-education teachers: A systematic literature review. Education Sciences. 14(2), 127. DOI: https://doi.org/10.3390/educsci14020127

[17] Sousa, R.P.D., 2016. Theories and Practices in Educational Technologies. EDUEPB: Campina Grande, Brazil. DOI: https://doi.org/10.7476/9788578793265 (in Portuguese)

[18] Glat, R., 2007. Inclusive Education: Culture and Daily School Life. 7 Letras: Rio de Janeiro, Brazil. Available from: https://buscaintegrada.ufrj.br/Record/aleph-UFR01-000822901/Details?utm_source (in Portuguese)

[19] Franco, R.M.D.S., Gomes, C., 2020. Inclusive education beyond special education: A partial review of national studies. Revista Psicopedagogia. 37(113). DOI: https://doi.org/10.5935/0103-8486.20200018

[20] UNICEF, 2017. The State of the World's Children 2017: Children in a Digital World. In State of the World's Children. United Nations Children's Fund's: Geneva, Switzerland.

[21] Pinho, T.d.S., Hornink, G.G., 2018. Use of Facebook as a support and interaction tool in the Biochemistry course. In: Hornink, G.G. (Ed.). Digital Technologies Mediating the Teaching-Learning of Sciences, 1st ed. Publisher of the Federal University of Alfenas—UNIFAL-MG: Alfenas, Brazil. pp. 45–78. (in Portuguese)

[22] Ricci, G.F.B., Barros, J.A.V.d.A., Hornink, G.G., 2018. Evaluation of digital media for the teaching of Biochemistry. In: Hornink, G.G. (Ed.). Digital Technologies Mediating the Teaching-Learning of Sciences, 1st ed. Publisher of the Federal University of Alfenas—UNIFAL-MG: Alfenas, Brazil. pp. 109–147. (in Portuguese)

[23] Hornink, G.G. (Ed.), 2018. Digital Technologies Mediating the Teaching-Learning of Sciences, 1st ed. Publisher of the Federal University of Alfenas—UNIFAL-MG: Alfenas, Brazil. Available from: https://www.unifal-mg.edu.br/bibliotecas/wp-content/uploads/sites/125/2020/05/05-TICs_2018_1.pdf (in Portuguese)

[24] Mantoan, M.T.E., 2015. Special education from an inclusive perspective: What teachers, managers, and parents say. Revista Diálogos e Perspectivas em Educação Especial. 2(1), 23–42. DOI: https://doi.org/10.36311/2358-8845.2015.v2n1.5169 (in Portuguese)

[25] Fonseca, F.F., Sena, R.K.R., Santos, R.L.A.D., et al., 2013. Childhood and adolescence vulnerabilities and Brazilian public intervention policies. Revista Paulista de Pediatria. 31(2), 258–264. DOI: https://doi.org/10.1590/S0103-05822013000200019 (in Portuguese)

[26] INEE, 2013. INEE Guidance Note on Conflict Sensitive Education. The Inter-Agency Network for Education in Emergencies (INEE): New York, NY, USA. Available from: https://inee.org/sites/default/files/resources/INEE_CSE_Guidance_Note_EN.pdf

[27] UNESCO, 2018. ICT Competency Framework for Teachers, Version 3. UNESCO: Paris, France.

[28] Minea-Pic, A., 2020. OECD Education Working Papers No. 237: Innovating Teachers' Professional Learning through Digital Technologies. OECD Publishing: Paris, France. DOI: https://dx.doi.org/10.1787/3329fae9-en

[29] Wolfenden, F., Castillo-Canales, D., Roque-Gutierrez, E., et al., 2024. A Framework for Strengthening Teacher Professional Development Systems with ICT. Foundation for Information Technology Education and Development: Quezon City, Philippines.

[30] MacDonald, R.J., 2008. Professional development for ICT integration: Identifying and supporting a community of practice through design-based research. Journal of Research on Technology in Education. 40(4), 429–445.

[31] Alves Guimarães, U., Accadrolli Gobatto, A., Bacelar Silva, L., et al., 2023. Assistive technologies and other resources: Pathways to inclusion. RECIMA21—Revista Científica Multidisciplinar. 4(7), e473579. DOI: https://doi.org/10.47820/recima21.v4i7.3579 (in Portuguese)

[32] Garrison, D.R., Anderson, T., Archer, W., 1999. Critical inquiry in a text-based environment: Computer conferencing in higher education. The Internet and Higher Education. 2(2–3), 87–105.

[33] Moore, M.G., 1993. Theory of transactional distance. In: Keegan, D. (Ed.). Theoretical Principles of Distance Education, 1st ed. Routledge: New York, NY, USA. pp. 22–29.

[34] Berge, Z.L., 1995. Facilitating computer conferencing: Recommendations from the field. Educational Technology. 35(1), 22–30.

[35] Keegan, D., 1996. Foundations of Distance Education. Routledge: London, UK.

[36] Palloff, R.M., Pratt, K., 2007. Building Online Learn-

ing Communities: Effective Strategies for the Virtual Classroom. Jossey-Bass: San Francisco, CA, USA.

[37] Malta, D.P.d.L.N., Rodrigues, C.A.D., Tenório, I.B.d.S., et al., 2024. Integration of technology in collaborative learning: Strategies and impacts on modern education. IOSR Journal of Humanities and Social Science (IOSR-JHSS). 29(6), 49–57. Available from: https://www.researchgate.net/publication/385173876_Integracao_Da_Tecnologia_Na_Aprendizagem_Colaborativa_Estrategias_E_Impactos_No_Ensino_Moderno (in Portuguese).

[38] Gierus, B., 2025. Prevalence and quality of mixed methods research in educational subdisciplines: A systematic review. SAGE Open. 15(1), 2158244025133517. DOI: https://doi.org/10.1177/21582440251335171

[39] Gonçalves, B., 2024. Challenges of Education in Mozambique in the Digital Era: From Memorisation Models to Developing Student Autonomy. Revista EDaPECI : Educação a Distância e Práticas Educativas Comunicacionais e Interculturais. 24(1). 106–119. Available from: https://dialnet.unirioja.es/descarga/articulo/9476862.pdf (in Portuguese)

[40] Aleixo, F.V.F.A., 2025. Challenges of Higher Education in Mozambique in the Digital Era. Revista Educação Em Páginas. 4(4), e17145. Available from: https://periodicos2.uesb.br/redupa/article/download/17145/10394 (in Portuguese)

[41] Krueger, R.A., Casey, M.A., 2021. Focus Groups: A Practical Guide for Applied Research, 6th ed. Sage Publications: Thousand Oaks, CA, USA.

[42] Flick, U., 2018. Triangulation in Qualitative Research: Conceptual and Methodological Strategies. Routledge: London, UK.

[43] Creswell, J.W., Plano Clark, V.L., 2022. Designing and Conducting Mixed Methods Research, 4th ed. Sage Publication: Thousand Oaks, CA, USA.