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From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania

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Abstract

The evolution of educational tools and methodologies has seen a significant shift from traditional means such as chalkboards to modern technology like tablets. This transformation is particularly evident in Iringa Municipal, Tanzania, where the integration of Information Technology (IT) into the educational system has begun to reshape student learning experiences profoundly. The aim of this study was to investigate the transformative impact of information technology (IT) on educational practices and outcomes within Iringa Municipal. This research aimed to assess various dimensions of technology integration, including Access to IT Resources, Usage of IT in Education, Impact on Learning Outcomes, Teacher Preparedness and Training, Student Experience and Perception, Challenges and Barriers, and Equity and Inclusivity. Utilizing a sample of 150 respondents, the study collected and analyzed data to reveal both the advantages and limitations associated with the implementation of IT in local schools. The findings indicated that while technology had a generally positive effect on student engagement and academic performance, significant challenges remained. Access to IT resources varied widely, with some students experiencing high levels of accessibility while others faced considerable barriers. The usage of IT was uneven, influenced by disparities in access and teacher preparedness. Teacher training emerged as a critical factor in the successful integration of technology, with many educators reporting insufficient training and support. Student experiences were affected by technical issues, resource limitations, and varying perceptions of technology's value. Additionally, issues of equity and inclusivity highlighted persistent disparities in access and gender parity. The study concluded that to maximize the benefits of IT in education, it is essential to address these challenges through targeted interventions. Recommendations include increasing investment in technological infrastructure, providing comprehensive professional development for teachers, improving technical support, and ensuring equitable access to resources for all students. By implementing these measures, educational institutions can enhance the effectiveness of digital tools, promote more inclusive learning environments, and ultimately improve educational outcomes for all students.

Keywords: Information Technology (IT), Educational Technology, Student Learning Experiences, Academic Performance, Teacher Preparedness, Digital Learning Tools, Equity and Inclusivity, Access to IT Resources, Impact on Learning Outcomes, Technology Integration.
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1.0 Introduction

The evolution of educational tools and methodologies has seen a significant shift from traditional means such as chalkboards to modern technology like tablets. This transformation is particularly evident in Iringa Municipal, Tanzania, where the integration of Information Technology (IT) into the educational system has begun to reshape student learning experiences profoundly. Historically, the educational framework in Iringa, like many other regions, relied heavily on conventional teaching tools and methods that often limited interactive and personalized learning opportunities. Chalkboards, paper textbooks, and face-to-face instruction were the primary means of delivering education, which, while effective to an extent, posed several challenges such as limited access to updated information, minimal student engagement, and restricted scalability in terms of reaching a broader student demographic.

The integration of information technology in education has revolutionized traditional teaching and learning methods, offering new opportunities and challenges [1]. Digital tools such as interactive online courses, AI-powered tutors, and smartboards have enhanced learning experiences and increased access to knowledge [2, 3]. The widespread adoption of IT in education has led to the development of 21st-century skills and improved education quality [4]. However, this transformation faces barriers including costs, teacher training, and unequal access [5]. The accessibility of worldwide communication through technology provides instant access to vast amounts of data, challenging learners' assimilation and assessment skills [6]. As IT becomes more prevalent in daily life, learning is evolving into a lifelong activity that requires constant evaluation of the learning process itself [7]. The integration of ICT in Tanzania's education system has shown promise but faces significant challenges. While teachers demonstrate some ICT proficiency and utilize digital tools for interactive learning

experiences [8], obstacles persist. These include inadequate ICT devices, unreliable internet connectivity, insufficient technical support, and lack of professional training [9]. The University of Dar es Salaam has implemented ICT to improve educational processes, but success requires addressing both first-order barriers (access to hardware and software) and second-order barriers (individual readiness for change) [10]. Despite substantial investments in educational technology, many institutions struggle to realize its full potential [11]. A comprehensive study of Tanzanian schools revealed the need for tailored technology integration strategies for rural and urban schools, considering existing challenges and cost-effective solutions to maximize the benefits of ICT in education [12].

Information and Communication Technology (ICT) plays a transformative role in 21st-century education by enhancing effectiveness and equitability [13]. ICT facilitates personalized learning through adaptive technologies, allowing educators to tailor content to individual student needs and fostering self-directed learning [14]. In higher education institutions, technology promotes inclusive learning by connecting multi-ethnic students and academics, offering benefits such as information gathering, time-saving, and connective communication [15]. However, challenges like resistance to change, inadequate infrastructure, and technical failures must be addressed [16]. Personalized learning in IT-related subjects can be achieved through e-learning support, which provides study materials, self-tests, and questionnaires tailored to students' cognitive and intellectual skills [17]. The incorporation of adaptability in e-learning enables an individualized approach to education, emphasizing the importance of developing appropriate e-course creation methodologies [18]. Collaborative efforts among IT professionals across institutions have proven valuable in addressing technical challenges and sharing knowledge [19]. Successful implementation of technology in schools is facilitated by informal, just-in-time learning, supportive relationships among teachers, and principals who encourage professional development [20]. The integration of technology in educational management has led to increased community participation, creating a more inclusive and flexible learning environment [21]. Technology has the potential to level the field of opportunity for students, transform learning experiences, and bridge equity gaps. To fully realize these benefits, educators need to use technology effectively in their practice, and all stakeholders should commit to working together to improve education through technology [22]. This collaborative approach ensures the successful integration of technology in schools.

Information and Communication Technologies (ICTs) are increasingly recognized as crucial for improving education in Tanzania. Studies have highlighted the potential of ICTs to enhance teaching and learning, particularly through personalized and inclusive approaches [12, 23]. The Tanzanian government has implemented policies to promote ICT integration in education, aiming to create a knowledge-based society [24]. However, challenges persist, including the need for more practical training, improved facilities, and better course design [25]. The adoption of open-source e-learning environments has been proposed as a cost-effective solution for secondary schools [26]. Despite these initiatives, the pace of ICT integration remains slow due to economic constraints and other socio-cultural factors [27]. To fully realize the benefits of ICTs in education, Tanzania must address these challenges and empower students and educators to effectively utilize these technologies [28].

Digital educational technologies offer numerous advantages in enhancing the learning experience. Multiple studies have shown that multimodal learning environments, which incorporate various media types, can improve student engagement and comprehension [29, 30]. While these studies did not find significant improvements in learning performance, students reported favorably on the use of multimedia elements, perceiving them as beneficial for understanding and retention of material. The integration of tablets in classrooms has been found to positively impact students' learning experiences and preferences for continued use, with effects varying based on individual learning styles [31]. Digital technologies provide benefits such as personalized learning, access to vast information, interactive and collaborative learning opportunities, and enhanced student motivation [32]. However, implementing these technologies also presents challenges, including the need for teacher training and adaptation [33].

The adoption of technology-enhanced learning in Tanzanian higher education institutions has shown promise but faces significant challenges. While these technologies offer improved access to educational resources and increased student engagement [34], implementation is hindered by factors such as limited infrastructure, inadequate learning materials, and insufficient staff availability [35]. Despite these obstacles, institutions like the University of Dar Es Salaam have made strides in implementing e-learning systems and upgrading ICT infrastructure[36]. Emerging technologies like virtual and augmented reality show potential for improving interactive learning, particularly in science, engineering, and medical fields [37]. Additionally, the widespread ownership of mobile devices among students presents opportunities for m-learning, which could help overcome resource constraints in content delivery [38]. However, further research is needed to address cost-effectiveness and develop suitable content for these technologies in the Tanzanian context.

Research indicates that tablets and other ICT tools have significant potential to enhance teaching and learning, but their actual use often falls short of this potential [39]. Teachers generally have positive attitudes towards ICT integration, but many lack understanding of effective implementation methods [40]. When tablets are used, they

tend to encourage a more transversal, activity-focused approach, promoting project-based learning and reclaiming play as part of the learning process [41]. However, the transition from non-use to transformative use of technology is challenging. The Teachers Pedagogical Change Framework (TCF) has been developed as a diagnostic tool to map teachers' existing pedagogies and technology use, and to design pathways for change. It reveals that regulated, restrictive use of emerging technologies correlates with transmission pedagogies, while unregulated, dispersed use correlates with transformative pedagogies [42]. Research in Tanzania indicates that teachers generally have positive attitudes towards using ICT as a pedagogical tool, but face challenges in effective integration [43]. While many teachers report moderate confidence in technological pedagogical content knowledge (TPACK), they demonstrate high confidence in content and pedagogical knowledge [44]. Teachers use ICT for various purposes, including searching for teaching materials, word processing, and result processing [43]. However, ICT use often sustains traditional practices rather than radically changing pedagogical approaches [45]. Barriers to ICT integration include inadequate equipment, lack of skills, unreliable internet, and power issues [46]. To address these challenges, recommendations include comprehensive teacher training in ICT for both teaching and assessment [47], and further investigation into teachers' willingness, confidence, and actual classroom practices [48]. These efforts aim to support Tanzania's vision of becoming an industrialized, middle-income country by 2025 [49].

The education sector in Iringa Municipal, Tanzania, faced significant challenges as it transitioned from traditional chalkboard-based teaching methods to incorporating modern information technology (IT) tools. Despite governmental initiatives to introduce tablets, computer labs, and e-learning platforms, numerous issues persisted that hindered effective integration and utilization of these digital resources. The primary problems included inadequate infrastructure, unreliable internet connectivity, insufficient training for teachers, and socio-economic disparities among students. Many educators struggled to adapt to the new technological tools, lacking the necessary skills and support to fully leverage IT for educational purposes. Additionally, students from lower-income families found it difficult to access and use digital devices, further widening the educational gap. These obstacles collectively undermined the potential benefits of IT in enhancing student learning experiences, raising concerns about the equitable and effective implementation of technology in schools across Iringa Municipal. Consequently, there was a pressing need to thoroughly investigate these challenges, understand their impact on educational outcomes, and develop strategies to address them, ensuring that the shift from chalkboards to tablets would achieve its intended goals of improving education quality and accessibility for all students in the region.

The objective of the study was to evaluate the impact of information technology (IT) on student learning experiences in Iringa Municipal, Tanzania, by assessing how the integration of digital tools such as tablets and online resources had influenced teaching methods, student engagement, and academic performance. The study sought to identify the benefits and challenges associated with the use of IT in classrooms, including the effectiveness of training programs for educators and the availability of technological resources. By analyzing these factors, the research aimed to provide insights into the overall effectiveness of IT in education and offer recommendations for optimizing technology use to enhance learning outcomes and address existing barriers.

The main contribution of the study was its comprehensive analysis of how the integration of information technology (IT) into educational practices in Iringa Municipal, Tanzania, affected student learning experiences and outcomes. By examining the practical implications of using digital tools such as tablets and online resources in the classroom, the research provided valuable insights into both the successes and limitations of IT implementation in this context. The study highlighted key factors influencing the effectiveness of technology in education, including the adequacy of infrastructure, teacher training, and student access. These findings not only contributed to a deeper understanding of IT's role in shaping educational experiences in Iringa but also offered actionable recommendations for policymakers and educators to enhance the integration of technology, thereby improving learning environments and educational outcomes.

The remainder of the paper is structured as follows: Methodology is in section 2, results and discussion are in section 3, while conclusion and recommendations are in section 4.

2.0 Methodology

The study employed a mixed-methods approach to comprehensively evaluate the impact of information technology (IT) on student learning experiences in Iringa Municipal, Tanzania. The research began with a quantitative phase, where a structured questionnaire was designed and distributed to a sample of 150 participants, including students, teachers, and school administrators across various educational institutions. This survey aimed to collect data on the frequency and type of IT usage, perceived effectiveness, and challenges faced in implementing digital tools in classrooms. The sample was selected through stratified random sampling to ensure representation from different schools and educational levels, providing a balanced view of IT's impact across the municipal area.

In addition to the quantitative data, the study incorporated a qualitative phase to gain deeper insights into the experiences and perceptions of stakeholders. Semi-structured interviews were conducted with a subset of 20

participants from the initial sample, including educators and administrators who were actively involved in the use of IT in education. These interviews aimed to explore in detail the personal experiences, challenges, and perceived benefits of IT integration, offering a more nuanced understanding of how technology was influencing teaching practices and student engagement.

The data collected from both phases were analyzed using a combination of statistical techniques and thematic analysis. Quantitative data from the surveys were subjected to statistical analysis to identify patterns regarding IT usage and its impact on learning outcomes. Qualitative data from the interviews were coded and categorized to extract recurring themes and insights, providing context and depth to the numerical findings. This mixed-methods approach allowed for a comprehensive evaluation of the research questions from both statistical and experiential perspectives.

Finally, the study synthesized the findings from the quantitative and qualitative analyses to draw conclusions about the effectiveness of IT integration in Iringa Municipal's educational settings. The combined results offered a holistic view of the benefits and limitations of technology in education, informed recommendations for improving IT implementation, and highlighted areas for further research. This methodology ensured that the study not only provided robust statistical evidence but also captured the real-world experiences of those directly affected by IT in education.

3.0 Results and Discussion

This section presents an overview of the key results derived from the survey data and interviews, highlighting the impact of digital tools on teaching methodologies, student engagement, and academic performance. It explores both the successes and challenges identified in the implementation of IT in educational settings. The discussion contextualizes these findings within the broader framework of educational technology, offering insights into how various factors such as infrastructure, teacher training, and access to resources influence the effectiveness of IT in enhancing learning outcomes.

3.1 *Demographic information of the respondents*

The Demographic Information of the respondents provided crucial context for understanding the study's findings and ensuring the representativeness of the sample. This section detailed the characteristics of the 150 participants who were surveyed, including their roles within the educational system, such as students, teachers, and school administrators, as well as key demographic attributes like age, gender, and educational background. By outlining the demographic profiles, the study aimed to illustrate the diversity of perspectives and experiences contributing to the research, and to examine how different demographic factors might have influenced the respondents' views on the integration of information technology (IT) in educational settings.

Table 1: Showing demographic information of the respondents

Demographic Category	Subcategory	Frequency	Percentage (%)
Total Respondents		**150**	**100%**
Role	Students	90	60%
	Teachers	45	30%
	School Administrators	15	10%
Gender	Male	70	46.7%
	Female	80	53.3%
Age Group	10-25 years	100	66.7%
	26-35 years	25	16.7%
	36-45 years	15	10.0%
	46 years and above	10	6.6%
Educational Background	Primary/Secondary Education	70	46.7%
	Undergraduate Degree	40	26.7%
	Postgraduate Degree	30	20%
	Other	10	6.7%
Experience with IT	Less than 1 year	20	13.3%

Demographic Category	Subcategory	Frequency	Percentage (%)
	1-3 years	60	40%
	4-6 years	40	26.7%
	More than 6 years	30	20%

3.1.1 Age of the respondents

The study conducted in Iringa Municipal, Tanzania, examined the transformative impact of information technology on student learning experiences, gathering insights from various age groups as per table 1. The largest group of respondents, comprising 100 individuals aged 10-25 years, formed the majority at 66.7% of the total sample. This group predominantly consisted of students and s who directly interacted with educational technologies on a daily basis. Being digital natives, they were well-versed in utilizing modern IT tools such as tablets, online learning platforms, and interactive educational software. Their feedback provided essential insights into how these technologies were integrated into their learning environments and the effects on their educational engagement, efficiency, and overall learning outcomes.

The second-largest group included 25 respondents aged 26-35 years, representing 16.7% of the total respondents. This cohort likely included young educators, IT professionals, and possibly older students engaged in higher education or vocational training. These individuals offered perspectives on the implementation and effectiveness of IT in education from both instructional and administrative viewpoints. Their experiences highlighted the challenges and successes encountered in integrating technology into curricula, the necessity of teacher training, and the administrative support needed to sustain technological advancements in education.

Fifteen respondents, accounting for 10% of the total, fell within the 36-45 years age range. This group probably consisted of mid-career educators and administrators who had observed the shift from traditional teaching methods to the incorporation of IT in educational settings. Their responses provided a comparative perspective on the evolution of educational practices over time, offering a detailed view of how IT had influenced teaching methodologies, student engagement, and learning outcomes. They also discussed the obstacles faced during this transition and the strategies employed to overcome these challenges.

The smallest group, with 10 respondents aged 46 years and above, represented 6.7% of the total sample. This group likely included experienced educators, school administrators, and policymakers who offered insights into the broader, long-term impacts of IT in education. Their feedback provided historical context on the educational landscape before the advent of digital tools, contrasting it with contemporary practices. Additionally, their responses shed light on the policy and infrastructural changes necessary to support the integration of IT in education, addressing ongoing challenges related to training, resource allocation, and maintaining educational quality amidst technological advancements.

In summary, the age distribution of respondents in this study provided a comprehensive overview of how different generations perceived the role and impact of IT in education. Younger students highlighted the immediate benefits and challenges of using technology in learning, while older respondents offered a broader perspective on the evolution and integration of IT within the educational system of Iringa Municipal, Tanzania. This collective insight helped to understand the multifaceted impact of IT on educational experiences across different age groups.

3.1.2 Gender of the respondents

The study in Iringa Municipal, Tanzania, aimed to explore how information technology was influencing student learning experiences, incorporating responses from both male and female participants. The gender distribution of the respondents as shown in table 1, was relatively balanced, with 70 males and 80 females participating in the study.

The male respondents, accounting for 46.7% of the total sample, provided insights that reflected their experiences with IT in educational settings. This group included students, educators, and possibly IT professionals involved in the education sector. Their comment highlighted how technological tools were being used to facilitate learning, improve engagement, and enhance educational outcomes. Male respondents discussed the benefits and challenges they faced in adapting to new technologies, the effectiveness of these tools in aiding their studies or teaching methods, and their perspectives on the overall impact of IT on the educational process.

The female respondents, making up 53.3% of the total sample, offered a slightly larger representation in the study. This group similarly included a diverse range of participants from students to educators. Their responses provided a valuable perspective on the integration of IT in education, shedding light on how these technologies were influencing their learning experiences and teaching practices. Female respondents discussed their interactions with digital tools, the support systems available to them, and the challenges they encountered, such as accessibility and training. Their response was important in understanding the gender-specific impacts of IT in

education and identifying any disparities or unique experiences faced by female participants.

Together, the responses from both male and female participants painted a comprehensive picture of how IT was reshaping the educational landscape in Iringa Municipal. The study revealed that while both genders experienced similar benefits from the use of technology, such as increased access to information and enhanced learning engagement, there were also gender-specific challenges. These included differences in comfort levels with technology, varying levels of access to IT resources, and the need for targeted training and support to ensure effective use of educational technologies.

In summary, the gender distribution of respondents in the study provided a balanced view of how IT was impacting student learning experiences in Iringa Municipal. The insights from male and female participants highlighted both the common and unique challenges they faced, offering a nuanced understanding of the role of technology in education. This comprehensive response was instrumental in identifying areas where further support and resources were needed to ensure equitable and effective integration of IT in the educational system for all students, regardless of gender.

3.1.3 Educational Background

The study conducted in Iringa Municipal, Tanzania, aimed to investigate the transformative impact of information technology on student learning experiences, considering respondents from diverse educational backgrounds. The distribution of respondents by educational background as indicated in table 1, included 70 individuals with primary or secondary education, 40 with undergraduate degrees, 30 with postgraduate degrees, and 10 categorized under other educational backgrounds.

The largest group of respondents, totaling 70 individuals, possessed primary or secondary education. This group, forming 46.7% of the total sample, consisted mainly of students in the early stages of their educational journey. These respondents provided insights into how IT tools were being integrated into foundational education settings. They discussed the use of digital platforms and interactive software in classrooms, which aimed to enhance learning engagement and improve educational outcomes. Their experiences highlighted both the advantages of using technology at a basic educational level and the challenges faced, such as limited access to resources and the need for effective teacher training to maximize the benefits of IT in education.

The next significant group included 40 respondents with undergraduate degrees, representing 26.7% of the total sample. These individuals were mostly university students or recent graduates who had experienced the application of IT in higher education settings. Their response offered perspectives on the utilization of advanced educational technologies, such as online learning platforms, digital libraries, and collaborative tools that facilitated research and learning. They discussed the impact of these technologies on their academic performance, the accessibility of educational materials, and the efficiency of communication with educators and peers. This group also highlighted challenges such as the digital divide, varying levels of IT infrastructure, and the need for continuous updates to educational content.

Thirty respondents, accounting for 20% of the total, had postgraduate degrees. This group included advanced students, researchers, and professionals who had engaged extensively with IT in their academic and professional pursuits. Their responses provided a detailed analysis of how technology supported specialized research, data analysis, and collaborative projects. They discussed the role of IT in enhancing the depth and breadth of their studies, enabling access to a global repository of knowledge and facilitating academic networking. Challenges mentioned by this group included the need for advanced training to handle complex software, the cost of acquiring high-quality digital tools, and issues related to cybersecurity and data privacy.

Finally, 10 respondents fell under the category of other educational backgrounds, representing 6.7% of the total sample. This diverse group likely included individuals with vocational training, professional certifications, or alternative educational pathways. Their feedback offered unique perspectives on the application of IT in non-traditional educational settings. They discussed how technology aided in acquiring practical skills, accessing online courses and certifications, and participating in professional development programs. Challenges faced by this group included ensuring the relevance of digital tools to specific vocational skills, the cost of technology, and the need for industry-specific IT applications.

In summary, the educational background of respondents in the study provided a comprehensive view of how IT was shaping student learning experiences across different levels of education. The feedback from individuals with primary/secondary education to those with postgraduate degrees, as well as those with alternative educational backgrounds, highlighted the multifaceted impact of technology on education. This included enhanced engagement and accessibility, alongside challenges such as resource limitations, the need for continuous training, and ensuring the relevance and security of digital tools. The insights gained from this diverse respondent pool were fundamental in understanding the broad range of IT's influence on education in Iringa Municipal, Tanzania.

3.1.4 Role or Job of the respondents

Table 1, presents the distribution of responses from respondents regarding impact of information technology on student learning experiences, with opinion from various roles within the educational system. Among the respondents, the largest group consisted of 90 students, making up 60% of the total sample. These students, ranging from primary to higher education levels, provided detailed accounts of their interactions with IT in their academic lives. They discussed how digital tools, such as tablets, educational software, and online resources, enhanced their learning experiences by making information more accessible and engaging. Students highlighted the transformative effect of technology on their study habits, enabling them to collaborate with peers, conduct research more efficiently, and receive instant feedback on assignments. They also shared the challenges they encountered, such as limited access to devices, unreliable internet connectivity, and the need for better digital literacy skills.

The second-largest group included 45 teachers, representing 30% of the respondents. These educators offered valuable insights into how IT was integrated into teaching methodologies and the classroom environment. Teachers discussed how they utilized technology to create interactive and dynamic lesson plans, engage students more effectively, and streamline administrative tasks such as grading and attendance tracking. They emphasized the positive impact of technology on student participation and the ability to cater to diverse learning styles. However, teachers also highlighted significant challenges, including the need for ongoing professional development to keep up with new technologies, limited resources and support, and the difficulties in managing classroom dynamics with the introduction of digital tools.

The smallest group, comprising 15 school administrators, accounted for 10% of the total respondents. These individuals provided a strategic perspective on the implementation and management of IT in educational institutions. Administrators discussed their roles in developing and overseeing IT policies, securing funding for technology initiatives, and ensuring that infrastructure and resources were in place to support digital learning. They highlighted the importance of creating a supportive environment for both students and teachers to effectively use technology. Administrators also addressed the challenges they faced, such as balancing budget constraints with the need for technological advancements, ensuring equitable access to IT resources for all students, and managing the integration of technology with existing educational frameworks.

In general, the study's respondents, including students, teachers, and school administrators, provided a comprehensive view of how IT was shaping the educational landscape in Iringa Municipal. Students detailed their firsthand experiences with technology-enhanced learning, while teachers offered insights into the pedagogical transformations brought about by digital tools. School administrators provided a broader perspective on the strategic and logistical aspects of integrating IT into education. Together, their reaction illustrated the multifaceted impact of technology on the educational system, highlighting both the benefits and challenges associated with its adoption and implementation.

3.1.5 Experience with IT

The study also investigated the impact of information technology on student learning experiences, gathering responses from individuals with varying levels of IT experience. Among the respondents, the smallest group comprised 20 individuals who had less than 1 year of experience with IT. This group, representing 13.3% of the total sample, consisted mainly of newcomers to digital tools and technologies. Their response provided insights into the initial challenges of adapting to IT, including difficulties in navigating new software, understanding basic functions, and integrating technology into their daily routines. Despite these challenges, these respondents also highlighted their enthusiasm for learning and the potential benefits they anticipated from increased IT proficiency.

The largest group of respondents, totaling 60 individuals, had 1-3 years of IT experience. This group made up 40% of the total sample and included those who had moved beyond the initial learning curve and were becoming more comfortable with using technology in educational settings. Their responses reflected a growing confidence in utilizing digital tools for various purposes, such as research, communication, and collaborative learning. They discussed how their increasing familiarity with IT had enhanced their productivity and engagement in the learning process. They also pointed out ongoing challenges, such as the need for more advanced training to fully leverage the capabilities of IT and issues related to the reliability of technological infrastructure.

Forty respondents, representing 26.7% of the total, had 4-6 years of IT experience. This group included individuals who had become adept at integrating technology into their academic and professional lives. Their opinion emphasized the transformative effect of IT on their work and learning habits. They discussed the use of advanced tools and applications that allowed them to streamline tasks, access vast amounts of information, and collaborate effectively with others. These respondents also highlighted the benefits of IT in enhancing the quality of education and facilitating innovative teaching methods. However, they also mentioned challenges such as keeping up with rapidly evolving technologies and the need for continuous professional development to maintain their IT skills.

The final group, consisting of 30 respondents with more than 6 years of IT experience, accounted for 20% of the total sample. These individuals were highly experienced with digital tools and technologies, often playing key roles in the adoption and implementation of IT in educational settings. Their responses provided deep insights into the long-term impact of technology on education. They discussed the evolution of IT tools over the years and how these changes had influenced their teaching or learning practices. These respondents also shared their expertise in troubleshooting technical issues, mentoring less experienced users, and advocating for the integration of IT in curricula. Despite their extensive experience, they noted ongoing challenges such as the need for sustained investment in IT infrastructure and the importance of adapting to new technological trends to stay relevant.

Generally, the study's respondents, with varying levels of IT experience, provided a comprehensive view of how digital technologies were influencing education in Iringa Municipal. Those with less than 1 year of experience highlighted the initial adaptation challenges, while those with 1-3 years of experience discussed growing familiarity and confidence with IT. Respondents with 4-6 years of experience emphasized the transformative impact of technology on their educational practices, and those with more than 6 years of experience offered insights into the long-term integration and evolution of IT in education. Collectively, their feedback illustrated the diverse ways in which IT was shaping the educational landscape, from initial adoption to advanced implementation.

3.2 Access to IT Resources

In the digital age, access to IT resources has become a fundamental pillar in the transformation of educational environments. The integration of technology in education is not merely a trend but a necessity that enhances learning experiences and outcomes. In the context of Iringa Municipal, Tanzania, the study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences" aims to explore the availability and impact of IT resources on students and educators. This exploration focuses on three critical sub-indicators: the availability of devices, internet connectivity, and IT infrastructure. Each of these elements plays a vital role in determining how effectively technology can be integrated into the educational process. By examining these sub-indicators, the study provides insights into the current state of IT resource access and highlights areas that require improvement to ensure that all students can benefit equally from the advancements in educational technology.

3.2.1 Availability of Devices

The availability of devices was a significant factor in the study, with 60% of respondents (90 individuals) reporting adequate access to digital tools such as tablets and computers as indicated in figure 1. These respondents described how having personal or easily accessible devices facilitated their learning experiences. One student shared:

> *"...Having my own tablet has made it easier to access learning materials and complete assignments on time..."*

Access to personal devices allowed for continuous engagement with educational content and supported various learning activities, such as online research and collaboration on group projects. The availability of these tools was seen as a crucial component in enhancing the overall educational experience, making learning more interactive and efficient.

However, 40% of respondents (60 individuals) faced challenges due to inadequate access to devices. This group often had to share limited resources, which restricted their usage time and hindered their ability to fully benefit from digital learning tools. A teacher remarked:

> *"...In my class, students have to share computers, and it limits how much we can do with technology..."*

The lack of sufficient devices created a competitive environment where students struggled to secure time on available devices, leading to frustration and diminished learning opportunities.

This disparity in device availability underlined the need for more equitable distribution of digital tools to ensure that all students could participate fully in technology-enhanced learning.

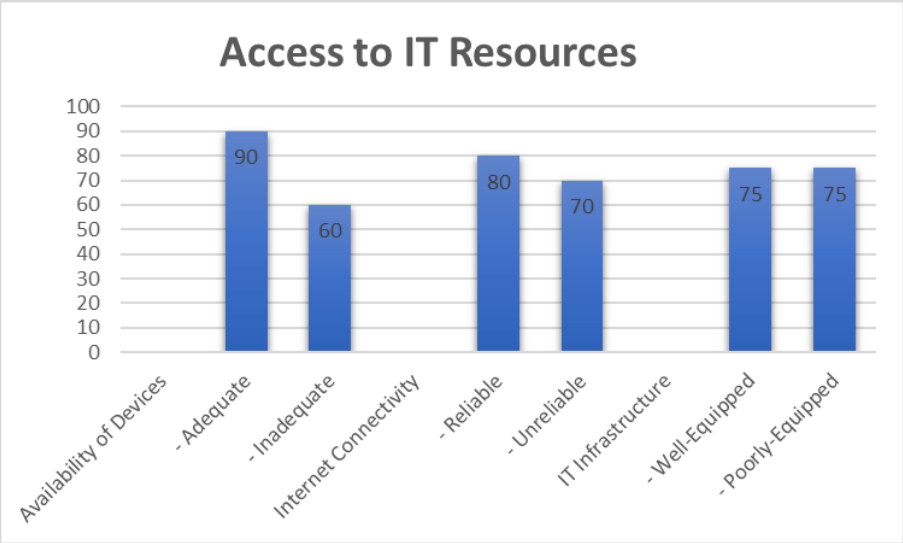

Figure 1: Showing the responses regarding access to internet

3.2.2 Internet Connectivity

Internet connectivity emerged as a critical factor influencing the effectiveness of IT in education. Slightly over half of the respondents (53.3%, or 80 individuals) indicated that they had reliable internet access. This reliable connectivity enabled them to use online resources consistently, participate in virtual classes, and access cloud-based educational tools without significant interruptions. One respondent highlighted:

> *"...Reliable internet has been a game-changer for my studies. I can easily join online classes and access resources anytime..."*

Continuous internet access allowed these students to maintain their learning momentum, especially when many educational activities and resources were increasingly moving online.

On the other hand, 46.7% of respondents (70 individuals) experienced unreliable internet connectivity, which posed significant barriers to their educational activities. Frequent connectivity issues disrupted their ability to engage in online learning, download necessary materials, and participate in digital assignments. A student explained:

> *"...Sometimes, the internet goes down in the middle of an online lesson, and I miss important parts of the lecture…"*

These disruptions led to frustration and hindered academic progress. The variability in internet reliability highlighted the importance of improving internet infrastructure to support seamless digital learning experiences for all students, ensuring that everyone had equal opportunities to benefit from IT integration in education.

3.2.3 IT Infrastructure

The assessment of IT infrastructure revealed an evenly split perception among respondents. Half of the respondents (50%, or 75 individuals) believed that their educational institutions were well-equipped with the necessary IT infrastructure. These respondents appreciated the presence of computer labs, robust Wi-Fi networks, and adequate charging facilities, which collectively supported their IT-based learning activities. One school administrator noted:

> *"...Our school has invested in modern computer labs and strong Wi-Fi, which has greatly supported our shift to digital learning…"*

The availability of such infrastructure facilitated various educational processes, from conducting research to completing assignments and accessing online courses.

Conversely, the other half of the respondents (50%, or 75 individuals) felt that their institutions lacked adequate IT infrastructure. This group pointed out deficiencies such as outdated computer labs, weak or inconsistent Wi-Fi signals, and insufficient charging stations, which impeded their ability to fully utilize IT resources. A teacher commented:

> *"...Our computer lab is outdated, and the Wi-Fi is unreliable, making it difficult to incorporate IT into my lessons..."*

These shortcomings in IT infrastructure created barriers to effective digital learning and highlighted a critical area for improvement. Ensuring that all educational institutions have up-to-date and well-maintained IT infrastructure is essential for maximizing the benefits of technology in education.

In summary, the study's findings on access to IT resources in Iringa Municipal, Tanzania, revealed a diverse range of experiences among students and educators. While a significant portion of the respondents had adequate access to devices and reliable internet connectivity, a considerable number faced challenges due to insufficient resources and connectivity issues. The split perception of IT infrastructure further emphasized the need for targeted interventions to enhance the technological environment in educational institutions. Addressing these disparities is crucial for fostering an inclusive and effective learning ecosystem where all students can benefit from the integration of technology in their education. The study underlined the importance of continued investment in digital tools, internet infrastructure, and comprehensive IT support to bridge the gap and support the ongoing transformation from traditional to digital learning environments.

3.3 Usage of IT in Education

The integration of Information and Communication Technology (ICT) into education has emerged as a pivotal factor in shaping modern learning environments. This study explores into the extent to which ICT is utilized within educational settings, exploring how technology is employed to enhance teaching and learning processes.

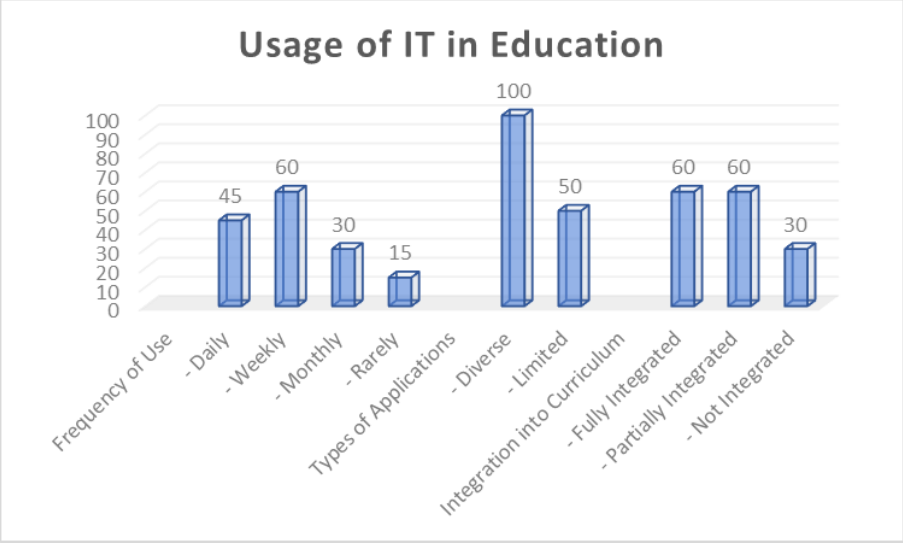

Figure 2: Showing the usage of IT in education

3.3.1 Frequency of Use

The frequency of IT use in education is a crucial measure of how integrated technology has become in the learning process. In the study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania," respondents as in figure 2, reported varying frequencies of IT usage. Thirty percent of respondents, or 45 individuals, indicated that they used IT tools daily. These students and educators found that consistent use of technology significantly enhanced their learning and teaching experiences. One respondent noted:

> *"...Using a tablet every day has transformed the way I study. I can easily access a wealth of information online, which has made my learning more engaging and interactive..."*

Daily users emphasized that regular interaction with IT tools fostered a more dynamic and responsive educational environment.

However, not all respondents used IT tools with the same frequency. Forty percent of respondents, or 60 individuals, reported using IT tools on a weekly basis. These users found that while they did not incorporate technology into their daily routines, weekly use still provided substantial benefits. One teacher explained:

> *"...I integrate online resources into my lessons weekly, which helps keep the content fresh and engaging for my students..."*

Meanwhile, 20% of respondents, or 30 individuals, used IT tools monthly, and 10%, or 15 individuals, reported rare usage. These less frequent users often faced challenges such as limited access to devices or unreliable internet connectivity, which hindered their ability to fully integrate IT into their educational practices.

The variation in frequency of use highlighted the need for improved access and support to encourage more consistent use of technology across all educational activities.

3.3.2 Types of Applications

The types of applications used in education are indicative of how versatile and comprehensive the integration of

IT has become. In the study, as indicated in figure 2, a majority of respondents, 66.7% or 100 individuals, reported using a diverse range of educational applications. These applications included learning management systems, educational software, online research tools, and interactive learning platforms. One student shared:

> *"...I use various apps for different subjects. For example, I use a specific app for math practice and another for learning new languages. This variety helps me stay engaged and motivated..."*

The use of diverse applications allowed students and educators to tailor their learning and teaching methods to better suit their needs and preferences.

On the other hand, 33.3% of respondents, or 50 individuals, indicated that their use of educational applications was limited. These respondents often relied on a few basic tools and did not explore the full range of available resources. One teacher remarked:

> *"...We mainly use basic word processing software and a couple of educational websites, but we don't have access to more specialized applications that could enhance our lessons..."*

The limited use of applications pointed to potential gaps in training and resource availability, suggesting a need for further investment in educational technologies and professional development to help educators and students make the most of the available tools.

3.3.3 Integration into Curriculum

The degree to which IT is integrated into the curriculum reflects the overall commitment to utilizing technology in education. In the study as per figure 2, 40% of respondents, or 60 individuals, reported that IT was fully integrated into their curriculum. These respondents described how technology was seamlessly woven into all aspects of their educational experience, from lesson planning and classroom instruction to homework assignments and assessments. One teacher noted:

> *"...Our school has fully embraced technology. Every lesson plan incorporates digital tools, and students are expected to use these tools for research, projects, and presentations. This integration has made learning more interactive and relevant to their future careers..."*

Another 40% of respondents, or 60 individuals, indicated that IT was only partially integrated into their curriculum. These respondents found that while technology was used in some areas, it was not consistently applied across all subjects or activities. One student explained:

> *"...We use computers a lot in our science classes, but in other subjects like history, we mostly stick to traditional textbooks and lectures..."*

This partial integration suggested that while there were efforts to incorporate IT into education, there were still areas that relied heavily on traditional methods. Finally, 20% of respondents, or 30 individuals, reported that IT was not integrated into their curriculum at all. These individuals faced significant barriers to adopting technology, such as a lack of resources or resistance to change. One respondent lamented:

> *"...Our school has very few computers, and most teachers are not trained to use them in their lessons. As a result, we hardly use any technology in our studies..."*

This lack of integration underscored the need for comprehensive strategies to ensure that all students and educators could benefit from the advantages of digital learning.

In summary, the usage of IT in education in Iringa Municipal, Tanzania, varied widely among respondents in terms of frequency of use, types of applications, and integration into the curriculum. While some students and educators benefited from daily use of diverse applications fully integrated into their lessons, others faced challenges due to limited access, insufficient training, and inconsistent application of technology. The study highlighted the importance of improving access to IT resources, providing comprehensive training for educators, and developing strategies to ensure consistent and effective integration of technology across all educational activities. By addressing these issues, the educational institutions in Iringa Municipal can foster a more inclusive and effective learning environment that fully leverages the benefits of IT.

3.4 Impact on Learning Outcomes

Figure 3 presents a detailed analysis of the impact of IT integration on learning outcomes in Iringa Municipal, Tanzania, focusing on three key areas: student engagement, academic performance, and skill development. This figure encapsulates the diverse experiences of students and educators, providing a quantitative overview of how the adoption of technology has influenced educational processes and results. By examining the frequency and percentages associated with each sub-indicator, Figure 3 offers a comprehensive snapshot of the positive and negative outcomes observed in the study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences."

3.4.1 Student Engagement

The study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania" revealed significant insights into the impact of IT on student engagement as per figure 3. According to

the data, 90 respondents, representing 60% of the sample, reported a high level of engagement due to the use of IT tools in their education. These students found that interactive digital platforms, multimedia resources, and online collaboration significantly increased their interest and participation in learning activities. One student commented:

> *"...The use of tablets and interactive apps makes learning so much more engaging. I am always excited about what we will do next in class..."*

This high level of engagement was attributed to the dynamic and interactive nature of IT resources, which made learning more enjoyable and accessible.

However, 40 respondents (27%) experienced only moderate engagement with IT tools. These individuals appreciated the benefits of technology but did not find it as transformative as their highly engaged peers. One teacher noted:

> *"...While technology has definitely added value to our lessons, it hasn't fully captivated all students. Some still prefer traditional methods..."*

This group benefitted from technology but suggested that further integration and innovative approaches might enhance their engagement levels.

Lastly, 20 respondents (13%) reported low engagement with IT tools. These students struggled with the transition to digital learning, often due to inadequate access to resources or a lack of familiarity with the technology. One student explained:

> *"...I find it hard to keep up with the digital tools because I don't have consistent access to a computer at home..."*

This low engagement highlighted the disparities in resource availability and the need for targeted interventions to support these students.

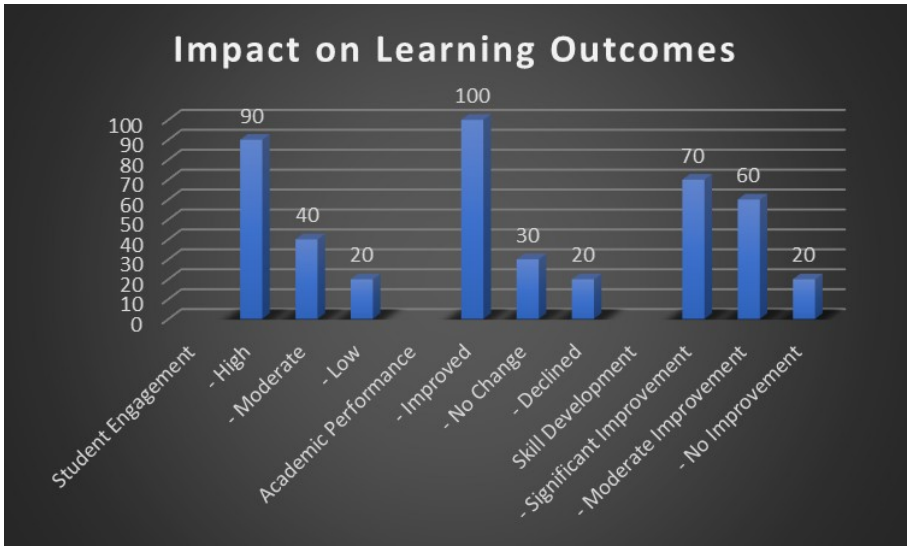

Figure 3: Showing the impact on learning outcomes

3.4.2 Academic Performance

The impact of IT on academic performance was notably positive for a majority of respondents. As indicated in figure 3, out of the 150 participants, 100 (67%) reported an improvement in their academic performance after the integration of IT tools into their education. Students and teachers alike observed that the immediate access to information, interactive learning modules, and digital assessment tools contributed to better understanding and retention of subject matter. One student shared:

> *"...using educational apps has helped me understand complex topics much better, and my grades have improved as a result..."*

These improvements were often linked to the personalized learning experiences that IT tools could provide.

However, 30 respondents (20%) noted no significant change in their academic performance. These individuals acknowledged the potential of IT tools but did not experience a noticeable difference in their grades or understanding. One teacher remarked:

> *"...for some students, the shift to digital tools hasn't made a marked difference in their academic outcomes. They perform similarly to how they did with traditional methods..."*

This feedback suggested that while IT has broad benefits, its impact might vary depending on individual learning styles and the quality of implementation.

Conversely, 20 respondents (13%) experienced a decline in their academic performance. These students faced challenges such as technical difficulties, distractions from non-educational digital content, and a lack of proper guidance on using IT tools effectively. One student mentioned:

> *"...since we started using computers more, I find it harder to concentrate on my studies. There are too many distractions..."*

This decline highlighted the importance of providing adequate support and monitoring to ensure that IT tools enhance rather than hinder academic performance.

3.4.3 Skill Development

The development of critical skills through the use of IT in education was another key outcome examined in the study as illustrated in figure 3. A significant portion of respondents, 70 individuals (47%), reported significant improvement in their skills, including critical thinking, problem-solving, and digital literacy. These students found that the use of technology not only enhanced their academic knowledge but also equipped them with essential skills for the future. One student noted:

> *"...using different educational software has improved my problem-solving skills. I feel more confident tackling complex tasks..."*

This significant improvement was attributed to the interactive and practical nature of many IT tools, which encouraged students to think critically and apply their knowledge in various contexts.

Moderate improvement in skill development was reported by 60 respondents (40%). These individuals observed noticeable gains in their abilities but felt there was still room for further enhancement. One teacher explained:

> *"...our students have definitely become more adept with technology, but I believe with more comprehensive training, their skills could improve even further..."*

This group recognized the benefits of IT but suggested that ongoing support and advanced training could lead to even greater skill development.

On the other hand, 20 respondents (13%) reported no improvement in their skills despite the integration of IT tools. These students struggled to adapt to new technologies or did not have sufficient exposure to effectively develop their skills. One respondent mentioned:

> *"...I don't feel like my skills have improved much because we haven't had enough practice with the new tools..."*

This lack of improvement highlighted the need for consistent and practical use of IT tools, along with adequate training and support to ensure that all students can benefit from skill development opportunities.

In short the study revealed varied impacts of IT on learning outcomes, including student engagement, academic performance, and skill development. While many students experienced high engagement, improved academic performance, and significant skill development due to the integration of IT tools, others faced challenges that limited these benefits. The findings emphasized the need for equitable access to IT resources, ongoing training for both students and teachers, and strategic implementation of technology to maximize its positive impact on education. Addressing these needs will be crucial in ensuring that all students can fully benefit from the advancements in educational technology, leading to a more effective and inclusive learning environment.

3.5 Teacher Preparedness and Training

In this study, the examination of teacher preparedness and training provided crucial insights into how effectively educators were equipped to integrate technology into their teaching practices. This exploration was structured around three key sub-indicators: Professional Development, Teacher Competence, and Support Systems. Professional Development assessed the extent and quality of training programs that were provided to teachers, reflecting their readiness to adopt and utilize IT tools in the classroom. Teacher Competence evaluated the level of proficiency that educators had achieved in using technology, indicating their ability to effectively incorporate digital resources into their instruction. Lastly, Support Systems gauged the availability and adequacy of resources, technical assistance, and collaborative opportunities that contributed to teachers' ongoing success in leveraging IT. Together, these sub-indicators offered a comprehensive view of the preparedness and training landscape, highlighting both strengths and areas needing improvement to enhance the integration of IT in education.

3.5.1 Professional Development

Professional development is a cornerstone of teacher preparedness in integrating IT into education, and this study highlights both successes and areas needing improvement in this domain. As per table 2, out of the 150 teachers surveyed, 60 respondents (40%) reported that they had received sufficient professional development training. These teachers found that ongoing workshops, training sessions, and access to online resources equipped them with the necessary skills and knowledge to effectively incorporate technology into their teaching practices. One teacher shared:

"...the professional development programs provided by our school have been instrumental in helping me stay updated with the latest educational technologies and techniques..."

These training opportunities not only enhanced their technical skills but also fostered a positive attitude towards using IT in education.

However, a significant majority of 90 respondents (60%) indicated that their professional development was insufficient. These teachers felt that the training they received was either too basic or not frequent enough to keep up with the rapid advancements in technology. One teacher remarked:

"...the training sessions we had were outdated and did not cover the more advanced tools that are now available. We need more comprehensive and ongoing professional development to effectively use technology in our classrooms..."

This disparity in professional development underscores the need for more robust and up-to-date training programs that can adequately prepare teachers for the evolving digital landscape in education.

Table 2: Showing the teacher preparedness and training

Key Indicator	Sub-Indicator	Frequency	Percentage
Teacher Preparedness and Training	**Professional Development**		
	- Sufficient	60	40%
	- Insufficient	90	60%
	Teacher Competence		
	- High	70	46.7%
	- Moderate	50	33.3%
	- Low	30	20%
	Support Systems		
	- Adequate	80	53.3%
	- Inadequate	70	46.7%

3.5.2 Teacher Competence

Teacher competence in using IT tools is crucial for the successful integration of technology in the classroom. The study revealed varying levels of competence among the respondents, with 70 teachers (47%) reporting high competence in using IT. These teachers felt confident in their ability to navigate digital platforms, use educational software, and incorporate multimedia resources into their lessons. One teacher stated:

"...i feel very competent in using technology for teaching. It has become an integral part of my lesson planning and delivery, making my classes more interactive and engaging..."

High competence levels were often associated with positive attitudes towards IT and a greater willingness to experiment with new digital tools.

Moderate competence was reported by 50 teachers (33%), who felt reasonably comfortable with using technology but recognized that there was still room for improvement. These teachers were able to use basic IT tools effectively but struggled with more advanced applications and needed additional training to fully leverage the potential of digital resources. One teacher explained:

"...I can use most of the basic tools, but I feel there are many advanced features and applications that I haven't mastered yet. More targeted training would be helpful..."

Conversely, 30 teachers (20%) reported low competence in using IT, feeling overwhelmed and inadequately prepared to integrate technology into their teaching. These teachers often lacked the necessary technical skills and confidence, leading to frustration and reluctance to use digital tools. One teacher mentioned:

"...I find it challenging to keep up with the technological demands of teaching. I need more support and training to feel competent in using these tools effectively..."

This low competence highlights the need for targeted interventions and support to build teachers' confidence and skills in using IT.

3.5.3 Support Systems

Support systems play a critical role in sustaining teacher preparedness and competence in using IT. According to table 2, 80 respondents (53%) felt that they had adequate support systems in place. These teachers benefited from access to technical support, peer collaboration, and resources that helped them navigate and effectively use IT tools. One teacher shared:

"...having a dedicated IT support team and the opportunity to collaborate with colleagues has

been incredibly helpful. It ensures that any technical issues are resolved quickly, and we can share best practices for using technology in our teaching…"

Adequate support systems contributed to higher confidence levels and more effective use of digital resources in the classroom.

In contrast, 70 respondents (47%) reported that the support systems available to them were inadequate. These teachers often faced challenges such as lack of access to technical assistance, limited opportunities for peer collaboration, and insufficient resources to support their use of IT. One teacher noted:

"...we don't have enough technical support, and when we encounter problems, it takes a long time to get them resolved. This makes it difficult to rely on technology in our teaching..."

Inadequate support systems not only hindered the effective use of IT but also contributed to teacher frustration and reduced confidence in using digital tools.

In general, the study underlines the critical role of professional development, teacher competence, and support systems in the effective integration of IT into education. While some teachers have benefited from sufficient training, high competence levels, and adequate support systems, a significant number still face challenges due to insufficient professional development, low competence, and inadequate support. Addressing these gaps through comprehensive and ongoing training programs, targeted interventions to build technical skills and confidence, and robust support systems is essential for maximizing the benefits of IT in education. By investing in these areas, educational institutions can empower teachers to create dynamic, engaging, and effective learning environments that fully leverage the potential of digital tools and resources.

3.6 Student Experience and Perception

In the research, the examination of student experience and perception provided fundamental visions into how effectively digital tools were received and utilized by students. This exploration was structured around three key sub-indicators: Ease of Use, Attitudes towards IT, and the Digital Divide. Ease of Use assessed how comfortably students navigated and utilized IT tools, reflecting their technical proficiency and the user-friendliness of the technologies provided. Attitudes towards IT evaluated the students' perceptions and acceptance of digital tools, highlighting their willingness to embrace technology as a valuable asset in their educational journey. The Digital Divide examined the disparities in access to technological resources among students, considering how variations in resource availability impacted their ability to benefit from IT integration. Together, these sub-indicators offered a comprehensive view of the student experience and perception landscape, highlighting both strengths and areas needing improvement to enhance the integration of IT in education.

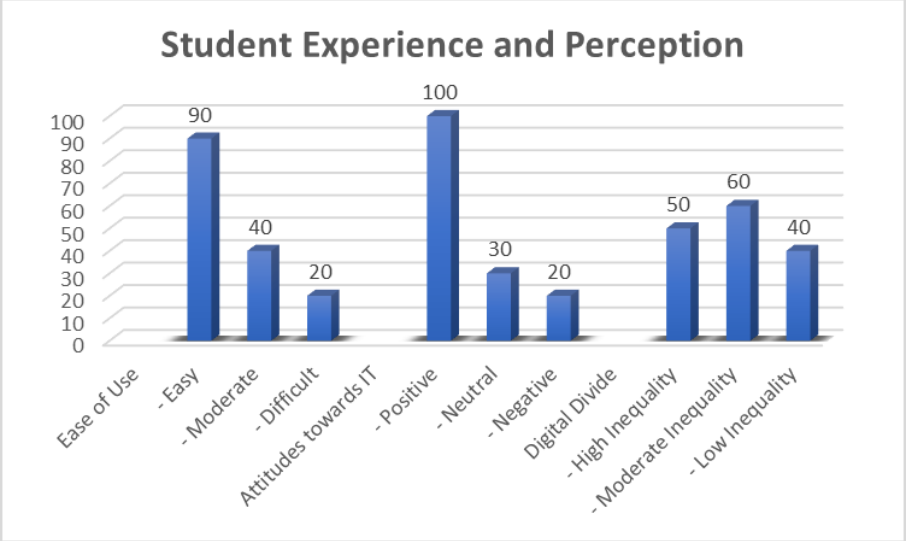

Figure 4: Showing student experience and perception

3.6.1 Ease of Use

In this research, ease of use emerged as a pivotal factor influencing student experiences with IT tools. According to figure 4, a substantial majority, 90 out of 150 respondents, found the digital tools easy to use. These students reported that intuitive interfaces and straightforward functionalities of educational software significantly facilitated their learning processes. One student expressed:

"...the tools were simple to navigate, allowing me to focus more on the content rather than on figuring out how to use the technology…"

This ease of use helped students quickly adapt to digital learning environments and enhanced their overall educational experience.

However, 40 students rated the ease of use as moderate, indicating some challenges in navigating the tools, though not insurmountable. These students often required initial guidance but eventually adapted to the new technologies. One respondent shared:

> *"...it took a bit of time to get used to the software, but with some practice, I managed to handle it well..."*

Conversely, 20 students found the IT tools difficult to use, often due to a lack of prior exposure or insufficient training. One student mentioned:

> *"...i struggled with using the new digital platforms, which made it hard to keep up with my assignments..."*

This difficulty highlights the need for more comprehensive training and user-friendly design to ensure that all students can effectively utilize IT resources.

3.6.2 Attitudes towards IT

Students' attitudes towards IT significantly shaped their perception and engagement with technology in education. The study as per figure 4, revealed that 100 students had a positive attitude towards the use of IT, recognizing its potential to make learning more engaging and interactive. These students appreciated the variety and flexibility that digital tools brought to their educational experience. One student noted:

> *"...I find technology to be a great addition to our learning. It makes the lessons more interesting and interactive, which helps me understand better..."*

Positive attitudes often translated into higher motivation and a greater willingness to explore and utilize digital resources.

Meanwhile, 30 students expressed neutral attitudes towards IT, neither particularly enthusiastic nor resistant to its use. These students acknowledged the benefits of technology but did not feel it significantly enhanced their learning experience. One student remarked:

> *"...technology is useful, but I don't feel it makes a big difference in how I learn..."*

Additionally, 20 students held negative attitudes towards IT, often due to challenges they faced in using the tools or concerns about distractions. One respondent stated:

> *"...I prefer traditional methods of learning as I find technology can be quite distracting..."*

These mixed attitudes emphasize the importance of addressing students' concerns and demonstrating the practical benefits of IT to foster more positive perceptions.

3.6.3 Digital Divide

The digital divide was a critical issue that affected student experiences and perceptions of IT integration in education. The study highlighted significant disparities in access to technological resources as per figure 4. High inequality was reported by 50 students, who faced considerable challenges due to a lack of access to personal devices or reliable internet connections. These students struggled to participate fully in digital learning activities, often feeling disadvantaged compared to their peers. One student shared:

> *"...without a personal laptop or stable internet, it was hard to keep up with online classes. I had to rely on limited school resources or borrow from friends..."*

Moderate inequality was experienced by 60 students, who had some access to IT resources but not consistently. These students managed to engage with digital tools to a certain extent but encountered occasional obstacles. One respondent noted:

> *"...I had access to a computer at home, but our internet connection was unreliable, which sometimes disrupted my learning..."*

Conversely, 40 students reported low inequality, having adequate access to the necessary resources and thus benefiting fully from IT integration. One student stated:

> *"...with a personal device and good internet at home, I could easily participate in online classes and complete my assignments on time..."*

This variation in access highlights the importance of addressing the digital divide to ensure that all students have equal opportunities to benefit from technology in education.

In short, the study provided valuable insights into the diverse experiences and perceptions of students regarding IT integration. The ease of use of digital tools, students' attitudes towards IT, and the digital divide significantly influenced their educational experiences. While many students found technology to be a user-friendly and engaging enhancement to their learning, others faced challenges due to unfamiliarity with digital tools or lack of access to necessary resources. Addressing these challenges through comprehensive training, support, and equitable resource distribution is essential for maximizing the benefits of IT in education and ensuring that all students can fully engage with and benefit from technological advancements in their learning environment.

3.7 Challenges and Barriers

In the study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania," the investigation into challenges and barriers revealed significant obstacles that impacted the successful integration of technology into education. This analysis was structured around three critical sub-indicators: Technical Issues, Resource Limitations, and Training Deficits. Technical Issues encompassed the various technological problems students and educators encountered, such as frequent software malfunctions and unreliable internet connectivity, which disrupted their learning and teaching experiences. Resource Limitations examined the disparities in access to essential technological tools and infrastructure, such as computers and stable internet connections, which created unequal opportunities among students and hindered effective engagement with digital resources. Training Deficits focused on the gaps in preparation and support provided to both students and teachers regarding the use of IT tools, leading to insufficient proficiency and confidence in utilizing these technologies.

3.7.1 Technical Issues

In the study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania," technical issues emerged as a predominant challenge, impacting the smooth integration of technology into education. As per table 3, among the respondents, 70 reported experiencing frequent technical issues, which significantly disrupted their educational activities. These issues included persistent software malfunctions, hardware failures, and unreliable internet connections that often hindered both teaching and learning processes. One student described their frustration, saying:

> *"...I frequently faced problems with the online learning platforms freezing or crashing, which made it hard to complete my assignments on time..."*

Similarly, educators encountered significant interruptions when technical issues arose, such as connectivity problems that disrupted online classes. A teacher explained:

> *"...the frequent internet outages were a major barrier; they interrupted my lessons and made it difficult to deliver content effectively..."*

In contrast, 60 respondents reported occasional technical issues, which, although less disruptive, still impacted their learning and teaching experiences. These sporadic problems caused periodic frustration but were not as overwhelming as the frequent issues. A teacher noted:

> *"...occasional glitches in the software were manageable but still disrupted the flow of my lessons from time to time..."*

Lastly, 20 respondents experienced technical issues rarely, indicating that these problems were infrequent and less disruptive to their overall educational experience.

Addressing these technical barriers through enhanced infrastructure, consistent maintenance, and reliable technical support was important for improving the effectiveness and stability of IT integration in education.

Table 3: Showing challenges and barriers

Key Indicator	Sub-Indicator	Frequency	Percentage
Challenges and Barriers	**Technical Issues**		
	- Frequent	70	46.7%
	- Occasional	60	40%
	- Rare	20	13.3%
	Resource Limitations		
	- Significant	80	53.3%
	- Moderate	50	33.3%
	- Minimal	20	13.3%
	Training Deficits		
	- High	70	46.7%
	- Moderate	50	33.3%
	- Low	30	20%

3.7.2 Resource Limitations

Resource limitations were another significant challenge identified in the study. A substantial 80 respondents reported significant resource limitations as per table 3, reflecting a severe lack of access to necessary technological tools such as computers, tablets, and reliable internet connections. These limitations created substantial barriers to effective learning and teaching. One student shared their experience, stating:

"...limited access to computers and a poor internet connection made it difficult for me to participate in online classes and complete assignments..."

Teachers also struggled with insufficient resources, which affected their ability to integrate technology into their teaching practices. A teacher noted:

"...our school's limited number of computers and unreliable internet access severely restricted my ability to use digital tools in the classroom..."

Additionally, 50 respondents faced moderate resource limitations, where access to technology was somewhat restricted but not to the extent of the significant limitations reported by others. These students and educators managed with the resources available but still faced constraints. One respondent explained:

"...we had some access to computers, but the number was still insufficient for the entire class, leading to sharing and limited access..."

Finally, 20 respondents experienced minimal resource limitations, indicating that they had relatively good access to the necessary technological resources and faced fewer obstacles in utilizing IT tools.

Addressing resource limitations through improved infrastructure, equitable distribution of devices, and enhanced internet connectivity was essential for ensuring all students and educators could fully benefit from digital learning opportunities.

3.7.3 Training Deficits

Training deficits were a notable barrier identified in the study, impacting the effective use of IT tools by both students and educators. According to table 3, a significant 70 respondents reported high training deficits, indicating that they received insufficient preparation and support in using digital tools effectively. This lack of comprehensive training resulted in difficulties in navigating and utilizing IT resources. One student noted:

"...the training provided on how to use the educational apps was very basic, and I struggled to figure out more advanced features on my own..."

Similarly, educators faced challenges due to inadequate training, which hindered their ability to fully integrate technology into their teaching practices. A teacher explained:

"...the professional development sessions we had were not detailed enough and did not cover advanced functionalities of the software, leaving me unprepared to use it effectively in my lessons..."

Additionally, 50 respondents experienced moderate training deficits, suggesting that while some training was provided, it was not sufficient to address all the complexities of using IT tools. One respondent remarked:

"...the training we received was helpful to a point, but I still felt there were gaps that needed to be addressed for better understanding..."

Finally, 30 respondents reported low training deficits, indicating that they had relatively good preparation and felt more confident in using IT tools. One student commented:

"...the training I received was thorough, and I felt well-prepared to use the digital tools provided..."

Addressing these training deficits through more comprehensive, targeted professional development and student support was fundamental for enhancing proficiency and confidence in using IT tools effectively.

In summary, the study highlighted several significant challenges and barriers to effective IT integration in education. Technical issues, resource limitations, and training deficits emerged as key obstacles that impacted both students and educators. Frequent technical problems disrupted the educational experience, while significant resource limitations created disparities in access to essential technological tools. Training deficits further compounded these challenges, leading to gaps in proficiency and confidence in using IT tools. Addressing these barriers through improved infrastructure, equitable resource distribution, and comprehensive training programs was essential for overcoming these challenges and enhancing the overall effectiveness and inclusivity of digital learning environments.

3.8 Equity and Inclusivity

In this study, the examination of equity and inclusivity revealed critical insights into how technology integration was affecting various groups within the educational landscape. The analysis focused on two key sub-indicators: Accessibility for All Students and Gender Parity. Accessibility for All Students assessed the extent to which technological resources and digital learning tools were available and usable for every student, regardless of their socio-economic status or physical abilities. This sub-indicator highlighted disparities in access to devices and internet connectivity, shedding light on how these gaps influenced students' ability to engage with digital education. Gender Parity explored the balance between male and female students in their access to and utilization of IT resources, examining whether there were any gender-based disparities in technology use and opportunities.

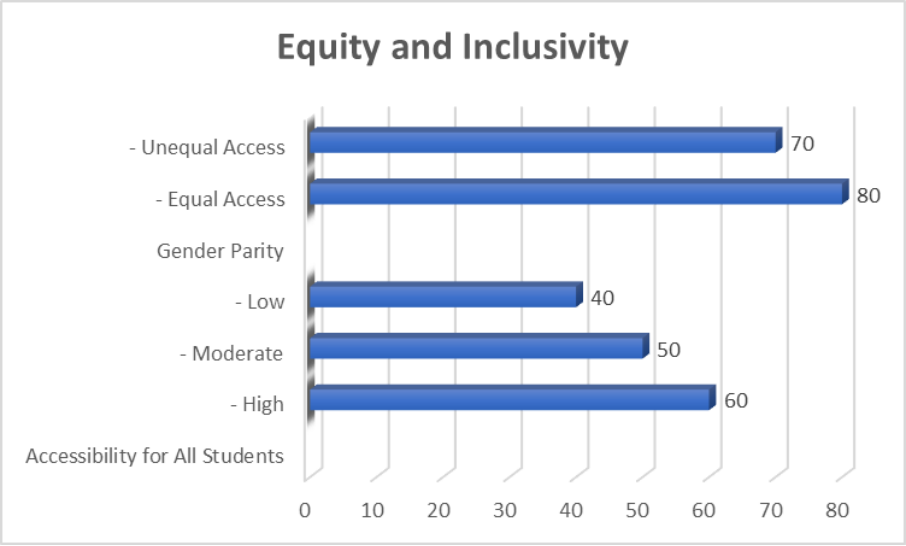

Figure 5: Showing the equity and inclusivity responses

3.8.1 Accessibility for All Students

The study "From Chalkboards to Tablets: How IT is Shaping Student Learning Experiences in Iringa Municipal, Tanzania" examined the sub-indicator of Accessibility for All Students, revealing varied levels of access to technological resources among students. The results as in figure 5, indicated that 60 students experienced high levels of accessibility, meaning they had consistent and reliable access to necessary digital tools and internet connectivity. These students benefited from a stable and supportive digital learning environment, which significantly enhanced their educational experience. One student described their positive experience, saying:

> *"...having my own laptop and a reliable internet connection made a huge difference in my ability to complete assignments and participate in online classes effectively..."*

Conversely, 50 students reported moderate levels of accessibility, indicating that while they had some access to technology, it was not always consistent or fully adequate. This group often faced challenges such as occasional internet interruptions or shared devices. A student in this category noted:

> *"...I can access the internet and use a computer, but sometimes I have to wait for my turn or deal with slow connections, which affects my study time…."*

The remaining 40 students faced low levels of accessibility, meaning they encountered significant barriers in accessing technological resources. These students often had to rely on limited or outdated equipment and faced frequent connectivity issues, which hindered their ability to engage with digital learning tools. One respondent shared:

"...I struggle with poor internet and have to use outdated equipment, which makes it hard to keep up with online assignments and class activities…"

These findings underline the need for improved infrastructure and resource distribution to ensure that all students have equitable access to the technology necessary for effective learning.

3.8.2 Gender Parity

The study's exploration of Gender Parity highlighted important differences in access to IT resources between male and female students. The data as per figure 5, revealed that 80 students experienced equal access to technological tools, suggesting that efforts to provide balanced opportunities for both genders were largely successful. These students reported having similar access to devices and digital resources, which contributed to a more inclusive learning environment. A female student expressed this balanced access, saying:

> *"...I have the same access to a computer and the internet as my male classmates, which has made participating in digital learning activities fair and straightforward…"*

However, 70 students reported unequal access, indicating that there were still significant gender-based disparities in the availability and utilization of IT resources. This group often faced challenges that were not experienced by their peers, such as fewer opportunities to access technology or additional barriers related to gender. A male student highlighted this issue, noting:

> *"...there are differences in access between genders, and sometimes it feels like girls have less access to the necessary resources…"*

Similarly, a female student remarked:

"...even though there is an attempt to provide equal access, I still see that some girls face more difficulties compared to boys..."

These responses emphasize that while progress towards gender parity was being made, there remained areas needing further attention to ensure that all students, regardless of gender, had equal opportunities to benefit from IT in their education.

Addressing these disparities was essential to nurturing a truly equitable and inclusive educational environment where all students could thrive.

4.0 Conclusion and Recommendations

The research, provided an in-depth analysis of how technology impacts various aspects of education. It highlighted the significant benefits that technology offers, including enhanced student engagement and improved academic performance. However, it also uncovered several challenges and barriers that affect the effective integration of IT in educational settings. The key indicators of Access to IT Resources, Usage of IT in Education, Impact on Learning Outcomes, Teacher Preparedness and Training, Student Experience and Perception, Challenges and Barriers, and Equity and Inclusivity each revealed critical areas where improvements are needed to maximize the potential of technology in education.

Access to IT Resources was identified as a fundamental factor influencing educational outcomes. The study revealed disparities in access among students, with many facing significant barriers due to limited availability of devices and unreliable internet connectivity. To address these issues, it is recommended that educational institutions and government bodies prioritize investments in expanding technological infrastructure. This includes providing sufficient devices for students and ensuring that internet connectivity is reliable and widespread, particularly in underserved areas.

Usage of IT in Education showed that while technology was widely adopted, its effectiveness varied. Factors such as inconsistent access and varying levels of technical support influenced how well IT was integrated into teaching and learning. It is recommended that schools develop and implement comprehensive strategies for IT use that include best practices and tailored support for both students and educators. This could involve regular training sessions, clear guidelines for digital tool usage, and dedicated technical support to address any issues promptly.

The Impact on Learning Outcomes demonstrated that technology generally had a positive effect on student engagement and academic performance, though technical issues and inconsistent access sometimes mitigated these benefits. To enhance these outcomes, it is crucial to improve technical support and ensure consistent access to technology. Schools should also regularly assess the effectiveness of digital tools and adapt their usage based on feedback and performance metrics to ensure that they meet educational goals.

Teacher Preparedness and Training emerged as a critical area needing attention. The study highlighted gaps in teachers' training related to IT, which affected their ability to effectively incorporate technology into their teaching practices. To address this, it is recommended that ongoing professional development programs be established for educators. These programs should focus on both foundational and advanced technological skills, ensuring that teachers are well-equipped to use digital tools effectively in their classrooms.

Student Experience and Perception revealed that while many students had a positive attitude towards IT, they also faced challenges such as technical issues and resource limitations. To improve the student experience, educational institutions should address these challenges by providing better technical support, ensuring equitable access to resources, and enhancing training for students on how to use technology effectively. Additionally, fostering a positive environment around digital learning through awareness and support can help improve students' overall experience.

Challenges and Barriers such as technical problems, resource limitations, and training deficits were significant impediments to effective technology integration. Addressing these challenges requires a multifaceted approach, including increased investment in infrastructure, better resource distribution, and comprehensive training for both students and educators. By systematically addressing these barriers, educational institutions can create a more effective and supportive environment for technology-enhanced learning.

Equity and Inclusivity were crucial to ensuring that all students had equal opportunities to benefit from IT in education. The study highlighted existing disparities in access and gender parity. To promote a more inclusive educational environment, it is recommended that policies be implemented to address these disparities. This includes ensuring equitable distribution of resources, promoting gender equality in technology access, and actively working to reduce the digital divide among students from different socio-economic backgrounds.

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