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E-Learning and Beyond: The Impact of IT on Modern Education

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Abstract **Original Research Article**

This study explored the impact of Information Technology (IT) on modern education, focusing specifically on e-learning in Mwanza City. With the rapid growth of digital tools and online learning platforms, the study aimed to assess the extent of IT integration in local educational institutions, evaluate the effectiveness of e-learning in enhancing student performance, and identify the challenges associated with adopting IT-driven learning methods. A mixed-methods approach was used, combining quantitative surveys and qualitative interviews with 200 respondents, including educators, students, and education officers. Findings revealed that while there was significant integration of IT in schools, challenges such as inadequate digital infrastructure, limited teacher readiness, and socioeconomic barriers affected the full adoption of e-learning. The study further demonstrated that e-learning positively impacted student academic outcomes, engagement, and satisfaction. However, barriers related to internet connectivity, device accessibility, and affordability needed to be dealt with to ensure equitable access to digital learning resources. The study concluded that the successful implementation of IT-driven learning methods in Mwanza City requires continued investment in infrastructure, teacher training, and initiatives to overcome socioeconomic disparities. The findings provide valuable insights into the potential and limitations of IT in transforming education and highlight the importance of strategic efforts to enhance digital learning accessibility and effectiveness.

Keywords: E-Learning, Information Technology (IT), Student Performance, Online Learning Platforms.

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1. INTRODUCTION AND BACKGROUND

The integration of Information Technology (IT) into education has revolutionized traditional learning methods, making education more accessible, flexible, and interactive. In the digital era, e-learning platforms, virtual classrooms, and digital resources have become essential tools in modern education, enhancing both teaching and learning experiences. As education systems worldwide embrace IT-driven innovations, the impact of these technologies on student performance, teacher effectiveness, and institutional growth continues to be a subject of interest. Mwanza City, a rapidly growing urban center in Tanzania, is experiencing a transition towards technology-enhanced education, raising important questions about the opportunities and challenges associated with this shift. This study sought to explore the influence of IT on education in Mwanza City, Tanzania, and how it is shaping the future of learning in the region.

Technology has revolutionized education, transforming traditional classroom settings and enabling learning beyond physical boundaries (Yasin *et al.,* 2024). Digital tools like virtual collaboration platforms, AI-driven systems, and online courses have enhanced engagement, personalized learning experiences, and provided global access to education (Yasin et al., 2024, Hutasuhut and Harahap, 2024). This shift allows people to pursue learning on their own terms, utilizing various technologies and platforms (Collins and Halverson, 2018). While technology offers numerous benefits, including opportunities for students with disabilities and eco-friendly distance learning options, challenges such as the digital divide, privacy concerns, and the need for teacher training persist (Yasin *et al.,* 2024, Timmers, 2018). As education continues to evolve, emerging trends like artificial intelligence, virtual reality, and gamification promise to further revolutionize teaching and learning practices (Hutasuhut and Harahap, 2024), ultimately reshaping education and fostering lifelong learning opportunities.

Educational platforms and digital technologies have

transformed the teaching-learning process, offering new opportunities and challenges in education. These platforms provide flexible access to learning resources, enabling students to engage with content anytime and anywhere (Josué *et al.*, 2023). They facilitate personalized learning experiences, adapting to individual student needs and offering customized learning paths (Josué *et al*., 2023, Da Costa et al., 2024). Digital tools enhance interaction and collaboration among students and teachers through features like discussion forums and online chats (Josué *et al*., 2023). They also provide diverse educational resources, including texts, videos, and interactive activities, enriching the learning experience (Josué et al., 2023). However, challenges persist, such as ensuring equitable access to technology and developing educators' digital skills (Da Costa *et al*., 2024). Despite these challenges, digital technologies offer significant potential to enhance teaching and learning, adapting education to the needs of students in the digital age (Josué *et al*., 2023, Da Costa et al., 2024).

The integration of Information Technology (IT) in educational institutions has become increasingly important for enhancing efficiency and effectiveness in administration and learning processes. Several studies have explored methods to assess IT integration in higher education. (Al-Alwani, 2014), proposed a survey instrument to evaluate IT integration and its impact on e-learning processes. (Meenakumari and Krishnaveni, 2011), emphasized the necessity of ICT integration in higher education administration for improved efficiency and accountability. (Dewen, 2010), focused on benchmarking IT implementation in quality education, highlighting its impact on pedagogy and student learning outcomes. (Consoli et al., 2023), reviewed various assessment tools for technology integration in schools, such as Loti, OPTIC, PETI, and TAGLIT, to aid decision-makers in selecting appropriate evaluation methods. These studies collectively underscore the importance of assessing IT integration to identify gaps, optimize performance, and inform policy decisions in educational institutions.

Research consistently demonstrates a positive correlation between student engagement in e-learning and academic performance. Studies have found that increased online interaction significantly improves examination grades, with one hour of e-learning participation potentially raising module marks by approximately one percent (Rodgers, 2008). This relationship has been observed across various disciplines, including engineering and accounting (Shah and Barkas, 2018, Krasodomska and Godawska, 2021). Association rule analysis further supports the link between higher engagement and better academic outcomes in blended e-learning environments (Moubayed *et al*., 2018). However, the impact of e-learning may vary based on personal characteristics. Some evidence suggests that female students may benefit less from e-learning materials compared to male counterparts, and overseas students might experience negative interaction effects (Rodgers, 2008). Moreover, nationality appears to influence the relationship between e-learning engagement and performance, while gender differences were not found to be significant in some studies (Krasodomska and Godawska, 2021).

The Tanzanian government has recognized the potential of ICT in education and has been actively promoting its integration in schools through national policies and initiatives since 2007 (Barakabitze *et al.*, 2015, Muhoza *et al*., 2014). However, implementation faces significant challenges, including limited infrastructure, unreliable electricity, and lack of ICT tools in schools (Muhoza *et al*., 2014, Mungwabi, 2018). Teachers' technological knowledge and skills are often insufficient, and there is a lack of awareness about government policies (Barakabitze *et al.*, 2015, Muhoza *et al*., 2014). The Dar es Salaam University College of Education is working to address these issues by equipping graduates with ICT integration skills (Mungwabi, 2018). Despite these efforts, ICT integration in Tanzanian education remains at an early stage, with most institutions not effectively using technology for administrative or academic activities (Barakabitze, 2014). Addressing these challenges requires a combined effort from educational stakeholders to improve ICT integration in the country's education system (Mungwabi, 2018).

Research on e-learning in Tanzanian higher education institutions reveals mixed findings. While e-learning has the potential to enhance student achievement and engagement (Tossy, 2017), its implementation faces challenges. Factors such as performance expectancy, ease of use, and perceived usefulness significantly affect teaching and learning performance, though perceived usefulness does not lower costs (Kisanjara, 2024). E-learning systems can positively impact academic performance, with behavioral intention playing a moderating role (Mugandila, 2023). However, the applicability of e-learning in Tanzanian universities remains limited due to poor attitudes, lack of skills, and insufficient ICT infrastructure (Innocent and Masue, 2020). However, IT based solution helps to share information successfully and timely (Mwakyeja and Kimario, 2024; Kimario and Mwagike, 2021). To improve e-learning adoption, policymakers should reformulate ICT policies to provide better facilities and create a conducive learning environment (Kisanjara, 2024). Additionally, increased government funding for ICT facilities and curriculum development from primary to higher education levels is recommended to enhance students' attitudes towards e-learning (Innocent and Masue, 2020).

The adoption of IT-based solutions in education faces several challenges for both educators and learners. Key barriers include resistance to disruptive technologies, lack of infrastructure, and insufficient guidance and support from authorities (Ilic, 2021, Sarva and Puriņa-Biezā, 2023). Educators struggle with time management, learning new digital tools, and applying them effectively in their teaching practices (Sarva and Puriņa-Biezā, 2023). Additionally, they face difficulties in collaborating with colleagues and developing a shared vision for technology integration (Sarva and Puriņa-Biezā, 2023). Despite recognizing the benefits of ICT in education, teachers often encounter obstacles in implementing it in classroom settings (Dubey and Kanvaria, 2020). To overcome these

challenges, educators require dedicated time for experimentation, practical and peer-oriented learning approaches, and ongoing support to enhance their digital competence and confidence (Sarva and Puriņa-Biezā, 2023). Further education and training for teachers are considered crucial in bridging the gap between technological progress and education (Sarva and Puriņa-Biezā, 2023). The adoption of e-learning in Tanzanian higher learning institutions faces some barriers. Poor infrastructure, including inadequate ICT facilities and low internet bandwidth, is a major challenge (Kisanga and Ireson, 2014, Mwakyusa, 2016). Financial constraints and lack of technical support also hinder e-learning implementation (Kisanga, 2015, Kisanga and Ireson, 2014). Additionally, insufficient e-learning knowledge among educators and resistance to change impede adoption (Kisanga and Ireson, 2014, Kisanga, 2015). The absence of e-learning policies in many institutions further complicates the transition (Mwakyusa, 2016). To overcome these barriers, studies recommend providing training to teachers and administrators, improving financial and technical support, and developing strategic approaches involving all stakeholders (Kisanga and Ireson, 2014). Enhancing teacher-student and student-content interactions is also suggested as a strategy to optimize e-learning involvement (Kisanga, 2015). Addressing these challenges is crucial for successful e-learning adoption in Tanzanian higher education.

The digital divide, characterized by disparities in access to and use of technology, presents significant challenges in education, particularly in developing countries like Tanzania. While urban areas generally have better access to technology compared to rural areas (Furuholt and Kristiansen, 2007), challenges such as limited access to reliable electricity and internet connectivity, lack of digital literacy among teachers and students, and insufficient infrastructure persist (Barakabitze *et al.,* 2019). In Tanzania, the integration of ICT in education faces obstacles including inadequate availability of ICT devices, unreliable internet connectivity, insufficient technical support, and lack of professional training programs (Mbawala and Lestari, 2024). These challenges are further compounded by socioeconomic factors, with students from low-income households experiencing lower levels of internet access (Afzal *et al.,* 2023). Addressing these issues requires ongoing teacher training, policy interventions to incentivize affordable data packages, and the establishment of technology resource centers in schools (Barakabitze *et al.,* 2019, Afzal *et al.,* 2023).

The adoption of IT in education has transformed learning experiences in Mwanza City, introducing e-learning platforms, digital classrooms, and interactive teaching tools. However, despite its potential to enhance accessibility and flexibility, several challenges hinder its effective implementation. Limited digital infrastructure, insufficient teacher training, inadequate funding, and disparities in internet connectivity pose significant barriers to IT integration in education. Furthermore, economically disadvantaged students struggle to access digital learning resources, exacerbating the digital divide. While IT holds promise for improving academic performance and bridging educational gaps, its uneven adoption raises concerns about equity, effectiveness, and sustainability. This study sought to explore the impact of IT on modern education in Mwanza City, analyzing the extent of e-learning adoption, challenges faced by educators and learners, and the overall effectiveness of IT-driven education in fostering a more inclusive and technology-enhanced learning environment.

The main objective of this study was to examine the impact of Information Technology (IT) on modern education in Mwanza City, with a focus on e-learning. Specifically, the study aimed to evaluate the extent of IT integration in educational institutions, analyze the effectiveness of e-learning in improving student performance and engagement, and identify the challenges faced by educators and learners in adopting IT-based solutions.

The main contribution of this study was to provide empirical insights into the impact of IT on modern education in Mwanza City, particularly in the context of e-learning adoption and integration. The study contributed to the academic discourse by highlighting the extent to which IT was utilized in educational institutions, assessing its effectiveness in improving student engagement and performance, and identifying the key challenges hindering its full adoption. Furthermore, the study offered practical recommendations for policymakers, educators, and stakeholders on how to enhance digital learning environments, bridge the digital divide, and develop strategies for effective IT implementation in education.

2. METHODOLOGY

This study adopted a mixed-methods research approach, combining both quantitative and qualitative methods to provide a comprehensive analysis of the impact of IT on modern education in Mwanza City. The research utilized surveys, interviews, and participant observations to collect data from key stakeholders, including students, teachers, school administrators, and education policymakers. A structured questionnaire was used to gather quantitative data on the extent of IT integration, student engagement levels, and challenges faced in e-learning adoption. In addition, semi-structured interviews allowed for an in-depth exploration of participants' experiences, perceptions, and insights regarding IT-driven education. Content analysis was employed to examine qualitative responses, ensuring a deeper understanding of the factors influencing IT implementation in Mwanza's education sector. The study was conducted across various primary, secondary, and higher education institutions in Mwanza City, with a total sample size of 200 respondents. The selection of participants followed a purposive and stratified sampling technique to ensure a diverse representation of educators, learners, and policymakers. The collected data were analyzed using descriptive statistics for quantitative findings and thematic analysis for qualitative insights. By employing this mixed-methods approach, the study provided a holistic view of the role of IT in education, capturing both numerical trends and personal reflections to inform policy recommendations and future strategies for enhancing digital learning environments in Mwanza City.

3. RESULTS AND DISCUSSIONS

This section presented the findings and analysis of the study, which examined the impact of IT on modern education in Mwanza City, based on data collected from 200 respondents, including students, teachers, and education stakeholders. The results were analyzed through both quantitative and qualitative methods, providing insights into the extent of IT integration, the effectiveness of e-learning, and the challenges faced in adopting IT-driven learning solutions. The discussion explored how these findings aligned with existing research and their implications for improving digital learning environments in Mwanza's educational institutions.

3.1. Extent of IT Integration in Education

This section examines the extent to which IT was integrated into the educational environment, focusing on several key factors. It explored the availability of digital infrastructure, including the accessibility of computers, internet, and e-learning platforms, as well as the frequency and scope of IT use in classrooms, particularly regarding teaching materials and digital tools. Furthermore, it assessed the proficiency of both teachers and students in utilizing IT for educational purposes. These aspects were analyzed to understand how well IT had been incorporated into the teaching and learning processes.

Table 1: Showing the extent of IT Integration in Education

Sub-Indicator	High	Moderate	Low
Availability of digital infrastructure (computers, internet access, e-learning platforms)	87	91	22
Frequency and scope of IT use in classrooms (digital tools, apps, online resources)	92	75	33
Teacher and student proficiency in using IT for educational purposes	78	95	27

3.1.1 Availability of digital infrastructure

The availability of digital infrastructure, including computers, internet access, and e-learning platforms, was one of the most critical aspects discussed by the respondents when evaluating the integration of IT in education. As per data on Table 1, a significant portion of the participants, 87 respondents, indicated a **high** availability of digital infrastructure in their respective institutions. These respondents expressed positive comments about the ongoing efforts to equip schools with modern technologies. One respondent, a teacher at a secondary school in Mwanza City, stated:

> *"...we are fortunate to have sufficient computers and reliable internet access. The provision of e-learning platforms has definitely enhanced our teaching methods. We now use digital resources that support interactive learning, making education more engaging for students..."*

This was echoed by a school headmaster who mentioned:

> *"...the school has invested heavily in computer labs, and the internet connectivity is stable. This has facilitated a shift from traditional teaching methods to more dynamic, IT-driven approaches..."*

However, 91 respondents felt that the availability of digital infrastructure was **moderate**. While these respondents acknowledged the presence of some digital resources, they emphasized that many schools still faced challenges such as outdated equipment or inconsistent internet connectivity. A teacher from a school located from Buhongwa mentioned:

> *"...although we have computers and some internet connectivity, they are often outdated and not enough to cater to all students. The infrastructure is not sufficient to keep up with the growing demand for digital learning..."*

Similarly, another respondent pointed out:

> *"...we have some e-learning platforms, but many teachers are still struggling to access them due to slow internet speeds and intermittent connectivity..."*

On the other hand, 22 respondents indicated a **low** availability of digital infrastructure. These respondents were primarily from schools that faced significant challenges in accessing basic technological resources. One respondent, a school teacher, shared:

> *"...our school has very few computers, and the internet is practically non-existent. We rely heavily on traditional teaching methods, and the lack of digital infrastructure is a huge barrier to implementing IT-based learning..."*

This view was further supported by a ward education officer, who remarked:

> *"...the disparity in infrastructure between urban and rural schools is concerning. In some areas, schools still lack the most basic IT tools, which severely limits students' access to modern education..."*

The differing levels of digital infrastructure across schools in Mwanza City highlight both the progress and the challenges that schools face in integrating IT into education. While some schools have incorporated IT integration with high availability of resources, others

continue to struggle with moderate or low infrastructure, which hinders the full realization of the potential benefits of IT in education.

3.1.2 Frequency and scope of IT use in classrooms

The frequency and scope of IT use in classrooms varied significantly among respondents, reflecting disparities in how digital tools, educational apps, and online resources were integrated into teaching and learning. Among the respondents as on Table 1, 92 reported a **high** frequency and scope of IT use, highlighting that digital tools had become an essential part of classroom instruction. These educators frequently incorporated technology into their teaching methodologies, leveraging e-learning platforms, virtual labs, and interactive applications to enhance student engagement. A secondary school teacher in a certain school situated in Majengo, Mkolani shared:

> *"...we use digital tools almost daily. Online resources such as e-books, academic websites, and learning management systems have transformed how we teach and assess students. Applications like Google Classroom and Zoom have enabled us to conduct both in-person and remote learning effectively..."*

Similarly, a university lecturer stated:

> *"...the integration of IT in our classrooms is at an advanced stage. We use video lectures, discussion forums, and simulations to reinforce theoretical concepts. This has significantly improved students' understanding and participation in class..."*

These respondents expressed that IT had not only facilitated knowledge delivery but also enhanced interaction between teachers and students, allowing for a more engaging and flexible learning environment.

However, 75 respondents indicated that the frequency and scope of IT use in classrooms were moderate. While these respondents acknowledged the benefits of IT in education, they reported inconsistencies in its application due to infrastructure limitations, technical challenges, or lack of adequate training. A teacher from Butimba explained:

> *"...we do use IT tools, but not as consistently as we would like. Some teachers are comfortable with digital platforms, while others still rely on traditional teaching methods. There is also the issue of limited access to projectors and smartboards, which makes it difficult to fully implement digital learning..."*

Another educator echoed this statement, saying:

> *"...we encourage students to use online resources for research, but due to unstable internet access, we often have to supplement digital lessons with printed materials. Sometimes, the digital content is not fully aligned with our curriculum, which limits its use..."*

These respondents pointed out that although IT had been introduced in many schools, its usage was still not fully optimized, often depending on individual teacher preferences and the availability of reliable digital infrastructure.

On the other hand, 33 respondents reported a **low** frequency and scope of IT use in classrooms, highlighting significant barriers to IT adoption in education. Many of these respondents worked in schools with limited access to digital tools, unreliable internet connections, or teachers who lacked adequate IT training. A teacher from school situated in Igoma stated:

> *"...our school has computers, but they are rarely used for teaching. The internet is slow, and most teachers are not trained in how to integrate digital tools into their lessons. As a result, IT remains an untapped resource in our classrooms..."*

Similarly, a school headmaster remarked:

> *"...we have been trying to introduce digital learning, but with only a few working computers and no regular IT training for teachers, its usage is minimal. Most lessons are still conducted using chalkboards and printed textbooks..."*

These respondents emphasized that while IT integration was a priority, several challenges, including lack of funding, inadequate teacher training, and insufficient digital resources, had hindered its widespread implementation.

The study revealed a mixed level of IT usage in classrooms across Mwanza City. While some schools had successfully integrated digital tools into daily teaching practices, others faced barriers that limited the frequency and scope of IT utilization. The findings accentuated the need for continuous investment in IT infrastructure, teacher training, and policy reforms to bridge the digital divide and ensure that all students benefit from modern educational technologies.

3.1.3 Teacher and student proficiency in using IT for educational purposes

The proficiency of teachers and students in using IT for educational purposes varied according to data on Table 1, across different schools in Mwanza City, reflecting disparities in digital literacy, training opportunities, and exposure to technology. Among the respondents, 78 indicated a high level of proficiency, highlighting that both teachers and students had developed significant competence in utilizing digital tools for teaching and learning. Many teachers in this category had undergone formal IT training or self-learning initiatives, enabling them to integrate technology seamlessly into their classrooms. A secondary school teacher who had received specialized IT training explained:

> *"...I have been using digital tools for several years now. Platforms like Google Classroom, Microsoft Teams,*

and Zoom have become part of my teaching routine. I also encourage students to use online resources, such as academic databases and e-books, to supplement their studies. Many of my students have adapted well to these tools, and they even help each other navigate digital learning platforms…"

Similarly, a university professor emphasized the growing IT competence among students, stating:

"…our students are very comfortable with IT-based learning. Most of them are proficient in using e-learning systems, submitting assignments through digital platforms, and participating in online discussions. This has made the learning process more dynamic and interactive…"

These respondents highlighted that consistent IT training and frequent exposure to digital tools had enabled both teachers and students to develop high proficiency levels, ultimately improving the effectiveness of IT in education.

However, 95 respondents reported a moderate level of proficiency, indicating that while teachers and students had some familiarity with IT, they still faced limitations in fully utilizing digital tools for educational purposes. Some teachers in this group had only received basic IT training, and their use of technology was often limited to specific applications, such as PowerPoint presentations or simple online quizzes. A primary school teacher from school situated in Kirumba explained:

"…I use IT in my lessons, but I am not confident in utilizing all the available digital tools. I mainly rely on pre-prepared teaching materials from the internet, but I struggle with creating my own interactive content. Some students are very good with technology, but others still need a lot of guidance…"

Another respondent, a school head teacher, pointed out the variation in IT skills among teachers, saying:

"…while some teachers have adapted well to using technology in the classroom, others are still hesitant. They may know how to operate a computer, but they lack the confidence to integrate IT into their lessons effectively. More training is needed to ensure that all educators are at the same level…"

From the student viewpoint, some learners were proficient in using basic digital tools, but their ability to navigate complex online learning platforms remained inconsistent. A secondary school student from a school located at Mkuyuni admitted:

"…I know how to use a computer and access study materials online, but sometimes I struggle with technical issues. If I encounter a problem in an e-learning system, I often need help from my teacher or classmates…"

These findings suggested that while many teachers and students had moderate IT proficiency, additional training and hands-on experience were necessary to enhance their digital literacy and confidence.

On the other hand, 27 respondents indicated a low level of IT proficiency, revealing significant challenges in digital literacy among both teachers and students. Many of these respondents were from schools with limited access to digital infrastructure or lacked exposure to consistent IT training. A teacher from a rural school admitted:

"…I have never received formal IT training, and I find it very difficult to use digital tools in my lessons. We rarely use computers or online resources, so most of my teaching is still done using traditional methods..."

Another respondent, a secondary school student, shared similar difficulties, stating:

"…I have never used an online learning platform before. We do not have enough computers at school, and at home, I do not have access to the internet. I would like to learn more about digital tools, but there are no opportunities for training…"

A head teacher further emphasized the gap in IT proficiency, explaining:

"…many of our teachers and students lack basic IT skills. Even when we introduce new technology, it takes time for them to adapt because they have not been trained properly. Without continuous support and training programs, IT integration will remain a challenge in our school…"

These responses highlighted the urgent need for structured IT training programs, better resource allocation, and policy interventions to ensure that teachers and students across different schools could develop the necessary skills to benefit from digital education.

The study revealed a mixed level of IT proficiency among teachers and students in Mwanza City. While some had successfully adapted to digital learning, others faced barriers such as limited training, lack of confidence, and inadequate infrastructure. The findings emphasized the importance of continuous IT capacity-building initiatives, ensuring that both teachers and students were equipped with the necessary digital skills to fully integrate IT into the educational system. Addressing these differences through targeted training programs and better access to technology would be essential for bridging the digital divide and enhancing the overall effectiveness of IT in education.

3.2 Effectiveness of E-Learning in Enhancing Student Performance

The effectiveness of e-learning in enhancing student performance was evaluated by examining improvements in academic outcomes, levels of student engagement, and overall satisfaction with digital learning methods. The findings exposed that while many students experienced positive academic progress through e-learning, the extent of improvement varied based on accessibility to digital resources and familiarity with online platforms. Some students demonstrated higher engagement levels, actively participating in virtual

discussions and utilizing online study materials, whereas others struggled with motivation and adaptability. Moreover, student satisfaction with e-learning methods depended on factors such as the quality of instructional design, interaction with teachers, and the availability of technical support.

Table 2: Showing the Effectiveness of E-Learning in Enhancing Student Performance

Sub-Indicator	Very Effective	Moderately Effective	Ineffective
Improvement in student academic outcomes (grades, test scores)	95	80	25
Levels of student engagement in online learning	88	95	17
Student satisfaction with e-learning methods	100	70	30

3.2.1 Improvement in student academic outcomes

The study examined the effectiveness of e-learning in improving student academic outcomes, particularly in grades and test scores. Findings as on Table 2, indicated that a majority of students (95) found e-learning very effective, while 80 considered it moderately effective, and 25 reported it as ineffective. The factors influencing these results included accessibility to digital learning materials, adaptability to online education, and the level of interaction with educators.

Many of those who found e-learning very effective (95) attributed their academic success to the availability of digital resources and the flexibility to learn at their own pace. One teacher emphasized the significant impact of e-learning on high-performing students, stating:

> *"…among my students, I noticed that those who actively engaged with e-learning platforms showed remarkable improvement in their test scores. Out of my 40 students, at least 25 improved their grades by one or two levels after consistently using digital learning tools…"*

Another educator noted:

> *"…in a class of 50, about 30 students benefited greatly from e-learning because they could access recorded lessons and supplementary quizzes that reinforced classroom learning…"*

These accounts were echoed by students themselves, as one respondent explained:

> *"…I used online practice tests almost daily, and my grades improved from a C to an A in just one term. At least 10 of my classmates had a similar experience…"*

However, 80 students found e-learning only moderately effective, primarily due to limitations such as lack of direct teacher interaction and technical challenges. One student noted:

> *"…in my class of 45 students, around 20 of us faced issues with internet disruptions, which sometimes made it difficult to complete assignments or attend live lessons..."*

Another learner shared:

> *"…I found online learning helpful for reviewing concepts, but without in-person guidance, I struggled to stay motivated. About 15 of my friends felt the same way, especially when it came to subjects like science and mathematics that required hands-on practice…"*

Some teachers also recognized this pattern, with one stating:

> *"…out of the 60 students I teach, around 25 benefited from e-learning, but another 20 needed additional support, as they found the digital format somewhat limiting…"*

For the 25 students who found e-learning ineffective, challenges such as digital literacy, engagement, and lack of discipline in self-paced learning were major obstacles. A school headmaster observed:

> *"…from a group of 35 students in one class, at least 10 struggled significantly because they lacked the self-discipline needed for independent learning…"*

Similarly, one student admitted:

> *"…without face-to-face interaction, I often lost track of my studies. In my group of 20 classmates, at least eight of us found it hard to concentrate without a teacher's direct supervision…"*

Another respondent mentioned:

> *"…technical issues, including poor internet and device failures, were a major setback. At least 7 of my classmates missed important lessons because of such problems…"*

These findings suggested that while e-learning was highly effective for many students, its overall success depended on factors such as technological accessibility, student motivation, and the ability to maintain engagement. For schools to maximize the benefits of digital learning, it was essential to enhance digital infrastructure, provide training for both teachers and students, and develop interactive content that maintained student interest and participation.

3.2.2 Levels of student engagement in online learning

The study assessed the levels of student engagement in online learning, revealing as per Table 2,

that 88 students found it very effective, 95 considered it moderately effective, and 17 reported it as ineffective. Engagement in e-learning was influenced by various factors, including the availability of interactive digital content, teacher involvement, and students' self-discipline. Those who found e-learning highly engaging attributed it to the interactive nature of digital tools, personalized learning experiences, and the ability to collaborate with peers through online platforms. A teacher from one of the secondary schools in Nyamaghana explained:

> *"…in my class of 50 students, at least 30 were highly engaged in online learning because they could interact with multimedia resources, such as videos, quizzes, and discussion forums. They even formed study groups on digital platforms, which improved their collaboration and understanding of difficult subjects…"*

Another educator highlighted the role of interactive features, stating:

> *"…In my experience, around 20 out of my 40 students responded well to e-learning because they could revisit recorded lessons and participate in live discussions. This flexibility allowed them to learn at their own pace without feeling overwhelmed…"*

A student echoed this sentiment, saying:

> *"…I found e-learning very engaging because I could choose when and how to study. At least 10 of my classmates agreed that having control over our learning schedules kept us more focused and motivated..."*

However, 95 students considered online learning only moderately effective in terms of engagement, citing challenges such as distractions, lack of face-to-face interaction, and inconsistent motivation. One respondent noted:

> *"…in my class of 45 students, about 20 found e-learning useful but struggled with staying focused due to social media distractions and household responsibilities..."*

Another student shared:

> *"…the online format was engaging at times, but without a teacher physically present, it was easy to lose track of assignments. Around 15 of my classmates faced similar issues, especially during long virtual lectures..."*

Some teachers also observed mixed engagement levels, with one stating:

> *"…out of 60 students in my class, around 25 remained consistently engaged in e-learning, while another 20 struggled to maintain focus due to various external distractions…"*

For the 17 students who found e-learning ineffective in terms of engagement, the lack of in-person interaction, technical issues, and difficulties in maintaining self-discipline were the main obstacles. One teacher from Sangabuye (Ilemela District) observed:

> *"…In a group of 35 students, at least 8 lost interest in online classes entirely because they found the digital environment too impersonal…"*

Another respondent stated:

> *"…without a teacher physically present, I often felt disconnected from the lessons. At least 6 of my classmates also mentioned that they found it difficult to stay engaged without direct supervision and immediate feedback…"*

A school principal highlighted the issue of technological barriers, saying:

> *"…in one of our classrooms with 40 students, about 10 struggled with engagement simply because they had unreliable internet access, which made it difficult to follow lessons consistently…"*

These findings suggested that while e-learning offered a high level of engagement for many students, factors such as interactive content, teacher involvement, and self-discipline played crucial roles in maintaining student focus. To enhance engagement levels, schools needed to implement strategies such as blended learning approaches, interactive lesson designs, and digital literacy training to help students adapt to the online learning environment more effectively.

3.2.3 Student satisfaction with e-learning methods

The study as shown on Table 2, also explored student satisfaction with e-learning methods, revealing that 100 students found e-learning to be very effective, 70 considered it moderately effective, and 30 found it ineffective. The students who were highly satisfied (100) with e-learning emphasized the flexibility and convenience it provided, allowing them to learn at their own pace, access resources at any time, and engage with interactive content. A respondent from Advanced level school who used online platforms very often like NECTAPrep and Learning Hub Tanzania, explained:

> *"…for me, e-learning was very effective because I could study at my own pace. I didn't have to rush through lessons, and I could review the material as many times as I needed. Many of my classmates felt the same, especially with the added benefit of accessing course materials anytime and anywhere…"*

Another student added:

> *"…the interactive quizzes, videos, and discussion boards helped me engage with the lessons much better than traditional methods. I could see my progress and receive instant feedback, which was really motivating..."*

On the other hand, 70 students reported a moderately

positive experience, indicating that while e-learning offered several advantages, it still had room for improvement. One student shared:

> *"...e-learning was good in terms of flexibility and materials, but I sometimes felt isolated. The lack of physical interaction with my teachers and classmates made me miss the dynamics of a traditional classroom..."*

Another student echoed similar sentiments, saying:

> *"...I liked the convenience of e-learning, but I often struggled with staying motivated and managing my time effectively. Some of my friends felt the same way, especially when it came to long online lectures or assignments with no direct support from the teacher..."*

Teachers also noticed mixed levels of satisfaction, with one educator commenting:

> *"...while many students appreciated the flexibility of e-learning, they still struggled with engagement and participation, particularly in classes with little face-to-face interaction..."*

The 30 students who rated e-learning as ineffective in terms of satisfaction mainly pointed to challenges such as lack of direct communication with teachers, technical issues, and the absence of social interaction with peers. One respondent expressed:

> *"...I just couldn't enjoy e-learning because I missed the teacher-student interaction. I felt like I was on my own, and whenever I faced technical issues, it made things worse..."*

Another student said:

> *"...I struggled with understanding some of the lessons because there was no one to ask questions directly. It became overwhelming at times, especially when I had problems with the internet or accessing materials..."*

A teacher described the situation from their perspective:

> *"...I had students who found e-learning quite frustrating because they couldn't reach out for immediate help. Some struggled with the technology, and others just didn't feel comfortable with the online format. At least 10 of my students stopped participating actively in the online lessons..."*

The study generally, found that while e-learning was generally well-received, there were significant gaps in terms of social interaction, technical issues, and the need for more interactive features. The data highlighted that for e-learning to be more effective and satisfactory, it needed to offer greater support for students who struggled with technology, more opportunities for real-time interaction, and better strategies to keep learners engaged throughout the learning process. By addressing these challenges, schools could improve the overall satisfaction and performance of students in the e-learning environment.

3.3 Challenges in Adopting IT-Driven Learning Methods

The study dug into the challenges faced in adopting IT-driven learning methods, identifying key barriers that hindered effective integration of technology in education. These challenges included technological barriers, such as poor internet connectivity and limited availability of devices, which affected both students and teachers. Moreover, the readiness and training of teachers in integrating IT into their teaching practices were found to be inadequate, limiting the effective use of digital tools. Socioeconomic factors also played a significant role, with disparities in access to devices and the affordability of technology creating further obstacles for both educators and learners in fully embracing IT-driven learning methods.

Table 3: Showing the challenges in Adopting IT-Driven Learning Methods

Sub-Indicator	Major Challenge	Minor Challenge	No Challenge
Technological barriers (internet connectivity, device availability)	110	70	20
Teacher readiness and training in IT integration	92	85	23
Socioeconomic factors (access to devices, affordability)	105	68	27

3.3.1 Technological barriers

The study revealed that technological barriers, particularly internet connectivity and device availability, were major challenges in adopting IT-driven learning methods. According to data on Table 3, out of 200 respondents, 110 considered these barriers to be major challenges, 70 identified them as minor challenges, and 20 reported no challenges at all.

The respondents who cited technological barriers as a major challenge (110) shared that poor internet connectivity was the primary factor hindering their engagement with online learning platforms and digital resources. One teacher explained:

> *"...the internet connection in our area is very unstable, and during live sessions, students often get disconnected. This significantly disrupts the flow of lessons and leaves some students behind..."*

Another teacher added:

> *"…students are often frustrated because the speed of the internet makes it hard for them to access materials or attend classes without interruption. Even simple things like watching a video or downloading notes can take forever…"*

Several students also expressed similar concerns. A respondent from O-level secondary school remarked:

> *"…Internet connectivity is the biggest issue for us. Even when we have the devices, they become useless if the internet is down or too slow to load anything. It has made online learning very frustrating at times…"*

Another student shared:

> *"…sometimes, I have to go to a café or a friend's house just to get a better internet connection. This costs extra money and takes up my time, which could be better spent studying..."*

These comments reflected the widespread response that internet connectivity was a significant barrier that hampered both the quality and effectiveness of IT-driven learning.

Regarding device availability, many respondents noted that a lack of sufficient devices, both for teachers and students, further exacerbated the challenges of adopting IT-driven methods. A teacher noted:

> *"…not all students have access to a personal device. Some students have to share one device with multiple siblings, which makes it difficult for them to participate in lessons consistently…"*

Another teacher added:

> *"…the school has a limited number of computers and tablets for student use. During classes, students often have to wait for their turn to use a device, which slows down the learning process…"*

This lack of access to devices was particularly evident in rural areas, where affordability and availability were key obstacles.

However, 70 respondents considered these technological barriers to be a minor challenge. These respondents were in more urbanized areas like Isamilo (Nyamaghana), Kirumba (Ilemela District), Nyakato (Ilemela District), with better internet access or had better access to personal devices. One teacher from school located in one of those areas shared:

> *"…although we do have some issues with the internet, they are not as frequent as in other areas. Our students generally have their own smartphones or computers, so the lack of devices is less of an issue for us…"*

Similarly, a student in those locations mentioned:

> *"…while internet problems occasionally arise, I usually have a device to work with, so I can catch up on missed lessons…"*

Despite these minor challenges, 20 respondents reported no significant challenges in terms of technological barriers. These individuals were fortunate enough to have reliable internet connections and access to personal devices, which allowed them to fully engage in IT-driven learning. One student stated:

> *"…I have a stable internet connection at home and a personal laptop, so I haven't faced any problems with online learning…"*

Similarly, a teacher said:

> *"…the school is well-equipped with devices for both teachers and students, and we don't experience much trouble with connectivity, so we can fully embrace digital tools in our teaching..."*

The study found that while technological barriers such as poor internet connectivity and limited device availability posed significant challenges for many respondents, a smaller group of individuals did not face these issues, mainly due to their geographic location or personal access to technology. Dealing with these challenges would require investment in improving infrastructure and increasing access to devices, particularly in rural areas, to ensure that all learners can fully benefit from IT-driven learning methods.

3.3.2 Teacher readiness and training in IT integration

The study highlighted that teacher readiness and training in IT integration was another critical challenge in adopting IT-driven learning methods. A significant number of respondents 92 out of 200 considered this a major challenge, while 85 identified it as a minor challenge, and 23 reported no challenge at all as presented on Table 3.

The teachers who viewed this as a major challenge (92) shared their concerns about their limited knowledge and experience with integrating technology into their teaching practices. One teacher remarked:

> *"…we were never trained on how to use digital tools in the classroom. The idea of integrating IT into our lessons was introduced, but we were left to figure it out ourselves. It's overwhelming, and often, we don't know where to start…"*

Another teacher added:

> *"…there is a real gap in our training. We have basic computer skills, but when it comes to applying technology for teaching especially interactive tools or managing online classes we struggle to make the most of it…"*

These comments reflect a common feeling of inadequacy among educators when it comes to effectively utilizing technology in the classroom, especially without sufficient training or professional development opportunities.

A significant portion of the teachers expressed that a lack of structured training and professional development had made it difficult for them to adapt to the demands of IT-driven education. One teacher shared:

"…we were given a few workshops on using basic tools,

but there was no follow-up or deep dive into how to use technology for active learning or creating engaging online content. We're just not confident in using IT to its full potential..."

Also, some teachers pointed out the need for continuous support and guidance, especially in understanding how to integrate new educational technologies. A secondary school teacher noted:

> *"...IT is always changing, and so are the tools we are supposed to use. It's not enough to have one training session; we need ongoing support, a community of practice, or resources to help us keep up with new technologies..."*

On the other hand, 85 respondents identified teacher readiness and training as a minor challenge. These teachers acknowledged that while they faced some difficulties in integrating technology, they had received some form of support or had experience in using IT tools in their teaching. A respondent from a well-equipped school in Mahina noted:

> *"...I think I have a better understanding of how to incorporate IT because I've had more exposure to training and workshops. Still, there are times when I feel overwhelmed with the different tools and platforms available..."*

Another teacher from the same setting mentioned:

> *"...although I can use basic digital tools, I still struggle with complex applications, like interactive software. But overall, it's manageable, and I keep learning through trial and error..."*

However, 23 respondents reported no significant challenge in terms of teacher readiness and training. These respondents were either more experienced in IT integration or worked in schools that had invested significantly in professional development programs. One teacher from a technology-forward institution in Majengo, Mkolani stated:

> *"...at our school, we regularly attend professional development sessions on using IT in education. Our IT department also provides continuous support, so I never feel left behind in terms of technology integration..."*

A respondent from a private school shared:

> *"...we have been using e-learning tools for years now. I was trained early on, and now I help others in the school who are less confident. I can easily integrate technology into my lessons without facing any challenges..."*

The study revealed that while there were some teachers who had received sufficient training and felt confident in using IT, a significant portion faced challenges due to insufficient preparation or lack of ongoing professional development. The findings stress the importance of structured and continuous training programs to equip educators with the skills necessary to effectively integrate technology into their teaching practices. Ensuring that teachers have the support they need will be crucial for the successful adoption of IT-driven learning methods.

3.3.3 Socioeconomic factors

The study as illustrated on Table 3, also revealed that socioeconomic factors, particularly access to devices and affordability, presented a significant challenge in adopting IT-driven learning methods. A total of 105 respondents considered this a major challenge, 68 identified it as a minor challenge, and 27 reported no challenge at all.

For many, the inability to afford necessary devices, such as computers, tablets, and reliable internet services, significantly hindered the integration of technology into their learning environments. One respondent, a teacher from Buswelu (Ilemela District), emphasized:

> *"...the biggest barrier we face is the cost. Most of our students cannot afford personal laptops or even smartphones. Without these devices, it's hard to expect them to participate fully in e-learning..."*

Another teacher shared similar concerns, saying:

> *"...many of our students can't even afford internet bundles to access online materials. So, even when we have digital tools at school, students can't benefit from them outside of class..."*

This indicates that, despite the potential of IT to revolutionize learning, the affordability gap remained a fundamental issue in many schools, especially those located in less economically developed areas.

Additionally, a teacher from one school in Pansiasi (Ilemela District) highlighted how affordability affected both students and educators. And he stated that:

> *"...while students may struggle with devices, as teachers, we too face similar challenges. Not every teacher has a personal laptop or a stable internet connection at home, which is crucial for planning lessons, accessing resources, and engaging with students outside of class hours. Without access to technology, we cannot fully implement IT-driven methods in our teaching..."*

This insight from educators pointed to the wider issue of digital equity, where disparities in socioeconomic status led to unequal access to learning opportunities. The concern over affordability was not only about personal devices but also about the financial limitations that prevented many schools from upgrading infrastructure, such as high-speed internet connections, digital content, and e-learning platforms.

However, some respondents viewed these challenges as less severe. A portion of teachers 68 out of 200 identified the issue as a minor challenge. These respondents often worked in better-resourced schools, where access to devices and the internet was relatively more stable. One teacher remarked:

> *"...in our school, the administration has done a good job of providing computers and internet access. It's still a challenge*

for some families to afford devices at home, but we try to support them through programs like device loans or internet scholarships…"

Another teacher from a school in Nyamagana (Nyamagana District) mentioned:

"…although some of our students don't have the latest technology at home, we are lucky to have computers in our school. We also allow students to use school devices for assignments and lessons. It doesn't solve everything, but it helps..."

These responses indicated that in more affluent or better-equipped schools, the socioeconomic challenge was more manageable.

A small proportion of teachers 27 out of 200 reported no challenge related to socioeconomic factors. These teachers generally worked in private or well-funded institutions where students and teachers had access to the necessary technological resources. One respondent from a Calfonia Hills Secondary School shared:

"…our school provides laptops for all students, and we have high-speed internet. The socioeconomic factor doesn't really come up here because the school covers the costs. It makes IT integration so much smoother and more effective…"

Another teacher noted:

"…our students are generally from middle-income families, so they can afford the devices and internet connections needed for e-learning. This is a huge advantage for both students and teachers..."

The study's findings accentuate the profound impact of socioeconomic factors on the adoption of IT-driven learning methods. Access to devices and affordability emerged as significant barriers for a large portion of students, particularly in rural and economically disadvantaged areas. While some schools with adequate resources managed to integrate technology more effectively, the disparity in access to devices and the internet continues to hinder the potential for equitable IT integration across educational institutions. Dealing with these socioeconomic challenges would require targeted interventions, such as subsidies for low-income families, school-based device lending programs, and partnerships with telecom companies to improve internet accessibility. Only by dealing with these foundational issues can schools truly leverage the potential of IT to enhance learning opportunities for all students, regardless of their socioeconomic background.

4. CONCLUSION AND RECOMMENDATIONS

The study revealed the significant impact of IT on modern education, particularly in the context of e-learning in Mwanza City. The findings showed that while there was considerable IT integration in educational institutions, areas such as the availability of digital infrastructure, the frequency and scope of IT use, and the proficiency of both teachers and students in using IT still required further development. IT positively influenced student performance, especially in terms of academic outcomes, engagement, and satisfaction with e-learning methods. However, several challenges were identified, hindering the full adoption of IT-driven learning methods, particularly related to technological barriers, teacher readiness, and socioeconomic factors such as access to devices and affordability. The study confirmed that the effectiveness of e-learning in enhancing student performance was significantly influenced by the extent of access to and integration of IT tools and platforms into the learning environment. Challenges like limited access to devices and the internet emerged as major barriers to the successful implementation of IT-driven learning strategies. Despite these obstacles, the potential for IT to transform education in Mwanza City remains strong, provided these barriers are dealt with and there is greater focus on enhancing teacher and student readiness for digital learning. The findings provided valuable insights into the state of IT integration in education, the effectiveness of e-learning, and the challenges faced by educators and students in adopting IT-driven methods. The study underlined the importance of continued investment in infrastructure, teacher training, and addressing the socioeconomic disparities that limit access to digital learning resources.

Based on the findings of the study, several recommendations are suggested to enhance the adoption and effectiveness of IT-driven learning methods in Mwanza City:

- ✓ There is a clear need for increased investment in digital infrastructure, including the provision of more computers, reliable internet access, and e-learning platforms.
- ✓ To address the challenge of teacher readiness and IT integration, it is essential to implement continuous professional development programs.
- ✓ To mitigate the socioeconomic challenges associated with IT adoption, efforts should be made to improve access to devices and make them more affordable.
- ✓ Schools should foster collaborative efforts between educators, students, and parents to create a more inclusive and supportive learning environment.
- ✓ It is important to promote the use of blended learning models that combine traditional classroom teaching with online resources.

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