

Investigating Teachers' Use of Information and Communication Technology (ICT) in Teaching and Learning at Kisesa Secondary School in Mwanza, Tanzania

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ABSTRACT

This study investigated teachers' use of information and communication technology (ICT) in teaching and learning at Kisesa Secondary School in Mwanza, Tanzania. ICTs are crucial for improving teaching and learning in secondary schools, yet challenges such as inadequate infrastructure, limited technical support, and insufficient ICT skills among teachers continue to hinder their effective integration into classroom activities. The study was guided by the SAMR model by Puentedura (2013) and the technological acceptance model (TAM) by Davis et al. (1989) to explain the adoption and effective use of ICT in education. The study used a mixed-methods approach to examine teachers' use of ICT in teaching and learning in a Tanzanian secondary school, specifically Kisesa Secondary School. Data were collected mainly through a questionnaire and FGDs, supplemented by key informants. Quantitative data from the questionnaire were analyzed using the Statistical Package for the Social Sciences (SPSS) and presented as percentages, while qualitative data were processed using a word processor and presented as concepts, quotes, and themes. The results showed that ICT facilitates teaching and learning, improves communication among teachers in secondary schools, fosters innovation and active learning, widens access to educational resources, enhances learners' understanding, facilitates collaborative work, and improves learners' engagement in the lesson. Therefore, the study recommends that the government identify priorities and commit resources to improving ICT infrastructure, providing technical support, and equipping teachers with effective ICT skills and knowledge for teaching and learning.

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1. INTRODUCTION

Globally, ICT refers to electronic technologies used for information storage and retrieval (Emperor et al., 2010). It has emerged as vital to digitalization and the advancement of current technological systems, leading to new operational possibilities (Carlos et al., 2012). Zhang et al. (2007) noted that ICT is an important part of most organizations nowadays, as improvements in ICT increase the need for integrating and implementing ICT tools. Peter (2021) suggested that ICT tools have been a driving force behind various activities, contributing to national growth and development. Both developed and developing countries acknowledge the importance and value of ICT for their social and economic development. In everyday economic activity, ICT has become an important driver and agent of positive change (Peter, 2021). In the 21st century, the term technology is an important issue in many fields (Puspitawati et al., 2021; Baldwin, 2009; Liu et al., 2017) worldwide, as ICT has been found to improve performance, transparency, and development (Adzroe et al., 2014). ICT plays a major role in communication among users, thereby reducing delivery time (Anantatmula, 2008; Bardhan et al., 2013). For example, in the government sector, ICT doesn't involve physical interaction between government and citizens; instead, it involves the exchange of information. Also, according to Kariuki (2015), ICT plays a major role by improving communication, reducing human errors, ensuring stakeholder involvement, reducing costs, and improving delivery time.

Stefan (2018) suggests that ICTs underlie virtually all transport systems and significantly influence transport behavior. In particular, websites, social media, and chat have been found to influence transport behavior (Line et al., 2011), raising the question of how ICT affects the growth, structure, and sustainability of the transport sector. ICT can increase interest in more sustainable forms of transportation, such as public transport, walking, or bicycling; it can also substitute for travel or initiate growth in transport demand. Advances in Internet platforms, smartphone and tablet applications, and the rise of social media platforms are increasingly relevant in transport contexts, as they facilitate travel, enable copresence in the sharing of distant lives, and generate new forms of social and network capital (Germann Molz, 2012; Timmermans, 2013). For example, Cohen et al. (2014) found that social media had gained considerable importance for tourism behavior and mobility patterns, as a result of opportunities to communicate travel patterns. Social media can also set in motion competitive travel and changes in collective and individual identities modeled on movement (G€ossling et al., 2015).

Gregor et al., 2015, noted that extremely rapid developments in ICT are occurring. Investment in ICT and the availability of appropriate ICT support tools make it possible to create a knowledge repository and a foundation for knowledge and learning management at different levels of human interaction (personal, community, society) (Bontis 2002; Banker 2003; Youndt et al. 2004; Damien 2005). According to Gregor et al., 2015, ICT tools are mostly used as a means for developing entrepreneurial knowledge and skills, and they identify which tools seem to be most important in the three stages of starting up a business. According to Gregor et al., 2015, ICT might be used as a tool for creating and developing entrepreneurial skills. In addition, ICT might offer learning opportunities, business planning solutions, database tools, and business training through business plan simulators.

Additionally, Buell, 2009 suggest that, ICT led to advanced healthcare delivery over the global world through the use of technological tools like electronic health records (EHR), telemedicine, biometric devices for patient authentication, and mobile health applications, but also the use of mobile apps and web applications. ICT also supports e-government initiatives through promotion of transparency, accountability, and efficiency in public administration (UN, 2020), and support digital service delivery, online records management, and citizen participation, thereby reducing corruption.

Moreover, in education sector, many researchers have also tried to make use of the great potential of ICT and appropriate ICT tools, which provide teachers with exciting and effective opportunities in their teaching activities. Currently, students, immersed in technology from a very early age, spend much of their time using computers, televisions, radios, smart-phones and digital media (Cha et al., 2020). As a result, for these students to be engaged in education, the integration of technological tools into learning environments and teaching contexts is indispensable. In a global context, academic institutions of all types and levels including secondary schools acknowledge the use of ICT tools as a gateway for improving the provision of education and their performance (Ullah et al., 2019; Humbhi et al., 2021; Lei et al., 2021). ICT has dramatically reshaped teaching and learning processes and greatly contributed to the advancement of education in schools globally. ICT tools are in terms of both instructional and learning process (Kihzoza et al., 2016; Sharma, 2017; Mwapwele et al., 2019) hence led to the influence on teaching and learning in secondary schools. It provides the opportunity for personalizing, and making learning flexible and asynchronous and shifting the learning experience from teacher to student centred. As Cha et al., (2020) argue, in Korea the benefits of using ICT in education are wider and broader when taken as an instructional method. Technology has become the knowledge transfer highway in most countries. Through integrating various technologies in different walks of life, societies are able to implement innovations that are transforming the way people think, work, and live (Grabe, 2007). As advised by the national ICT Policy (Ministry of Works, Transport and Communication, 2016), schools and other education institutions responsible for preparing students for lives in the knowledge society need to integrate ICT in teaching and learning (Ghavifek et al., 2012). Teachers are considered to be at the centre of ICT integration in teaching and learning activities because they are the ones to use ICT and ICT tools in classrooms to create more dynamic and proactive teaching and learning

environments that enhance learning in this new era (Arnseth et al., 2010).

Despite evident efforts to support ICT use in secondary schools in Tanzania, challenges persist, and integration distresses are widespread in secondary education settings (Crallet et al., 2016; Mabiki, 2017; Malekani, 2018). Several studies have examined ICT tools, their benefits, and the challenges associated with their use in secondary schools in Tanzania. Given that ICT significantly enhances the delivery and acquisition of education, it was deemed imperative to understand the ICT situation in the study area. Therefore, the purpose of this study was to examine the available ICT tools used in secondary schools, the benefits of these tools for teachers and students in the teaching and learning process, and the challenges faced by secondary schools in using these ICTs at Kisesa. In addition, given the many challenges regarding the use of ICT in secondary schools in Tanzania and beyond, the study explored the limitations of using ICT in secondary schools.

Accordingly, the study will strictly rely and focus on providing solutions and answers to the following questions: 1. what are the available ICT tools used by secondary school teachers in teaching and learning? 2. What are the Uses of the available technology ICT tools in teaching and learning in secondary schools? 3. What Challenges are facing secondary school teachers in the use of ICT?

2. LITERATURE REVIEW

2.1.Theoretical Review

This study employs two theories in investigating teacher's use of ICT in teaching and learning. The theories are substitution, augmentation, modification and redefinition (SAMR) by Puentedura, 2013 model and Technology Acceptance Model (TAM) by Davis et al., 1989. Models are for integrating technology in teaching and learning (Davis, 1989). These models differ in context and scope of application.

2.1.1. SAMR model

It describes four stages of technology integration in teaching and learning. The first stage is substitution that considers technology as a direct tool substitute which cannot bring any functional change. The second stage is augmentation considers technology as a direct tool substitute that can bring functional improvement. The third stage is modification stage. Under this stage, technology is seen to have the ability to bring significant change a task such as redesigning it. The fourth stage is redefinition. Under this one, technology is considered to have the ability to create new tasks not previously conceived (Puentedura, 2013). The model's four stages are closely aligned with levels of Bloom's taxonomy of inquiry processes namely remembering, understanding, applying, analyzing, synthesizing, evaluating, and creating. However, despite its usefulness in technology integration in classrooms, the model only fits contexts of classrooms rich in technologies such as mobile phones, computers and modern application software. The model does not show how someone can relate learning tasks and technologies, making it difficult for teachers and students to choose tasks that match technologies in school environments.

2.1.2. Technology Acceptance Model (TAM).

Davis, Bagozzi and Warshaw (1989) developed a theory of 'action relating to reasons' which is Technology Acceptance Model (TAM). Venkatesh and Davis (2000) discovered the reasons some people use ICT (computers) and their attitudes towards them that called TAM 2. According to Venkatesh and Davis (2000) when teachers are presented with a new technology, two key factors would influence their decision from the extended variables around them about how and when they will use it: External Variables (social, cultural, and political factors); It represents the challenges that teachers face that come from outside their sphere of control when integrating a new technology in their teaching and learning process. These challenges include: Limited accessibility and network connection, schools with limited ICT facilities, lack of effective training, limited time, and lack of teachers' competency. However, if they perceive ICT to be useful to them, their teaching and their pupils' learning, then according to the empirical evidence of previous studies (Cox et al., 1999) they are more likely to have a positive attitude to using ICT in the classroom. The following factors have been identified as key elements to teachers' perceived usefulness of ICT tools: Work more quickly, job performance, increased productivity, and effectiveness. Behavioral intention; the degree to which the teacher has formulated conscious plans to perform or not perform some specified future behavior.

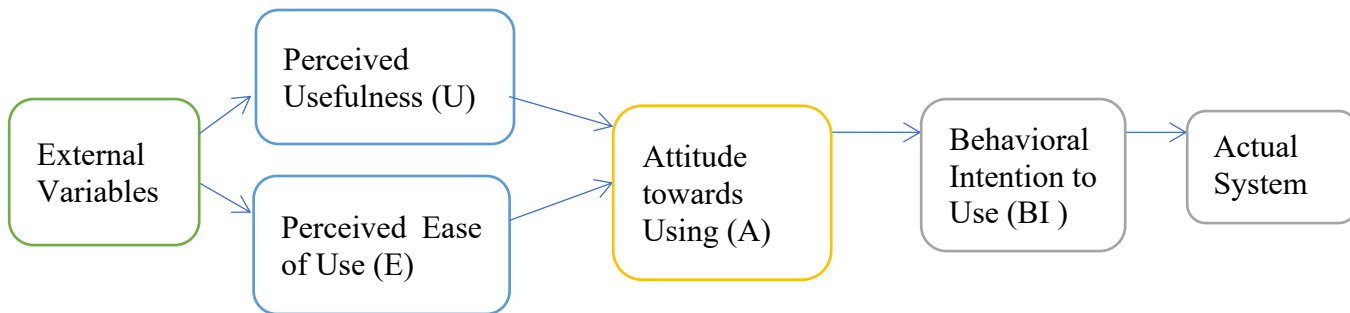


Figure 1: Technology acceptance model (TAM) for teacher's use of ICT in teaching and learning in secondary school.

2.2. Empirical Review

2.2.1. The available ICT tools used by secondary school teachers in teaching and learning

According to Kaur, 2023, ICT tools are the modern technological devices used in teacher-to-teacher, student-to-teacher, and student-to-student interaction in secondary schools. These tools are clicker devices, mobile applications, and flipped classroom for ICT. According to Saira et al., 2020, the integration of ICT tools in secondary schools has altered the mode of teaching and learning, since they have the abilities to improve teaching-learning process (Nikolić et al., 2019), by increasing efficiency and promoting ICT literacy. Ramadhan et al., 2024, stated that in the recent few years, tablets, television, printers, laptops, desktop computers and mobile technologies have been ICT tools successfully used in teaching, learning, and evaluation in schools. Kaur, 2023 also stated that, the use of ICT tools has become universal in secondary schools due to the use of Blogs, social websites, web pages and platforms. Then Ahmadi et al., 2011 noted that the acceptance and implementation of ICT in teaching-learning has changed the requirements of curriculum development and instructional design, therefore Hafeez et al., 2020 concluded that, educationists and managers develop the curriculum according the requirement of the digital age of ICT. It is because schools have the responsibility of preparing learners for their current and future lives in the information society (Nzilano et al., 2019).

According to Osborne et al., (2003), tablets allow learners to become more motivated, think more clearly, and improve their ability to comprehend data. This is because teachers use tablets for demonstration which leads to effective teaching and learning (Ramadhan et al., 2024). Almasi et al., 2018, also noted that tablets are used to provide students with a more engaging visual and interactive learning experience than traditional teaching techniques. Tablets display images, diagrams, and videos that can assist pupils in visualizing and comprehending complicated subjects (Ramadhan et al., 2024). Demonstrations using tablets can assist teachers and students in improving the learning experience by making it more interesting, interactive, and successful (Davis, 1991). Ramadhan et al., 2024 stated that, teachers also use tablets to find useful resources to employ in their lessons and teaching activities, to search for articles, videos, and other resources relating to the topics they teach, to download and use educational apps that supply their pupils with learning materials and tools.

According to Peter (2021), laptops had been a necessary tool in everyday work life of secondary school teachers because it can be applied for various functions in the process of teaching and learning, used as an instruction media, a source of materials, and an equipment to prepare and organize teaching and learning materials. Bhalla, 2013 suggest that, most teachers own laptops and use them for educational purposes, since the use of laptops is high among secondary school teachers. These include preparing teaching notes, teaching aids, worked examples, test and examinations. Selwyn, 2007 stated that, personal computers are not used in the classroom to display materials to students as pedagogy tools but are used to support teachers in their administrative and daily jobs. According to Yusuf et al., 2019, Secondary schools have to extend the use of laptops to teaching non-computer subjects.

According to Calle et al., 2013, Mobile phones are also the mostly mobile learning technologies for educational purposes, these mobile technologies include smart phones (Yusuf et al., 2019). Wendeson et al, 2010 suggest that, there is no doubt that the booming of smartphones currently gives numerous opportunities for students to utilize mobile application in supporting learning activities. Smartphones play a very important role in education, in that it offered a major chance in enhancing access to learning resources (Gaskell et al 2010), promote collaboration, communication (Shuler, 2009) and can also help to encourage instruction that is adaptable to individual and diverse learners (Twum, 2017). Mobile phone had great potential as a learning tool and it could positively be used for teaching and learning purposes in science areas. Varanasi et al., 2020 suggest that, through smart phones, schools have created and make heavy use of WhatsApp groups that teachers are expected to participate in for a range of administrative and communication functions.

According to Peter, 2021, most secondary schools in Tanzania use printers for printing subject notes, tests, results,

announcements and examinations within schools. This prepare an active learning environment that is more interesting and effective for both teachers and students by overcoming the way in which they used to go to print examinations to different location which may lead to expose of examination (Swarali, 2022).

According to Ambachew et al., 2019, another ICT tool in teaching and learning in secondary schools is television, which is an electronic device which transmits picture and sound, hence it used in some of secondary schools. It is used for entertainment, information and commercials. Television combines the appealing features of the movies and radio and it is one of the most popular amusement devices during the childhood years. As Syed (2010) explains, television is an electronic carpet that transports millions of persons each day to far of places. It is a new media of transmission which made its impression on every aspect of the world life.

Other studies also noted that, some of ICT tools used in teaching and learning in secondary schools are smart boards (Nuri, 2015) that allows transfer of images from computers to the board, projectors to display notes and information, padlets (Haris et al., 2017) that enhance student's performance in language learning particularly in English grammar, radios, scanners, and desktop computers (Andy Cawthera).

TABLE 1:
Summary of ICT tools used in secondary schools for teaching and learning

ICT tools	Uses	Citation(s)
Tablets	Teachers use tablets to find useful resources for their lessons and teaching activities. To display images, diagrams, and videos that can assist pupils in visualizing and comprehending complicated subjects	Ramadhan et al., 2024 Almasi et al., 2018
Computers	To prepare and organize teaching and learning materials like teaching notes, teaching aids, worked examples, test and examinations.	Hafeez et al., 2020 Selwyn, 2007
Mobile phones	Promote collaboration, and communication. Make teachers aware on services like search engines, e-mail, chat, digital libraries, e-journals, e-books, digital dictionaries, and e-forum	Shuler, 2009 Kaur, 2023
Printers	To design and print subject notes, announcements, tests, academic results, lessons and internal examinations within the school.	Peter, 2021 Davis, 2003 Hashim et al., 2020 Swarali, 2022
Televisions	It is media of transmission, as it transmits picture, videos and sounds. It is used for entertainment, information and commercials.	Syed, 2010 Ambachew et al., 2019
Padlet, radios, smart boards, desktop computers, projectors and scanners	Padlets enhance student's performance in language learning Smart boards allow transfer of images from computers to the board Projectors to display notes and information Desktop computers for practices especially computer subjects Scanners convert physical documents into digital format	Nuri, 2015 Haris et al., 2017 Andy Cawthera

2.2.2. Uses of the available ICT tools in teaching and learning in secondary schools

According to Barak et al., 2013, learning and teaching may both benefit from the development of interactive Web 2.0 and

cloud apps on mobile devices, such as laptop, desktop computers, tablets, and mobile phones. The domain of education has taken great leaps by capitalizing on technology and the utilization of modern devices (Katsaris et al., 2021). As a consequence of the worldwide surge of COVID-19 instances, several schools and institutions in almost every region of the globe have closed in 2020 and then switched to remote learning via zoom, Google meet, and other digital learning platforms (Karakose et al., 2021). This has led to educators, teachers and students spending more time online than ever before, with both groups researching, learning, and familiarizing themselves with information, resources, tools, and frameworks to adapt to online or remote learning (Mohammed, 2022). When it comes to the online and distance mode of education, students get an education without attending face-to-face classes. Therefore, remote teaching and learning practices seem to be the fundamental tenets of education (Njiku et al., 2021) to provide a quality education through an online mode of delivery (Marban et al., 2021).

According to Mikre (2011), ICT in teaching and learning offers the opportunity for more centered teaching and learning, teacher-to-teacher communication and collaboration, this is because of mobile phones for communication via messages, and calls and smartphones for sharing information through whatsapp groups, and e-mails and exposes teachers and students to vocational skills and real world experience (Mikre, 2011). In addition, ICT in teaching offers teachers with opportunities to access new sources of information and apply multiple technologies in teaching, hence creating greater learning enthusiasm among students.

According to peter (2021), ICTs are very crucial for effective delivery of education and have huge potential of improving education performance in the study area. According to Brás et al. (2014), ICTs can make great contribution to effective teaching and learning by expanding access to educational materials, enhancing the quality of teaching and improving the quality of learning. ICTs can make great contribution to various aspects of education development and effective teaching and learning through promoting efficiency, expanding access, enhancing the quality of teaching and improving the quality of learning (Lei et al., 2021). Collaboratively, according to Wong et al. (2016) the contribution of ICT on students' creativity, motivation and engagement; moreover ICT increase students' confidence and making learning more enjoyable.

ICT has become a part of personal and professional life (Dahal et al., 2020). No doubt, people have been using ICT tools for various purposes. However, COVID-19 has created possibilities of virtual learning environment and opportunities of gaining experiences for individual and collaborative learning for students, teachers, and trainers (Mohd et al., 2015). Teachers have got chance to challenge their existing modes of instruction by enabling personalized learning using their smart phones (Mohd et al., 2015), thus help the mathematics teachers to develop their ways of learning at their own pace and time to be prepared for excelling virtual teaching and learning system. Teachers were also engaged in online platform to learn about how to assign and evaluate individual and collaborative tasks (Dahal et al., 2019).

According to Larsen et al., 2005, ICTs potentially offer increased possibilities for codification of knowledge about teaching, learning and for innovation in teaching and learning activities through being able to deliver learning and cognitive activities anywhere at any time. In many classroom situations it is difficult to allow students to be sufficiently active as participants but teachers are the active participants (Stella et al., 2016). Typically, students are often passive, spending a lot of time listening or reading. Student's engagement with the curriculum will increase as they are afforded opportunities to create their own information and represent their own ideas. Expert system can be used to provide students with learning experiences where they are interacting directly with the computer system, and are not just passive but active participants in the learning process, thus increasing the quality of education (Salekhova et al., 2013).

The variety of input and output devices available provides the opportunity for students who are physically handicapped to be involved in the same learning activities as other students (Stella et al., 2016). For some students' computers provide the only environment which they can manipulate and the only tools that reduce their level of disability, hence it become easier for teachers during teaching. Modified keyboards and mouse-drivers may be used to allow extremely handicapped students to use regular software packages. For students who are not able to take notes during the course of the class, the system stores in a database lessons already taken for further studies (Stella et al., 2016) and provides a more user-friendly environment for blind students through audio interpretation of the course (Bingimlas, 2009), thus enhancing their learning.

TABLE 2: Summary on uses of available ICT tools in teaching and learning.

Uses of available tools	Commonly tool (s) used	Citation (s)
Teacher-To-Teacher Communication and Collaboration	Mobile and smart phones, tablets, and laptops	Mikre, 2011
ICT improves education delivery	Desktop computers, laptops, tablets, televisions, and radios.	Peter, 2021 Brás et al., 2014 Lei et al., 2021

		Wong et al. 2016
New innovation and development especially during COVID-19	Televisions, radios, smartphones, and laptops.	Larsen et al., 2005 Dahal et al., 2019
Active learning and authentic assessment	Smartphones and tablets for accessing online platforms like zoom meet, Google meets, what Sapp, and learning forums.	Mohd et al., 2015 Dahal et al., 2020
Overcome physical disabilities	Computers with modified keyboards and mouse drivers, radios audio to those blinds.	Stella et al., 2016 Bingimlas, 2009

2.2.3. Challenges facing secondary school teachers in the use of Information and Communication Technology (ICT)

Sicilia (2005) noted that teachers complained about the difficulty of always having access to computers. Inaccessibility of ICT tools is not always merely due to the non-availability of other ICT tools within the school (Becta, 2004). It was found that most secondary schools had computers because computer subjects were offered (Kaur, 2023); most of the time, they were used by teachers who were offering computer subjects, leaving the rest of the teachers in a dilemma. In Tanzanian secondary schools, teachers' lack of capacity and attitude toward ICT usage, along with poor infrastructure, remain major obstacles (Howie et al., 2005; Empirica, 2006). Many developing countries have plans, such as the Teacher Laptop Initiative in South Africa and Kenya, to increase teachers' and learners' access to computers (Kargiban et al., 2009). However, even if these initiatives are completed, there is no guarantee that most rural schools will reap the benefits of these laptops due to a lack of internet (Dominique et al., 2014). Toprakci (2006) found that low numbers of computers, outdated or slow ICT systems, and scarcity of educational software in the school were barriers to the successful ICT implementation in Turkish schools.

According to Lewis (2003), many schools face poor technical support in the classroom and limited whole-school resources, so teachers cannot be expected to overcome the obstacles preventing them from using ICT tools. One of the top barriers to ICT use in education was a lack of technical assistance (Pelgrum, 2001). According to Sicilia (2005), technical problems were found to be a barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet due to slow performance, especially on Wi-Fi, printers not printing, malfunctioning computers, and teachers having to work on old computers. Korte et al. (2007) argued that ICT maintenance contracts in schools help teachers use ICT in teaching without losing time fixing software and hardware problems. If there is a lack of technical support available in a school, technical maintenance is unlikely to be carried out regularly, resulting in a higher risk of technical breakdowns (Becta, 2004).

According to Gomes (2005), ICT integration in teaching needs a technician and if one is unavailable the lack of technical support can be an obstacle. Toprakci (2006) found that the lack of technical support was one of two significant barriers to ICT integration in ordinal education in schools and might be considered. Technical difficulties sought to become a major problem and a source of frustration for students and teachers and cause interruptions in teaching and learning process (Ghavifekr et al., 2015). Many teachers confided that though there are many computers in schools, frequent breakdown of notebooks and desktop computers still occur and repairs have been rather slow (Samuel et al., 2007). If there is lack of technical assistance and no repair on it, teachers are not able to use the computer for temporarily (Jamieson-Proctor et al., 2013). Poor technical support would make negative impacts on educator's desire to integrate ICT tools in teaching and learning (Mee et al., 2004).

Zyadah et al., 2004 suggest that, Lack of training in computer and internet use is one of the major factors that hinder effective ICTs use hence contributing to the underutilization of these facilities and related resources even when access was available. Pelgrum (2001) suggest that there were not enough training opportunities for teachers in using ICTs in a classroom environment. Similarly, Beggs (2000) found that one of the top three barriers to teachers' use of ICT in teaching was the lack of training. Main problem with implementing new ICT in education was the insufficient amount of in- service training for teachers (Özden, 2007). According to Becta (2004), the issue of training is certainly complex because it is important to consider several components to ensure training effectiveness. Cox et al. (1999) indicated that inappropriate teacher training is not helping teachers to use ICT in their classrooms and in preparing lessons. They assert that this is because training programs do not focus on teachers' pedagogical practices in relation to ICT but on developing ICT skills. Fundamentally, when there are new tools and approaches to teaching, teacher training is essential (Osborne & Hennessy, 2003) if they are to integrate these into their teaching. However, according to Balanskat et al. (2006), inadequate training leads to teachers being neither sufficiently prepared nor sufficiently confident to carry out full integration of ICT in the classroom.

Kaur, 2023, researched that teacher's acceptance is another problem in the implementation of computers in teaching-learning, which is in turn was influenced by their attitudes towards these media. Teacher's attitudes have been found to be the major predictors of the use of new technologies in instructional settings; the successful use of new technology in the classroom depends largely on the teacher's attitudes toward these tools. According Oladosu (2012) teachers' attitudes play an important role in the teaching-learning process that utilizes computers and Internet connections. Unfortunately, according to Wheeler (2000), whilst some have passionately integrated technology (such as computers), others have guardedly welcomed it whilst others have outrightly rejected it (Wheeler, 2000). The resistance in the acceptance of ICT in the classroom is often said to be primarily based on the risk of teachers losing influence over the values and directions of classroom activity (Türel, 2012).

Wheeler, 2000 discovered time limitations as one of the difficulties in scheduling enough computer and ICT time for classes in teaching and learning process. Some of the teachers who participated during the study done by Cox et al., 1999, specifically mentioned that they need time to locate internet information, prepare lessons, explore and practice using the technology, deal with technical problems, and receive adequate training. According to Alkahtani, 2017, for teachers in secondary schools, especially teachers who are newcomers to ICT, the time required to plan ICT-based lessons may be greater than the time needed to plan lessons without it, and thus schools should adjust their schedules to give teachers more time.

According Ramadhan et al., 2024, another difficulty for teachers adopting tablets in teaching and learning is the shortage of follow-up and feedback from ministry authorities. Teachers are unable to acquire direction on how to utilize tablets successfully, and their attempts to integrate tablets into the classroom are rarely acknowledged. Due to a lack of desire, this limited the potential advantages of tablet use in teaching and learning (Lewis, 2003). Furthermore, without proper follow-up and feedback, teachers are not held accountable for the efficient use of tablets in the classroom. Therefore a shortage of follow-up and feedback leads to inconsistency in the use of tablets across different schools. Therefore, Cox et al., 1999 discovered that ministry authorities are unaware of the achievements that teachers are having when adopting tablets and lack the information needed to make educated judgments about resource allocation.

Ramadhan et al., 2024 suggest that, lack of ICT vision and preparation is another challenge facing teachers who want to integrate tablets into their teaching and learning. In a time where digital technology is altering the educational landscape, having a clear and effective strategy for integrating ICT into the classroom is critical. Lack of a clear ICT vision might lead to a gap between the purpose of employing tablets and their actual implementation in the classroom. Teachers may struggle to link tablet usage with educational objectives, resulting in unplanned and unproductive tablet use. Without a clear goal, tablets may end up being more of a novelty than a strong educational tool. Hence, can result in disappointment and misuse of resources.

TABLE 3: Summary on challenges facing secondary school teachers in the use of ICT

Challenges	Citation (s)
Limited accessibility of computers	Sicilia, 2005 Becta, 2004 Dominique et al., 2014 Howie et al., 2005; Empirica, 2006
Limited technical support	Lewis, 2003 Pelgrum, 2001 Toprakci, 2006 Ghavifekr et al., 2015 Mee et al., 2004
Lack of effective training	Zyadah et al., 2004 Beggs, 2000 Özden, 2007
Teachers' Reluctance to the New Technology	Oladosu, 2012 Wheeler, 2000 Kaur, 2023 Türel, 2012
Time Limitation	Wheeler, 2000 Cox et al., 1999 Alkahtani, 2017

Shortage of follow-up and feedback from the educational leaders	Ramadhan et al., 2024 Cox et al., 1999
Poor ICT vision and plan	Ramadhan et al., 2024

In general, the reviewed literature indicates that the use and challenges of ICT tools in secondary schools have been studied in Tanzania and other countries worldwide. However, in Tanzania most of these studies were conducted to examine impact of ICT usage in teaching and learning process. Very few studies have been conducted to examine those tools, benefits of using ICT tools by secondary teachers in teaching and learning and the critical challenges that hinder secondary teachers from using ICT in teaching and learning process. Thus, this study intends to focus on this knowledge gap.

3. METHODOLOGY

3.1. Research approach

A mixed methods study approach was used to examine the teacher's use of ICT in teaching and learning in a Tanzanian secondary school specifically Kisesa secondary school. Under this approach, the quantitative part was adopted to gather quantifiable, value free, and objective data to supplement qualitative information. In general, the combination of the two approaches is considered superior to simply banking on one of them (Bauer et al., 2000). The qualitative approach was preferred because of its capacity to address research problems through sense making and construction of concepts, and interpretation of values and context of the study (Punch et al., 2014).

3.2. Study area

The study was conducted in both public and private secondary schools located at Kisesa within Mwanza region. The area was chosen because it was easily accessible, due to its duo urban-rural characters and the researcher was familiar with the locality. As Singleton et al., (2010) noted that the suitable study area is one that is related to the researcher's interest, easily accessible and allows the development of immediate rapport with the respondents.

3.3. Targeted population

The target population comprised 215 teachers employed in public secondary schools and 75 teachers employed in private secondary schools. Teachers were selected in order to give wide support in collecting and analyzing data on the ICT tools, uses of ICT tools in teaching and learning, and challenges they face.

Table 4:

Summarization of targeted population

Category	Sector	Population
Teachers	Government secondary schools	215
	Private secondary schools	75
	Total	290

3.4. Sampling technique and sample size

The study is based on both simple random and purposive sampling. According to Alkahtani, 2017 purposive sampling was used in qualitative approach to select teachers with ICT skills and experience. While simple random sampling was used to select teachers randomly from both private and public schools. Therefore, most teachers were selected through random sampling while key informants were selected through purposive sampling. This sample size was determined using Yamane (1967) formula, which was used since it is easy as it depends on the size of the population (Teachers) and the accuracy of the estimates. The formula is as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where; n = Sample size

N = Total number of target population (290 teachers in both public and private secondary schools)

e = Precision (5%)

$$n = \frac{290}{1 + 290(5\%)^2}$$

$$n = 168$$

Statistically, the sample size was large enough to make generalizations about the population basing on the rule of thumb, which suggests the minimum sample size for statistical analysis to be 30 (Saunders et al., 2007).

3.5.Data collection methods

The study used questionnaire, focus group discussion (FGD), and literature review methods to collect data. The questionnaire survey method was used to collect quantitative data needed to validate and help in the analysis of data from FGDs. The questionnaire used contained both open-ended and closed questions. The questions in the questionnaire focused on matters to do with ICT tool, uses, and challenges on the use of ICT in secondary schools. In contrast, FGDs were used to gather data on student's use of ICTs in teaching and learning while literature review was used to understand research gap and to get information from related studies.

3.6.Data analysis procedures

The gathered information was organized based on what were observed, heard and read, to make sense of acquired knowledge (Glesne et al., 1992). For instance, the quantitative data from questionnaire were analyzed based on their nature using statistical package for social sciences (SPSS) and displayed in percentages while the qualitative ones were processed using the Word Processor and appeared in concepts, quotes and themes.

3.7.Ethical Considerations

Before administering the questionnaire and FGD, respondents were clearly informed about the study's purpose, the type of information needed, and how the data would be used. Confidentiality and anonymity of respondents were strictly maintained by not allowing them to provide their names or any personal identification details on the questionnaire. Proper citation and referencing were consistently applied throughout the literature review. All ideas, theories, findings, and arguments from other authors were clearly cited with in-text citations and a complete reference list.

4. FINDING AND DISCUSSION

4.1.Demographic characteristics of respondents

In this study, 290 teachers were surveyed in Kisesa, Mwanza region. The result from table 3 show that 60.7% were males and 39.3% were females. Hence, there were male than female teachers. This has implication on skills and use of ICT tools since male teachers are comparatively more ready and willing to learn and acquire complex skills such as application of ICT tools for teaching and learning. This finding corroborates with Mafang'ha (2016), Stromquist et al. (2017) and the World Bank (2019) who reported that there are more male than female teachers in secondary schools in Tanzania. Also, Asimaki and Vergidis (2013) noted that teaching profession is a highly gendered profession and has a significant place in the literature on gender and education. According to age distribution the findings show most (58.3%) of the respondents belonged to the age range of 20-29 years of age, followed by those belonging to 30-39 years of age (27.0%). Hence, majority of the respondents were middle aged people who were innovative and flexible to adapt to technological changes. According to Schiller, 2003; Kubiato, 2013; Muriithi, 2017, older teachers are not likely to attend training regarding ICTs use in teaching and learning as young and middle aged teachers do. Also, Technological Acceptance Model (TAM) which was developed by Venkatesh and Davis in 2000 discovered that technology acceptance varies with age.

Table 5:
Demographic characteristics of respondents

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	102	60.7
	Female	66	39.3
	Total	168	100
Age	20-29 years	98	58.3
	30-39 years	52	31.0
	40-49 years	14	8.3
	50 + years	4	2.4
	Total	168	100
Teaching experience	1-2 years	19	11.3
	3-5 years	94	56.0
	6-10 years	14	8.3
	+ 10 years	41	24.4
	Total	168	100
Education level	Diploma	56	33.3
	Bachelor	108	64.3
	Masters	4	2.4
	Total	168	100
The ability to handle to ICT in teaching	High	44	26.2
	Medium	113	67.3
	Low	11	6.5
	Total	168	100
Subject taught	Computer	57	33.9
	Language	11	6.5
	Science	93	55.4
	Other	7	4.2
	Total	168	100

4.2.What are the available ICT tools used by secondary school teachers in teaching and learning?

The following table shows the descriptive statistics about the available ICT tools used by secondary school teachers in teaching and learning.

Table 6:
Descriptive statistics on available ICT tools

ICT tools	RATING						
	Strong agree	Agree	Neutral	Disagree	Strong disagree	Mean	SD

Tablets	38	22.6%	82	48.8%	32	19.0%	14	8.3%	2	1.3%	2.17	0.91
Laptops	8	4.8%	14	8.3%	57	33.9%	55	32.7%	34	20.3%	3.55	1.05
Mobile phones	4	2.4%	9	5.4%	30	17.8%	74	44.0%	51	30.4%	3.95	0.95
Desktop computers	17	10.1%	41	24.4%	66	39.3%	23	13.7%	21	12.5%	2.94	1.13
Printers	124	73.8%	39	23.2%	0	0.0%	0	0.0%	5	3.0%	1.35	0.76
Televisions and radios	13	7.7%	29	17.3%	27	16.1%	43	25.6%	56	33.3%	3.60	1.31
Other	27	16.1%	24	14.3%	12	7.1%	73	43.5%	32	19.0%	3.35	1.36

Findings in table 5 indicate that the available ICT tools in secondary schools for teaching and learning is uneven. Tablets and printers appears to be the most accessible and available tools with (22.6% strong agree and 48.8% agree) and (73.8% strong agree and 23.2% agree) respectively. The mean scores supports the observation (2.17 and 1.35) respectively, while laptops, mobile phones, desktop computers, televisions, radios, and other ICT tools are moderate or less available in most of secondary schools in teaching and learning, otherwise some of tools are used for personal use. Example teachers use mobile phones and laptops for their personal uses like communication and gaming and less in teaching and learning. Televisions are not supporting teaching and learning in most Tanzanian secondary schools instead most of teachers argued that they used in watching movies and news during break moments.

Findings were supported by Ramadhan et al., 2024 who suggested that in most secondary schools in Tanzania, Teachers use tablets to find useful resources to employ in their lessons and teaching activities, since government provide them with tablets by 2022 in order to support them in teaching and learning. Also, Peter, 2021 noted that printers help to design and Print subject notes, announcements, tests, academic results, lessons and internal examinations within the school, hence mostly found in Tanzanian secondary schools. While Toprakci (2006) found that in most secondary schools there is low numbers of desktop computers.

4.3. What are the Uses of the available technology ICT tools in teaching and learning in secondary schools?

The following table shows the descriptive statistics about the uses of available ICT tools in teaching and learning.

Table 7:

descriptive statistics on uses of available ICT tools in teaching and learning

Uses of ICT tools	RATING											
	Strong agree		Agree		Neutral		Disagree		Strong disagree		Mean	SD
Teacher-To-Teacher Communication and Collaboration	117	69.6%	51	30.4%	0	0.0%	0	0.0%	0	0.0%	1.30	0.46
ICT improves education delivery	34	20.2%	45	26.8%	76	45.2%	3	1.8%	10	6.0%	2.46	1.05
New innovation and development especially during COVID-19	19	11.3%	27	16.1%	4	2.4%	67	39.8%	51	30.4%	3.62	1.37
Active learning and authentic assessment	9	5.4%	23	13.7%	54	32.1%	46	27.4%	36	21.4%	3.46	1.15
Overcome physical disabilities	2	1.2%	17	10.1%	45	26.8%	65	38.7%	39	23.2%	3.73	0.98

The findings indicate that ICT tools are widely used to facilitate teacher to teacher communication and collaboration, since most of teachers own their own mobile phones, but also tablets are used in communication and collaboration in secondary schools. All respondents either strongly agreed (69.9%) or agreed (30.4%) that ICT supports communication and collaboration among teachers resulting in the lowest mean score ($M = 1.30$, $SD = 0.46$). furthermore, respondents acknowledged that ICT improves educational delivery, with 47.0% agreeing or strongly agreeing, although a substantial portion (45.2%) remained neutral ($M = 2.46$, $SD = 1.05$). hence findings imply that ICT contributes to the effectiveness of teaching and learning by providing access to educational resources, facilitating learning preparation, and supporting innovative instructional methods.

Mikre (2011) supported the study by noting that ICT in teaching and learning offers the opportunity for teacher-to-teacher communication and collaboration, because of mobile phones for communication via messages, and calls and smartphones for sharing information through what Sapp groups, and e-mails and exposes teachers and students to vocational skills and real world experience. According to Brás et al. (2014), ICTs can make great contribution to effective teaching and learning by expanding access to educational materials, enhancing the quality of teaching and improving the quality of learning.

4.4.What Challenges are facing secondary school teachers in the use of ICT?

The following table shows descriptive statistics on the challenges facing secondary school teachers in the use of ICTs

Challenges in using ICT	RATING											
	Strong agree		Agree		Neutral		Disagree		Strong disagree		Mean	SD
Limited accessibility of computers	89	53.0%	52	31.0%	7	4.2%	14	8.3%	6	3.5%	1.79	1.07
Limited technical support	71	42.3%	32	19.0%	11	6.5%	29	17.3%	25	14.9%	2.43	1.51
Lack of effective training	67	39.9%	49	29.2%	5	3.0%	34	20.2%	13	7.7%	2.27	1.37
Teachers' Reluctance to the New Technology	15	8.9%	23	13.7%	27	16.1%	62	36.9%	41	24.4%	3.54	1.25
Time Limitation	43	25.6%	61	36.3%	14	8.3%	29	17.3%	21	12.5%	2.55	1.39
Shortage of follow-up and feedback from the educational leaders	38	22.6%	63	37.5%	9	5.4%	31	18.4%	27	16.1%	2.68	1.43
Poor ICT vision and plan	17	10.1%	11	6.5%	7	4.2%	79	47.0%	54	32.1%	3.85	1.25

The findings indicate that several challenges hinder the effective use of ICT in teaching and learning. The most challenges identified was limited accessibility of computers both laptops and desktop computers, with 84.0% of respondents either agreeing or strongly agreeing ($M = 1.7$, $SD = 1.07$). also, lack of effective training was reported as a major challenge, with 69.1% of respondents agreeing that inadequate ICT skills and professional development opportunities limit teacher's ability to integrate technology effectively into classroom instructions ($M = 2.27$, $SD = 1.37$). Also limited technical support was a challenge, where 61.3% agreed or strongly agreed about it with mean score of 2.55 and SD of 1.39. Furthermore, time limitation was recognized as a barrier by 61.9%

of respondents ($M = 2.55$, $SD = 1.39$), suggesting that teachers often lack time to prepare, learn, and utilize ICT resources effectively during teaching process. Also, 60.1% of respondents agreed or strongly agreed that shortage of follow-up and feedback from educational leaders was also a barrier with mean score of 2.68 and SD of 1.43

Sicilia (2005) supported the study by noting that teachers complained about how difficult it was to always have access to computers. According to Lewis, 2003, many schools faces poor technical supports in the classroom and whole-school resources, teachers cannot be expected to overcome the obstacles preventing them from using ICT tools. Zyadah et al., 2004 suggest that, Lack of training in computer and internet use is one of the major factors that hinder effective ICTs use hence contributing to the underutilization of these facilities and related resources even when access was available. Wheeler, 2000 discovered time limitations as one of the difficulties in scheduling enough computer and ICT time for classes in teaching and learning process. Finally, Ramadhan et al., 2024 suggest that another difficulty for teachers adopting tablets in teaching and learning is the shortage of follow-up and feedback from ministry authorities.

5. CONCLUSION AND RECOMMENDATION

5.1.Conclusion

The study has shown that Tanzania secondary schools are still lagging behind in the application of ICT in the teaching and learning process. There is scarcity of ICT facilities in schools due to low ability of using ICT among teachers as a result of poor training and lack of support from the school management and higher levels of the government. Regardless of the benefits of using ICT in secondary schools there are still a great number of obstacles against the effective integration of ICT in secondary schools' teaching and learning process. Among others, the critical challenges of ICTs integration in education in the study area include limited accessibility of ICT tools such as computers, scanners, laptops, printers, projectors, televisions, radios, tablets and padlets, limited technical support, lack of effective training, teachers' reluctance to the new technology, time limitation, shortage of follow-up and feedback from the educational leaders, and poor ICT vision and plan.

5.2.Recommendation

Based on the findings of this study, it is recommended that the government should increase funding for the entire educational system focusing on acquisition of ICTs tools and infrastructures so as to properly integrate ICTs in the education delivery and raise its usage in teaching and learning. This will promote ICT usage in schools to a new domain. Furthermore, the study recommends that, policy makers should make mandatory for schools to have computer laboratory; and that in every five secondary school or in one division, there must be a specialized technician for providing technical support to teachers; and who should be appointed or recruited by district councils. In addition, it is recommended that teachers should be open minded and learn new and advanced technologies for teaching and learning as we move forwards further and deeper into the world of science and technology. This is because ICT can provide a lot of benefits though the delivery of quality secondary school education. Moreover, this study recommends that the government should identify priorities and commit resources in improving ICT infrastructure, providing technical support and equip teachers with effective ICT skills and knowledge for teaching and learning. To do this the study recommends that the government should enforce acquisition of ICT skills and programs for teachers. Besides, due to the limited resource of the nation, this study recommends for decision makers and other education practitioners to put much efforts in tackling the most critical challenges which will be fruitful; instead, of dealing with a multitude of challenges at a time. Lastly, but not least this study recommends to the government to allow secondary schools use their own sources of fund to equip their computer laboratories with up-to-date ICTs equipment and infrastructure.

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