Assessment of ICT Integration in Competence-Based Curriculum in Moshi Public Primary Schools

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Abstract
This study assessed the integration of ICT in implementing a Competence-Based Curriculum (CBC) in public primary schools in Moshi Municipality, Tanzania. Specifically, the study aimed to determine teachers' perceptions of integrating ICT into their lessons and to examine the challenges they face in this process. A mixed-methods approach was employed, using a convergent parallel design and a sample of 266 respondents. Data were collected through questionnaires and in-depth interviews. Quantitative data were analysed using descriptive statistics with the aid of the Statistical Package for Social Sciences (SPSS), while qualitative data were analysed thematically. The findings revealed that the majority of participants viewed ICT integration in CBC as essential for delivering quality education to pupils. Most respondents reported access to mobile devices (smartphones) with internet and email functionality (75.5%), laptops (67.3%), tablets (61.6%), and desktop computers (60.4%). However, key challenges identified included a lack of ICT facilities (39.2%) and inadequate digital infrastructure (32.2%). The study concludes that although ICT integration is critical for improving the quality of education and achieving Sustainable Development Goal 4, Target 4.1, its implementation in CBC remains limited. Consequently, the provision of quality education is hindered. The study recommends increased provision of ICT facilities and the development of digital infrastructure in schools. Furthermore, it calls for additional research on effective ICT integration in primary education.

Keywords: *Integration of ICT, competence-based curriculum, perceptions, computer, internet*

INTRODUCTION

Educational stakeholders around the world are increasingly emphasizing the integration of Information and Communication Technology (ICT) into competence-based curricula (Sendagire, 2023). ICT is widely recognized as a transformative tool capable of revolutionizing teaching and learning while enhancing the quality and accessibility of education (Facer & Selwyn, 2021; Saif et al., 2022). Technologies such as interactive whiteboards, instructional software, tablets, and laptops have been shown to improve both instructional effectiveness and student learning outcomes (Yalman & Basaran, 2021). The growing adoption of ICT in education is largely driven by its potential to foster creativity, actively engage learners, and provide access to a wide range of digital learning resources (Haleem et al., 2022; Kiwonde, 2024). However, to fully realize these benefits, technology must be seamlessly integrated into teaching and learning environments, ensuring more efficient, effective, and equitable educational experiences (Cheung et al., 2021).

Similarly, academic institutions worldwide, particularly primary schools, recognize ICT as a vital tool for enhancing learning as its integration enables learners to improve subject comprehension, acquire knowledge, and boost academic performance (Barakabitze et al., 2019; Li et al., 2022). In competence-based curricula, students develop principles, facts, attitudes, and skills essential for personal and national growth. However, despite the growing prominence of computers and digital tools in education, integrating technology into classrooms remains a significant challenge (Sendagire, 2023). For example, in Malaysia, the lack of sufficient ICT infrastructure has created major barriers to incorporating technology into the new curriculum (Ghavifekr et al., 2016). Similarly, in Indonesia, the effective implementation of the revised curriculum is hindered by both a shortage of ICT facilities and limited digital literacy among students and teachers (Yamtinah et al., 2022). To ensure high-quality and accessible ICT, policies must provide sustainable and adequate funding for the development and ongoing maintenance of ICT infrastructure, particularly in rural and remote areas (Ntorukiri, Kirugua, & Kirimi, 2022). Recognizing these challenges, the UN and other global education partners have integrated ICT into their development agendas, assisting nations in formulating legal frameworks and master plans for ICT in education (Miao et al., 2022). According to UNESCO, such initiatives can effectively address the complex challenges facing modern societies (Ismail et al., 2024). A notable example is Kenya, which has

developed a National ICT Policy and implemented digital learning initiatives across its education system. These measures have improved access to digital resources in both urban and rural areas, thereby enhancing teaching quality and learning outcomes (Barasa, 2021). This practical application highlights how international support and policy frameworks can drive ICT integration in education.

In Sub-Saharan Africa, the adoption of Competence-Based Curricula (CBC) reflects a regional commitment to improving education quality and equipping learners with essential 21st century skills, including ICT proficiency. This educational shift aligns with global trends championed by organizations such as UNESCO and the World Bank, which advocate for skill-based and digitally inclusive curricula (Nguvi, 2023). Countries such as Kenya, Rwanda, Tanzania, and Uganda have embraced CBC frameworks to enhance students' problem-solving capabilities and prepare them for participation in the digital economy (Wambiya & Ogula, 2023). Studies, including Nsengimana et al. (2020), emphasize that CBC in Africa aims to bridge the digital divide and foster innovation through the integration of ICT in teaching and learning. However, implementation remains a challenge in many contexts, where traditional teaching methods continue to dominate despite curriculum reforms (Thomas & Onyango, 2022). To promote effective ICT integration, school-based communities are encouraged to engage in knowledge-sharing practices and adopt modern pedagogical strategies (Nsengimana et al., 2020; Agyei, 2021).

Furthermore, educational institutions must develop comprehensive strategies to cultivate core competencies essential for lifelong learning and sustainable development across the continent (Amponsah, Adarkwah, & Ledwaba, 2024). In Tanzania, broad educational reforms—including the revised Education and Training Policy (2014) as updated in 2023, the ICT Policy for Basic Education, and the ongoing Education Sector Development Programme—have underscored the importance of ICT integration. These reforms have prompted a national shift from a traditional knowledge-based curriculum to a Competence-Based Curriculum (CBC) at both primary and secondary school levels. Revisited around 2015, this transition was designed to equip students with practical skills aligned with labor market demands while promoting personal development (URT, 2014; Mwakalinga, 2016). Within this framework, ICT integration has been prioritized as a strategic approach to enhance

teaching, learning, and skills acquisition for both teachers and students (URT, 2023).

Despite these policy commitments, successful ICT integration remains dependent on early-career teacher training and continuous professional development (Lubuva et al., 2024). In response, the Ministry of Education introduced ICT pedagogy into Teachers' Colleges (TTCs) as early as 2005, aiming to equip educators with the requisite competencies for technology-enhanced instruction (URT, 2019). This initiative focused on curriculum planning, innovative pedagogical methods, and ICT literacy to modernize teaching practices (URT, 2016). However, significant barriers continue to impede the effective use of ICT in Tanzanian schools. Research highlights the persistent lack of ICT infrastructure and digital resources as major constraints, undermining the implementation of CBC and the development of essential competencies for sustainable development (Joseph, 2021; Masegenya & Mwila, 2023; Warioba et al., 2022). These limitations are particularly acute in under-resourced areas, where digital exclusion further widens educational inequalities (Nkya et al., 2021; Tandika & Ndijuye, 2019). Addressing these challenges requires sustained investment in ICT infrastructure, targeted teacher capacity-building programs, and the provision of accessible digital learning tools to ensure the full realization of CBC objectives and equitable education outcomes across the country.

Despite Tanzania's endeavours to improve digital teaching by implementing the initiatives outlined in the draft of National Digital Education Strategy (2024–2030) and the Education Sector Development Plan (2025/26–2029/30), which include the expansion of ICT infrastructure, the integration of curriculum, the development of digital content, and the development of capacity, the education system continues to face substantial challenges. The objective of these reforms is to enhance teaching and learning, and they are bolstered by frameworks in cybersecurity, governance, and partnerships. However, their implementation continues to encounter systemic obstacles (URT, 2024; 2025).

In particular, ICT integration in teaching and learning seems to face multiple barriers, including insufficient infrastructure, lack of trained personnel, inadequate access to modern learning resources, and poor teacher ICT competence (Joseph, 2022; Kalinga, 2024; Kiwonde, 2024;

Koomar et al., 2022). Limited ICT literacy and persistent resource constraints significantly hinder both students and teachers from fully engaging with the Competence-Based Curriculum (CBC), ultimately affecting learners' academic performance and long-term career development. Although the Tanzanian government continues to promote ICT integration in education as a means to enhance learning outcomes, many schools still struggle with implementation. Existing studies, such as those by Masegenya and Mwila (2023) and Warioba et al. (2022), have explored these challenges; however, none have focused specifically on Moshi Municipality. This indicates a gap in localized research on ICT integration within this context, which this study seeks to address. Therefore, there is a limited amount of localised research on the integration of ICT at the primary level within a competence-based curriculum (CBC) in Tanzania, particularly in specific municipalities such as Moshi. As a result, there is a knowledge gap regarding ICT integration in CBC implementation at the primary school level.

Given this gap, it is essential to examine whether ICT integration facilitates the effective implementation of the Competence-Based Curriculum (CBC). Therefore, this study aims to investigate the integration of ICT in the implementation of CBC in public primary schools in Moshi Municipality, Tanzania. Specifically, the study seeks to determine teachers' perceptions of integrating ICT into their lessons as part of CBC implementation and to examine the challenges they face in doing so.

LITERATURE REVIEW

The ICT Competence-Framework for Teachers (ICT-CFT) by UNESCO is widely used to evaluate ICT integration in CBC (Farısa et al., 2023). While teachers acknowledge ICT's benefits, challenges such as inadequate training, limited ICT-based assessments, and curriculum misalignment hinder effective use (Yamtinah et al., 2022; Abel et al., 2022; Ishaq, 2023; Seifu, 2020). Despite policy awareness, a gap remains between intent and practice (Ngao et al., 2022; Rana et al., 2022; Zeng, 2022), highlighting the need for better ICT infrastructure and support, especially in underserved areas. Despite efforts to promote ICT integration, research indicates that only 15% of teachers in Indonesia use ICT as a pedagogical tool (Machmud et al., 2021). The rapid advancement of digital technology in the millennial era compels teachers to develop ICT skills to enhance student learning both in the classroom

and extracurricular activities (Fitria, 2023). In response, some educational institutions in Indonesia have implemented teacher training workshops, ICT-supported project management tools, and collaborative learning platforms to overcome ICT implementation challenges. These initiatives highlight the potential for continuous improvements in ICT integration strategies within CBC.

ICT is increasingly vital in education, helping students acquire essential digital skills (Mavuso & Makeleni, 2022; Qaddumi et al., 2023; Zhang et al., 2022). In many developing countries, ICT supports Competence-Based Curriculum (CBC) implementation. Nations like Kenya, Rwanda, and Tanzania have introduced national ICT policies, including Tanzania's Draft National Digital Education Strategy (2024/25–2029/30) and Rwanda's Vision 2050 and NST1. Programs such as Kenya's Digital Learning Programme and Rwanda's Smart Classroom Initiative aim to enhance CBC through ICT (Wambiya & Ogula, 2023). However, Sub-Saharan Africa faces barriers such as inadequate infrastructure, limited teacher skills, and viewing ICT as a separate subject rather than a cross-curricular tool (Agyei, 2021; Gonfa et al., 2024; Kibirige, 2023; Murithi & Yoo, 2021; Nii Akai Nettey et al., 2024). Additional issues include overcrowded classrooms and a lack of resources (Khan, 2023; Otieno, 2020). Despite reforms, traditional teaching methods persist in places like Rwanda (Nsengimana et al., 2020). Addressing these challenges requires targeted support, professional development, and ICT strategies tailored to CBC to improve learning quality and digital literacy (Qaddumi et al., 2023; Boahen & Atuahene, 2021; Rana & Rana, 2023; Kalinga, 2024).

The integration of ICT into Tanzania's Competence-Based Curriculum (CBC) in public schools faces significant challenges which limit its effectiveness in enhancing teaching and learning. While teachers recognise the potential of ICT in implementing CBC, many struggle to integrate it into their instructional practices due to insufficient training, lack of ICT resources, and inadequate curriculum orientation (Joseph, 2021; Koomar et al., 2022; Mbawala, 2023). Additionally, poorly resourced learning environments further hinder effective ICT adoption, preventing teachers from utilising technology as a pedagogical tool or incorporating digital assessments (Kalinga, 2024; Kiwonde, 2024; Simbeye, 2020; Stephen, 2022). Research suggests that effectively addressing challenges in ICT integration requires structured teacher training programs, alignment between policy and classroom practice, and

improved access to ICT infrastructure (Ngao et al., 2022). However, most existing studies have concentrated on secondary education, resulting in a limited understanding of ICT integration at the primary school level. To fill this gap, the present study investigates the integration of ICT in the implementation of the Competence-Based Curriculum (CBC) in public primary schools in Moshi Municipality, Tanzania.

Theoretical framework

This study was guided by Rogers' Diffusion of Innovations (DOI) Theory (2003), which explains how new technologies or practices are adopted and spread within a social system over time. The theory is particularly relevant for understanding the challenges teachers face in implementing the Competence-Based Curriculum (CBC) in Moshi's public primary schools, as well as their perceptions of ICT integration. DOI Theory categorizes adopters into five groups—Innovators, Early Adopters, Early Majority, Late Majority, and Laggards—allowing for an analysis of teachers' varying readiness and willingness to integrate ICT into their instructional practices. It also identifies five key attributes that influence the rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. These characteristics help explain how easily or reluctantly teachers embrace ICT in the classroom. Moreover, the theory highlights several barriers to innovation diffusion, such as limited infrastructure, insufficient training, low digital literacy, and resistance to change, all of which can impede the effective implementation of CBC. By applying DOI Theory, this study aimed to explore the potential for enhancing ICT adoption in primary schools, thereby improving alignment with CBC objectives and contributing to the overall quality of education in Tanzania.

MATERIALS AND METHODS

This study employed a mixed-method research approach to capitalize on the strengths of both quantitative and qualitative data. The approach enabled a more comprehensive investigation of ICT integration in the implementation of the Competence-Based Curriculum (CBC) in public primary schools in Moshi Municipality, Tanzania (Jawabreh et al., 2023). In addition, the study utilized a convergent parallel research design, which allowed for the simultaneous collection of quantitative and qualitative data to better understand the research problem (Dawadi et al., 2021).

The target population comprised 798 individuals within the Moshi Municipality Council. To ensure adequate representation, the study purposively selected 20 public primary schools from a total of 37, accounting for more than half of the schools in the area while also considering geographical distribution. A purposive sampling technique was used to select one District School Quality Assurance Officer (DSQAO) and 20 head teachers due to their direct involvement and relevance to the study. In contrast, simple random sampling was employed to select 245 teachers from the 20 schools, minimizing selection bias and ensuring a representative sample. This brought the total sample size to 266 respondents. Data collection instruments included in-depth interviews with the DSQAO and head teachers, while structured questionnaires were administered to the teachers, yielding a 100% response rate. Quantitative data were coded, entered into a computer, and analysed using descriptive statistics with the aid of the Statistical Package for Social Sciences (SPSS) Version 22.

The frequency, percentage, tables, and graphs were prepared under descriptive statistics. Thematic analysis was used to analyze the qualitative data collected during the study. The researcher first gathered and organized the field data, sorted it into broad thematic categories, and then constructed meaning by interpreting each theme to support discussion and reporting of the study's findings. The data were subsequently categorized, coded, and examined qualitatively to draw meaningful insights. To ensure the validity and reliability of the research instruments, the study employed content validity and Cronbach's Alpha, with a reliability coefficient of 0.85, to assess the internal consistency of the questionnaire. The validity of the interview guide was confirmed through expert consultation with research professional and further refined through a pilot test. The pilot was conducted in one public primary school that was not included in the main study sample. A variety of respondents were involved during the pilot phase to ensure the appropriateness and clarity of the instruments. To adhere to ethical guidelines, the researcher obtained a research clearance from the Open University of Tanzania. Subsequently, permission to collect data from the target population was requested from the Director of the Moshi Municipal Council. Additionally, participants were enrolled in the study based on their voluntary and informed consent. The researcher ensured that participants' concerns regarding privacy, confidentiality, and anonymity were fully respected and addressed throughout the research process.

RESULTS

This section presents the results based on the research objectives. The data were analyzed and organized into distinct themes, which are discussed in the following subsections.

Socio-Demographic Characteristics

This subsection outlines the socio-demographic profile of the study participants, providing context for interpreting their perspectives on ICT integration in the implementation of the Competence-Based Curriculum (CBC). The demographic data include gender, age, academic qualifications, and teaching experience, collected from both questionnaire respondents and in-depth interview participants. Out of the 245 primary school teachers who completed the questionnaire, the majority were female (55.1%). In terms of age, 33.9% of respondents were between 25 and 34 years old, while 40.4% were aged between 35 and 44 years. Regarding educational qualifications, 38.0% held teaching certificates and 38.4% held diplomas. Additionally, 36.3% of the teachers had between 6 and 10 years of teaching experience. These findings suggest that most participants had relevant professional experience and qualifications, positioning them to provide meaningful insights into the implementation of CBC since its introduction in 2016. The balanced gender representation also ensured that diverse perspectives were captured in the study.

Teachers' perception of integrating ICT into their lessons in implementing the competence-based curriculum

The study aimed to explore teachers' perceptions regarding the integration of ICT into their lessons to support the implementation of the Competence-Based Curriculum (CBC). Teachers expressed generally positive attitudes toward ICT integration, recognizing it as essential for enhancing teaching and learning. Under the subtheme of key qualities required for successful ICT integration, over 90% of teachers rated all identified attributes as either important or very important, with responses ranging from 92.3% acknowledging the importance of policy frameworks to 98.4% emphasizing the need for ICT skills. While their perceptions were largely favourable, the findings highlighted a clear need for ongoing training and support. Regarding personal and professional development needs, more than 64% of respondents rated all examined areas—ranging from using ICT for evaluation (64.1%) to instructional delivery (76.3%)—as high priorities. Fewer than 3% of participants considered any of the professional development items unnecessary, indicating strong

interest in capacity-building initiatives to improve ICT integration in CBC implementation (see Table 1*)*.

Table 1
Professional development needs (n=245)

Professional Development Needs	Ranking			
	HLN	MLN	LLN	NLN
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Use of ICT in teaching	187 (76.3)	37 (15.1)	14 (5.7)	7 (2.9)
Selection of ICT resources appropriate for teaching	179 (73.1)	53 (21.6)	8 (3.3)	5 (2.0)
Use of ICT for assessment	157 (64.1)	70 (28.6)	16 (6.5)	2 (0.8)
Knowledge and understanding of using ICT in the teacher's specific subject(s)	171 (69.8)	51 (20.8)	16 (6.5)	7 (2.9)
Technological pedagogical knowledge	158 (64.5)	67 (27.3)	16 (6.5)	4 (1.6)
Use of ICT for administrative purposes	170 (69.4)	58 (23.7)	12 (4.9)	5 (2.0)
Use of ICT as a depository data tool	162 (66.1)	67 (27.3)	14 (5.7)	2 (0.8)
ICT integration into the classroom	173 (70.6)	57 (23.3)	12 (4.9)	3 (1.2)
Development of ICT skills in a particular context	169 (69.0)	58 (23.7)	15 (6.1)	3 (1.2)

HLN= High level of need, MNL= Moderate level of need, LLN= Low level of need
NLN= No need at all

Similarly, during in-depth interviews, participants thought that workshops and seminars were a more effective way of increasing knowledge and confidence to teachers to make them comfortable in implementing the integration of ICT in the competence-based curriculum as mentioned below:

> Workshops and seminars for effective ICT use are very important because they give teachers more confidence, increase their knowledge from those who know, and make them comfortable in using ICT in teaching and the learning process. [R8, 2024]

The findings suggest that workshops and seminars aimed at enhancing ICT usage are essential, as they help build teachers' confidence and expand their knowledge through interaction with experts and experienced peers. These professional development activities make teachers more comfortable using ICT tools, equipping them with the necessary skills and support to effectively integrate technology into teaching and learning.

Level of experience in the use of ICT facilities

Regarding teachers' level of experience with ICT facilities, respondents were asked to report their familiarity with various tools and platforms. While more than half indicated they had experience using computers and the internet, fewer than 40% reported being knowledgeable or well-experienced in specific applications. For instance, 39.2% were familiar with word processing software, 38.8% with e-learning platforms, 37.6% with spreadsheets, 35.1% with digital instructional technologies, 30.6% with PowerPoint, and only 26.5% with data projectors. These results, as illustrated in Table 2, highlight that limited exposure, inadequate training, and poor ICT infrastructure continue to pose significant barriers to the effective integration of ICT in teaching and learning.

Table 2

Level of experience in the use of ICT facilities (n=245)

Please indicate your experience with:	Well Experienced Freq. (%)	Experienced Freq. (%)	Neutral Freq. (%)	Not Experienced Freq. (%)	Not Experienced at all Freq. (%)
Computers	39 (15.9)	90 (36.7)	83 (33.9)	21 (8.6)	12 (4.9)
Internet	34 (13.9)	95 (38.8)	79 (32.2)	28 (11.4)	9 (3.7)
e-learning platform (e.g. Blackboard, Moodle etc.)	34 (13.9)	72 (24.9)	75 (30.4)	54 (22.0)	10 (4.1)
Overhead Projector	20 (8.2)	66 (26.9)	72 (29.4)	72 (29.4)	15 (6.1)
Word processor	23 (9.4)	73 (29.8)	63 (25.7)	69 (28.2)	17 (6.9)
Spreadsheet [Excel]	23 (9.4)	69 (28.2)	75 (30.6)	60 (24.5)	18 (7.3)
Experience using digital technologies to teach	23 (9.4)	63 (25.7)	93 (38.0)	46 (18.8)	20 (8.2)
PowerPoint	17 (6.9)	58 (23.7)	67 (27.3)	69 (28.2)	34 (13.9)
Data Projector	16 (6.5)	49 (20.0)	10 (4.0)	103 (42.0)	67 (27.3)

The data presented in Table 2 reveals that while a modest number of teachers are well-experienced with general digital tools such as computers (15.9%) and the internet (13.9%), their proficiency significantly drops with more specialized educational technologies. Notably, fewer than 10% of respondents reported being well-experienced in using PowerPoint

(6.9%), data projectors (6.5%), or digital technologies for teaching (9.4%). A considerable proportion of teachers also rated themselves as not experienced or not experienced at all, particularly with data projectors (69.3%), PowerPoint (42.1%), and e-learning platforms (26.1%).

These results imply that although basic ICT familiarity exists among many teachers, the integration of ICT into actual classroom instruction remains limited due to low exposure and limited competence in using more pedagogically targeted tools. This skill gap directly affects the implementation of the Competence-Based Curriculum (CBC), which relies on the integration of digital tools for interactive, learner-centered instruction. The findings underscore the urgent need for targeted professional development programs that focus not just on general digital literacy, but on the pedagogical application of ICT tools in real classroom settings. Without improving these skill areas, the potential of ICT to enhance CBC implementation and improve learning outcomes remains underutilized.

Furthermore, results from in-depth interviews indicated that most of the participants had a positive perception of ICT integration that, ICT enables learners to be creative and makes learning easy as it is narrated below:

> Quality education depends on how ICT will be integrated because it is the one which enables learners to be creative, active and it facilitates easy learning [R11, 2024]

Another participant narrated that:

> ICT is the most important of the core competencies in implementing CBC because it is the one which enables students to acquire the 21st century skills through active learning [R17, 2024]

The two statements thereof suggest that the integration of ICT is crucial for ensuring quality education, as it enables students to become more creative, active, and engaged in the learning process. ICT plays a vital role in facilitating effective learning and creating an environment where students can actively engage in the learning process. It is also recognized as one of the core competencies in the implementation of the Competence-Based Curriculum (CBC). By promoting active learning, ICT helps equip students with essential 21st-century skills, thereby enriching their educational experience and better preparing them to meet future academic and professional challenges.

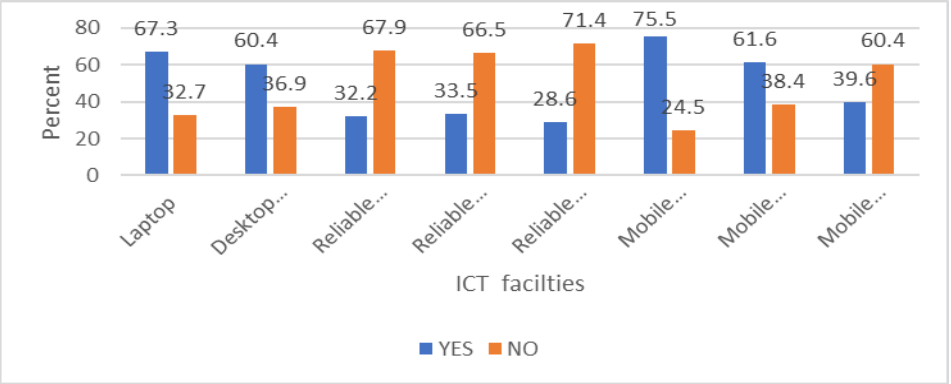
Challenges in integrating ICT in the implementation of CBC for public primary schools

Availability of ICT facilities

The distribution of availability of the ICT facilities to the study participants was as follows. The majority of the participants had the following ICT facilities available: see the figure below.

Figure 1

Availability of ICT facilities (n=245)



According to the data, the most commonly available ICT facilities reported by participants were mobile devices (smartphones) with internet and email functionality (75.5%), laptops (67.3%), tablets with similar features (61.6%), and desktop computers (60.4%). However, more advanced infrastructure, such as reliable internet connections (Wi-Fi, 3G/4G, or LAN), was reported as available by less than 34% of respondents. This indicates that while basic devices are somewhat accessible, overall ICT infrastructure is insufficient for effective integration into teaching and learning. Further insights from in-depth interviews supported this finding. Many respondents highlighted the shortage of ICT facilities in schools, particularly desktop computers. It was also noted that most of the laptops used were personally owned by teachers rather than provided by the schools. As one participant explained:

> Top of Form
> Bottom of Form
> No, the implementation is not good because teachers lack enough computers for students to learn practically. For example, most of the science and technology teachers fail to teach some topics (internet, word processor, spreadsheets etc.) [R3, 2024]

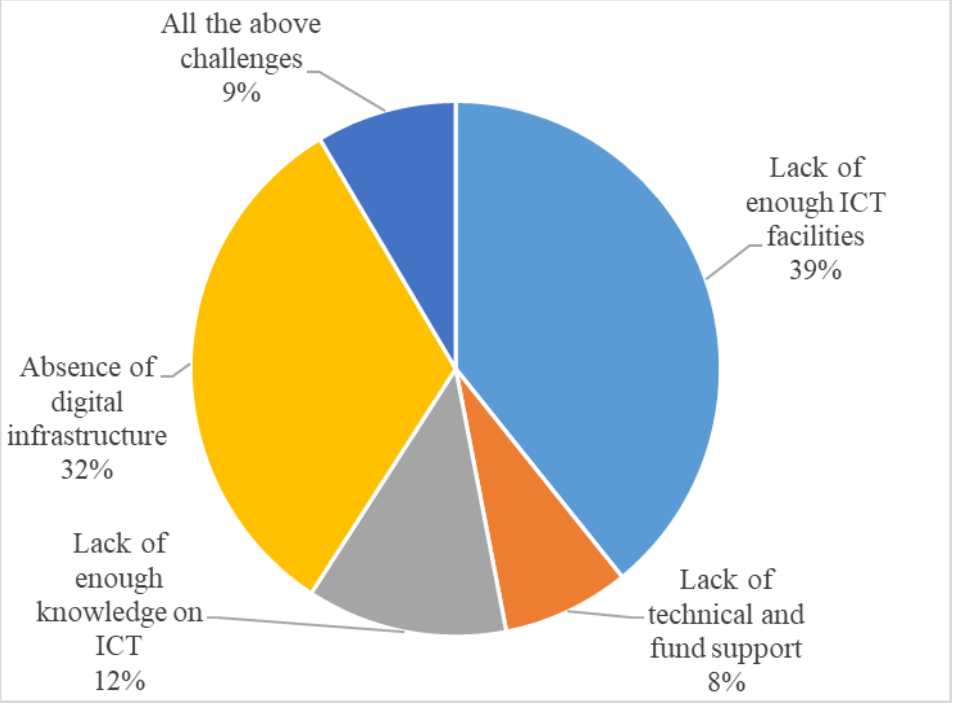
The above statement underscores the shortage of computers in schools, which significantly hampers the integration of ICT in teaching, particularly in science subjects. This limitation affects the use of tools such as the internet, word processing, and spreadsheets, thereby reducing teachers' ability to effectively deliver essential digital skills to learners.

Main Challenges faced by schools in integrating ICT

Respondents were asked to identify the challenges they face in incorporating ICT into the Competence-Based Curriculum in primary schools. The most frequently reported issue was insufficient ICT facilities (39.2%), followed by a lack of digital infrastructure (32.2%). Poor technical and financial support was the least cited challenge (7.8%). Additionally, only 8.6% of respondents reported experiencing all the listed challenges. These findings suggest that limited ICT integration in the studied schools is largely attributed to infrastructural and resource-related barriers that affect teachers' ability to effectively use technology in the teaching and learning process. Figure 1 shows the result below.

Figure 2

Challenges faced by schools in integrating ICT (n=245)



Likewise, most of the participants in in-depth interviews mentioned inadequacy of funds and technical support including frequent power cut-offs when it came to facilitating ICT integration in delivering CBC in primary schools. This was narrated by one of the participants:

> We have many challenges during ICT integration, for example, low facilities, lack of funds to support operations (internet, increasing some ICT resources), lack of technical support, power cut-off, poor infrastructures, and some teachers are not well prepared on using ICT tools. [R9, 2024].

Also, the participants mentioned the inadequacy of information technology (IT) literacy among teachers and the lack of facilities to implement integration of ICT in delivering CBC as mentioned by one of them who said that "Few of them are confident and comfortable in using ICT; about 75% are not using it because of low skills as well as lack of enough facilities." [R21, 2024]

Another head teacher had this to say:

> "We recognize the importance of ICT in education, and as a school, we are striving to integrate it into our teaching and learning processes. However, the reality is that we face several challenges. The most pressing issue is the lack of adequate ICT resources, particularly computers and internet access, which makes it difficult for teachers to incorporate ICT effectively into their lessons. Although we have some ICT equipment available, it's not enough for every student to engage practically during lessons". [R4,2024]

The responses highlight critical barriers to ICT integration in primary schools, particularly limited teacher competence and inadequate access to ICT resources. The lack of confidence and skills among teachers, combined with insufficient computers and internet connectivity, directly impacts the practical application of ICT in classrooms. These challenges hinder effective implementation of the Competence-Based Curriculum (CBC), limiting students' exposure to essential digital skills. The findings underscore the urgent need for targeted teacher training and equitable distribution of ICT infrastructure to ensure meaningful integration and improved learning outcomes. Furthermore, teachers are aware of the potential benefits that ICT can offer in terms of improving student engagement, enhancing creativity, and fostering critical thinking. But without sufficient resources, many teachers struggle to teach certain topics, especially in science and technology. For example, while we aim to teach students to use computer applications like word processors or

spreadsheets, we simply don't have enough devices for every student to practice. The narration above was complimented by the SQAO when remarked:

> From a quality assurance perspective, we recognize that ICT has the potential to enhance teaching and learning significantly, especially when it comes to fostering creativity, critical thinking, and student engagement. However, several challenges hinder its effective implementation, basically the issue of infrastructure. Many schools, particularly in rural or underfunded areas, still lack the necessary ICT resources such as computers, reliable internet access, and interactive learning tools. Without these, even the most motivated teachers struggle to integrate ICT into their lessons effectively. Additionally, we've observed that the limited availability of devices often leads to students not getting hands-on experience with technology, which is essential for building their ICT competencies. [SQAO,2024]

The statement emphasizes the pivotal role of ICT in enhancing educational quality by fostering creativity, critical thinking, and student engagement. It also highlights significant challenges hindering effective ICT integration, particularly in rural or underfunded areas. These challenges include inadequate technological infrastructure—such as limited access to computers, unreliable internet connectivity, and a shortage of interactive learning tools—which significantly hinder teachers' ability to effectively integrate ICT into their lessons. Consequently, students miss out on essential hands-on experience with technology, limiting their development of ICT competencies.

The study revealed that most teachers acknowledged the importance of ICT in implementing the Competence-Based Curriculum (CBC) to enhance the quality of education. The findings demonstrated a generally positive perception of ICT integration, consistent with Rogers' Diffusion of Innovation (DOI) Theory, which categorizes adopters into Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. This framework provides a useful lens for analyzing the varying levels of teachers' readiness and willingness to adopt ICT in their instructional practices. Teachers reported that ICT facilitates more efficient resource management, reduces reliance on traditional chalkboard teaching, and streamlines assessment processes. These insights highlight how positive attitudes toward ICT are closely linked to teacher preparedness and digital competency, both of which are essential for transforming pedagogy and equipping students with critical 21st-century skills. This view aligns with UNESCO's (2018) updated ICT Competency Framework for Teachers,

which emphasizes the role of ICT proficiency in advancing equity and excellence in education. The framework addresses key dimensions such as curriculum integration, pedagogy, infrastructure, and continuous professional development (Tomczyk & Fedeli, 2021). Similarly, the World Bank's ICT policy framework highlights the strategic use of technology to promote economic growth, enhance governance, and improve educational outcomes.

These perspectives are supported by Ishaq et al. (2023), who found positive teacher perceptions of ICT in the classroom, and by Kalinga (2024), who emphasized the importance of technical literacy among Tanzanian teachers. Mwendwa (2017) also reported that primary school teachers and principals perceived ICT as beneficial in improving performance, collaboration, and learning outcomes. Despite this enthusiasm, the study found a persistent gap between national ICT policy ambitions and actual implementation in schools. Although teachers and school leaders recognize the value of ICT, current infrastructure limitations, inadequate training, and resource constraints are not sufficiently addressed by existing ICT initiatives. This disconnect underscores the need for stronger alignment between policy intent and school-level support to realize the full potential of ICT in CBC implementation.

Despite positive perceptions of ICT, the study found that only 34.6% of respondents had mastered essential software like word processors, spreadsheets, and Moodle. While many were computer and internet literate, this gap in digital competencies suggests insufficient integration of ICT in teaching, which may hinder the effective implementation of the Competence-Based Curriculum (CBC). This shortfall also poses a challenge to Tanzania's goal of becoming a digitally-driven economy, as outlined in the updated National ICT Policy (2023), which emphasizes digital skill development for all sectors. World Bank (2023) has similarly identified gaps in Tanzanian teachers' ICT competencies, recommending strategies such as Learning Management Systems (LMS), e-libraries, and digital skills frameworks. Comparable issues were found in Kenya, where limited teacher training in ICT was a major barrier (Murithi & Yoo, 2021). Other studies (Kihoza et al., 2016; Simbeye, 2020) also highlight deficiencies in ICT skills and limited access to necessary tools and support. The study further revealed that the main barriers to ICT integration in CBC were inadequate ICT facilities and poor digital

infrastructure. These findings were supported by both survey responses and interviews with school leaders. Additional obstacles included limited technical support, power outages, and the prioritization of ICT for administrative rather than instructional use, mainly due to resource constraints. While mobile phones and laptops were reportedly available, they were often personal devices owned by teachers. There was also a noted lack of adequate digital and scientific learning materials. This situation contradicts the goals of the Draft National Digital Education Strategy (2024/25–2029/30) and the National ICT Policies (2016, 2023), which call for accessible, reliable, and sustainable digital infrastructure to support education. It also challenges the ambitions of Tanzania's Development Vision 2025, which emphasizes science and technology education and the role of ICT in building a skilled, knowledge-driven society (URT, 2019).

Addressing these gaps through greater investment in ICT infrastructure, teacher training, and learning resources is essential. Doing so would accelerate ICT integration, improve primary education quality, and support the achievement of Sustainable Development Goal 4, Target 4.1, which advocates for inclusive, equitable, and quality education by 2030. Similar studies (Murithi & Yoo, 2021; Mwendwa, 2017) affirm that many schools lack the financial capacity to provide adequate ICT resources, exacerbating educational disparities and limiting progress toward national education goals.

The study also found that the primary challenges of integrating ICT into the CBC curriculum in primary schools were inadequate ICT facilities and poor infrastructure. Key issues included limited technical support, unreliable electricity, and a lack of digital learning resources, which led to the use of ICT primarily for administrative tasks rather than for instructional purposes. A digital divide was evident between public and private primary schools in Moshi Municipality, with ICT rarely used for teaching in public schools. These findings align with the United Republic of Tanzania (2022), which acknowledges the gap between ICT policy goals and actual classroom practice. According to SDG Target 4.1, by 2030 all learners should acquire the technical and vocational skills needed for employment or entrepreneurship (United Nations, 2015), and ICT integration is central to achieving this vision (Antoninis et al., 2023).

The findings also support Nieminen (2020), who highlighted poor IT support, insufficient teacher training, and a shortage of qualified personnel as barriers to ICT adoption in Tanzanian schools. These constraints conflict with the goals of the Draft National Digital Education Strategy (2024/25–2029/30), which emphasizes accessible, curriculum-aligned digital learning resources and teacher empowerment (URT, 2024). Other studies (Mbawala & Lestari, 2023; Joseph, 2021; Kiwonde, 2020) reported inadequate devices, unreliable internet, and limited professional development opportunities. Teachers in this study echoed similar concerns, citing slow internet, frequent power outages, and a lack of training as key barriers to effective ICT integration. These findings are consistent with Lubuva, Ndibalema, and Mbwambo (2024), who noted that many Tanzanian primary school teachers lack the digital skills and tools necessary for meaningful ICT use. UNESCO (2023) also reports that education systems in low- and middle-income countries struggle to meet acceptable ICT integration standards due to systemic resource and capacity limitations. To address these challenges, increased investment in digital education infrastructure is critical. This includes providing appropriate digital tools for both online and offline use, training teachers and students in digital literacy, and ensuring access to relevant, localized digital learning materials. Collaboration among education stakeholders is essential to support the adoption, implementation, and sustainability of ICT in schools. The findings offer valuable insight into teachers' perceptions of ICT integration in CBC and underscore the need for education policies to prioritize digital transformation. Achieving SDG 4.1 by 2030 will require proactive measures to expand ICT access, improve infrastructure, and enhance teacher capacity to deliver quality, inclusive education in Tanzania’s public primary schools.

CONCLUSIONS

In conclusion, the assessment of ICT integration in the Competence-Based Curriculum (CBC) within Moshi Municipal public primary schools is both timely and significant. It addresses key gaps in educational policy and practice by providing localized evidence on digital readiness, teaching capacity, and infrastructure. The study contributes to the effective implementation of the CBC and aligns with national efforts, such as the Draft National Digital Education Strategy (2024/25–2029/30), to enhance education through technology. The findings have the potential to inform future educational reforms, improve teacher professional development, and support equitable access to quality education.

To achieve Sustainable Development Goal (SDG) 4 and Target 4.1—ensuring inclusive, equitable, and quality education by 2030—the integration of ICT into CBC teaching and learning must be prioritized. Key challenges such as limited ICT infrastructure, unreliable internet, and inadequate teacher training must be addressed. The government should increase the availability of digital tools including computers, tablets, projectors, and routers. Additionally, funds should be allocated to support regular internet access through term-based capitation grants. Addressing frequent power outages through electricity subsidies or solar installations is also critical. Teachers need to adjust their instructional practices and receive ongoing professional development in ICT integration. Therefore, education stakeholders must ensure that teacher training institutes are well-equipped to foster technology-supported teaching innovations and share training benefits across schools.

However, this study has several limitations. It was conducted solely in public primary schools within Moshi Municipality, which limits the generalizability of the findings to other regions. Some respondents may have withheld information due to concerns about disclosing ICT-related challenges, though this was mitigated through assurances of confidentiality. Moreover, the study focused only on government education officials and teachers, excluding students who could have provided deeper insights. A broader or longitudinal study involving more diverse participants could yield a more comprehensive understanding of ICT integration in education.

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