A Competency-Based Approach to ICT Integration in Teacher Education: Perspectives from Tutors and Teacher-Trainees in Tanzania Mainland

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ABSTRACT

This study aimed to examine implementation of a competency-based approach to ICT integration in Teacher Education in Tanzania. Specifically, the study sought to determine the access to ICT resources, the level of knowledge and skills among tutors and teacher-trainees for integrating ICT in teaching and learning activities and explore the views and opinions on the challenges facing the integration of ICT in Teachers Colleges in Tanzania Mainland. The study adopted mixed methods approach. Data were collected using interviews, focus groups, questionnaire and observation. Questionnaires were administered to 177(128 teacher-trainees and 49 tutors) respondents from two Teacher Training Colleges. Findings indicated that access to ICT resources and availability of training linked to integration of ICT in teaching and learning practices. For effective integration of ICT in teaching and learning there is a need to enhance access to ICT resources, training and re-training programmes more specifically in basic ICT skills and pedagogical integration of ICT and a favourable environment on use of ICT among tutors and the teacher-trainees.

Keyword*:* Teacher Education, Teacher-trainees' competencies, ICT, ICTs in Teacher Education, ICT Integration, Training on ICT integration

INTRODUCTION

- *Background*

This study investigated the competency-based approach to ICT integration in teacher education and its perspectives from teacher-trainees in Tanzania Mainland. In Tanzania and Africa, teacher trainees need to possess adequate ICT competencies to integrate technology effectively into their teaching practice (Kikwasi, 2021). ICT training is essential for teacher trainees to acquire computer literacy, digital communication, and multimedia skills, which are crucial for using technology in education. Moreover, teacher trainees with ICT competencies are better equipped to teach 21stcentury skills such as critical thinking, creativity, communication, and collaboration (Ajayi et al., 2021).

The demand for digital literacy is increasing in the job market, making it necessary to provide teacher trainees with adequate ICT training. Access to ICT training is a crucial factor in enhancing the competencies of teacher trainees in using technology for teaching and learning in Tanzania and Africa as a whole (Komba & Nkungu, 2022a, b). However, most teacher trainees need more ICT skills and competencies, which limits their ability to integrate technology effectively into their teaching practice. Therefore, providing teacher trainees with adequate ICT training is necessary to enhance their digital skills and competencies, enabling them to use technology effectively in education.

Kariuki (2021) conducted a study on the factors affecting the integration of ICT in education, with a focus on teacher education programs in Kenya. The study found that the lack of infrastructure, inadequate

training, and a shortage of resources such as computers and internet connectivity are among the factors that hinder the integration of ICT in education. Additionally, the study found that the limited support from the government and the institutions and inadequate funding contribute to the challenges in integrating ICT into education. Similarly, Kapinga (2019) explored the challenges of integrating ICT in teacher education programs in Tanzania, focusing on teacher colleges. The study identified the challenges in integrating ICT into teacher education programs, including inadequate infrastructure, technical support, funding, and training for tutors and teacher trainees. The author recommended that the government and the institutions provide adequate funding and support to address these challenges.

Studies highlight the importance of a supportive and conducive environment for successful ICT integration in teaching and learning for teacher trainees (Mtebe & Raisamo, 2020; Mtebe et al., 2018). Although challenges exist, such as insufficient infrastructure and lack of access to technology, there is a growing recognition of the need for ICT integration in teacher education programs.

Teacher trainees to possess adequate ICT competencies to integrate technology effectively into their teaching practice need adequate training. ICT competencies are crucial for teacher trainees to prepare students for the digital age (Mtebe & Raisamo, 2020; Mtebe et al., 2018; Dele-Ajayi, 2021). Providing teacher trainees with adequate ICT training is necessary to enhance their digital skills and competencies, enabling them to use technology effectively in education. Although challenges exist in integrating ICT in education, recent studies highlight the importance of a supportive and conducive environment for successful ICT integration in teaching and learning programs among teacher trainees in Tanzania and Africa. Further research is required to explore the effectiveness of a competency-based approach to ICT integration in teacher education and identify strategies to create a supportive environment for ICT integration in teacher education programs in Tanzania Mainland, and Africa.

Top of Form

- *Statement of the Problem*

The literature review highlights the importance of integrating ICT in teacher education for preparing teachers to provide quality education in the 21stcentury, especially in developing countries like Tanzania. However, there are challenges in effectively integrating ICT into teacher education due to inadequate infrastructure and limited teacher training (Kapinga, 2019; Komba & Nkungu, 2022b; Mtebe et al., 2018). The review suggests that a competence-based approach can enhance teacher-trainees' ICT integration skills by focusing on developing competencies such as digital literacy, instructional design, and pedagogical content knowledge. Adopting this approach can lead to positive outcomes, including increased teacher confidence in using ICT and improved student learning outcomes. Despite the acknowledged importance of this approach, there is limited empirical evidence of its effectiveness. Moreover, investigating teacher-trainees' perspectives in adopting a competence-based approach to ICT integration in teacher education is crucial in understanding its effectiveness and identifying potential challenges that need to be addressed.

- *Purpose of the Study*

The purpose of the study was to investigate the effectiveness of the competence-based approach in enhancing teacher-trainees' ICT integration skills and explore their perspectives on adopting this approach.

- *Objectives of the Study*

The study's main objective was to investigate the effectiveness of the competency-based approach in enhancing teacher-trainees' ICT integration skills and explore their perspectives on adopting this approach. The study aims to identify potential challenges and provide insights and recommendations that can inform policies and practices on ICT integration in teacher education in Tanzania Mainland.

Specifically, the study aimed to;

1. Examine level of knowledge and skills among tutors, colleges principals and teacher-trainees' in integrating ICT in teaching and learning activities.
2. Determine views of the tutors, colleges principals and teacher-trainees' towards the effective use of the ICT in Teachers-Training Colleges in Tanzania Mainland.

- *Significance of the Study*

The significance of the study lies in its contribution to the existing literature on ICT integration in teacher education, specifically the competency-based approach. The study aims to address the critical gap in the literature on ICT integration in teacher education in Tanzania Mainland by generating valuable data on the use of competence-based approach's effectiveness for teacher-trainees. The findings can contribute to developing effective strategies for ICT integration in teacher education and inform policy and practice in Tanzania Mainland and similar contexts. The study's significance lies in its contribution to addressing the lack of data on the competence-based approach to ICT integration in teacher education for teacher-trainees, particularly in the Tanzanian context. By providing valuable insights and empirical evidence, the study can inform policies and practices and contribute to the wider literature on ICT integration in teacher education. Ultimately, this study can promote effective ICT integration in teacher education and prepare future teachers to meet the challenges of the 21st century.

Overall, the study's conceptual implications lie in its potential to contribute to the theoretical understanding of the role of competencies in teacher education, the factors that influence the adoption of a competence-based approach to ICT integration, and the challenges and opportunities for effective ICT integration in developing country contexts. By providing insights and empirical evidence, the study can inform the development of effective strategies, policies, and practices for promoting ICT integration in teacher education, which can improve the quality of education in developing countries.

LITERATURE REVIEW

Information and Communication Technology (ICT) has been recognized as a powerful tool for enhancing teaching and learning outcomes across all levels of education (Kozma, 2016). In teacher education, ICT integration can enable teacher-trainees to develop the necessary skills and competencies to integrate technology into their teaching practice effectively (Chen & Chen, 2018). With the advent of the competency-based approach to teacher education, the role of ICT in enhancing teacher-trainee competencies has become even more significant (Mtebe & Raisamo, 2014). This literature review critically examines the key concepts, themes, and debates in the literature on ICT integration in teacher education.

- *ICTs in Teacher Education*

Over the last ten years, there has been an increased emphasis on integrating information and communication technology (ICT) into teacher education programs, with numerous studies exploring its potential to enhance teaching and learning outcomes. A significant finding from the literature is the importance of providing teachers with the necessary training and support to integrate ICT effectively into their teaching. Hinduja et al. (2023) identified that many teachers lack the required skills and knowledge to effectively use ICT in their teaching, highlighting the need for ongoing professional development programs. Similarly, Law et al. (2019) found that teachers who received training on ICT integration in teacher education reported greater confidence in using technology in their teaching.

Another crucial aspect of ICT integration in teacher education is the development of appropriate pedagogical strategies that effectively utilize technology in teaching and learning. Tondeur et al. (2017)

emphasized the significance of a pedagogical shift towards a more student-centered approach, emphasizing collaborative and interactive learning using technology. Bolliger and Martin (2021) found that using ICT tools such as interactive whiteboards and multimedia can enhance student engagement and motivation in the classroom. Furthermore, the literature highlights the importance of ensuring equitable access to ICT resources and technology for all students, regardless of socioeconomic background. Rana et al.(2022) found that access to technology can play a critical role in facilitating the integration of ICT in teacher education, particularly in developing countries where resources are limited. However, they also highlighted the need to consider the potential equity implications of technology use in education. According to Bindu (2016), the utilization of ICTs in teaching and learning provides an opportunity for present day teachers to create relevant and intriguing learning experiences for their students through learner-centred approach rather than the conventional teacher-centred pedagogy.

The literature offers valuable insights into the potential benefits and challenges of integrating ICT into teacher education, emphasizing the importance of providing teachers with ongoing training and support, developing appropriate pedagogical strategies, and ensuring equitable access to technology resources. These insights can guide the development of effective policies and practices for promoting the integration of ICT in teacher education, ultimately improving the quality of education for all students.

- *Teacher Education in Tanzania Mainland*

Teacher Education in Tanzania Mainland is under the supervision of the Ministry of Education, Science and Technology (Mgaiwa, 2018). The ministry is responsible for managing 34 public teacher's colleges and providing guidance to approximately 14 privately owned colleges that offer teacher training at the certificate and diploma levels (Kitta & Fussy, 2013; Luwavi, 2012). Moreover, universities, which are supervised by the Tanzania Commission for Universities (TCU) and the directorate of higher education at the MoEST, are responsible for preparing undergraduate and post-graduate teachers (Mgaiwa, 2018). The Teacher Education Unit at the MoEST is tasked with managing teacher education nationwide, including the preparation of "Grade A" (certificate) and Diploma teachers for pre-school, primary and secondary education (Mgaiwa, 2018).

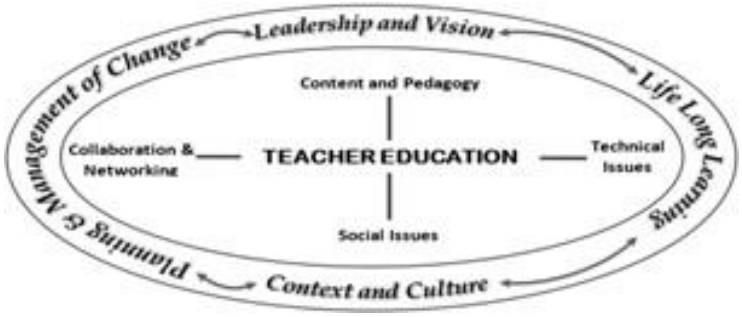

Fig. 1: UNESCO's Vision of ICT in Education (UNESCO, 2002)

To ensure reliable and dependable quality standards for teacher education graduates, examinations and certification of Grade A and Diploma teachers are administered nationally by the National Examination Council of Tanzania (NECTA) (Mgaiwa, 2018). Teacher training in Tanzania is provided at three levels: Grade A, Diploma, and Degree levels. Grade A student teachers are trained at teacher training colleges for two years, which includes teaching practice, to equip them with knowledge, pedagogical skills, and methods to teach at primary schools (Mosha, 2016; Ngao & Xiaohong, 2020). Upon successful completion of their training, Grade A graduates are employed by the government as professional teachers in primary schools (Mosha, 2016).

According to Mgaiwa (2018), teacher training in Tanzania is divided into two categories: pre-service and in-

service training. Pre-service training prepares individuals for a teaching career by providing them with educational theories, education philosophy, teaching methodologies, and educational ethics, as well as social skills and subject knowledge to start a successful teaching career. On the other hand, in-service training is provided to working teachers to improve the quality of their teaching and acclimate new teachers to carry out effective teaching and learning. This training is provided continuously and consistently and varies in approach, including short courses, seminars, workshops, meetings, and other special training, and is offered by the government and other education stakeholders within or outside the country.

Overall, the Ministry of Education, Science and Technology, in collaboration with other education stakeholders, is responsible for ensuring the quality of teacher education in Tanzania, from pre-service to in-service training, to meet the needs of pre-school, primary, and secondary education.

- *ICT Competency Framework for Teachers*

The UNESCO ICT Competency Framework for Teachers (ICT-CFT) is a comprehensive framework that provides guidelines for pre-and in-service teacher training on using ICTs across the education system. The framework consists of 18 competencies organized according to the six aspects of teachers' professional practice over three levels of teachers' pedagogical use of ICT. The three levels include Knowledge Acquisition, Knowledge Deepening, and Knowledge Creation, and the six aspects of a teacher's professional practice include Understanding ICT in Education Policy, Curriculum and Assessment, Pedagogy, Application of Digital Skills, Organization and Administration, and Teacher Professional Learning (UNESCO, 2018).

According to Andersson et al. (2014), the ICT-CFT is intended to be adapted to support national and institutional goals by providing an up-to-date framework for policy development and capacity building in the dynamic area of ICT and education. The framework incorporates inclusive principles of non-discrimination, open and equitable information accessibility, and gender equality in delivering technology-supported education. The framework addresses the impacts of recent technological advances on education and learning, such as Artificial Intelligence (AI), Mobile Technologies, the Internet of Things, and Open Educational Resources, to support the creation of inclusive Knowledge Societies.

The UNESCO ICT-CFT provides a clear roadmap for developing ICT competencies for teachers at all levels of education. It provides a foundation for teacher-trainees to acquire knowledge and skills related to the use of technology in education and to be able to integrate these skills into their teaching practice. By doing so, they can deliver quality education and effectively guide the development of students' ICT competencies.

METHODOLOGY

This study used pragmatism philosophy adopting mixed methods approach to investigate the perspectives of tutors and teacher-trainees on use of competence-based approach to developing ICT related competences. According to Creswell (2014), the mixed method combines both quantitative and qualitative methods in collecting, analyzing, and "mixing" data in a single study or a series of studies to understand a research problem. Leech and Onwuegbuzie (2009) highlight that to investigate the same problem or phenomenon, mixed methods research collects, analyses, and interprets both quantitative and qualitative data in a single research or in a series of research. Mixed method design can provide all encompassing and detailed data to respond to the research questions (Bryman, 2006).

Sampling and Sample Size

The study aimed to explore the factors that limit the integration of information and communication

technology (ICT) in teaching and learning processes and activities at two teacher colleges in Tanzania. The population studied included TC Management and Administration, tutors, and student teachers. A mixed research approach was used, and a case study design was employed. The sample size was determined based on the qualitative design being used, and 177 participants were selected using purposive, snowballing, and opportunistic sampling techniques. Purposive sampling was used to select two college principals, eight tutors, and 20 teacher-trainees with relevant experiences in assessing the contribution of ICT in the teaching and learning process in TCs. The sample size was deemed representative of the population, and participants were carefully chosen non-randomly based on the relevant experiences they possessed. The minimum prerequisites for someone to be included in the sample unit of the study were established a minimum service period of 5 years for college administrators, a minimum tutoring period of 2 years for college tutors, and a minimum training period of 6 months for student-teachers were considered sufficient.

Data Collection and Analysis

The data collection methods used in the study were both quantitative and qualitative, including interviews, focus groups, questionnaires, and observation. In the first phase, qualitative data was collected through interviews with participants representing the administration, tutors, and student teachers at the selected Teachers Colleges to develop a thick descriptive account of their practices and perceptions of integrating ICTs in teaching and learning. The purpose of data collection was to obtain information for decision-making and passing on to others. The data collection procedure was systematic, with a focus on choosing an appropriate instrument for collecting relevant information and ensuring validity, reliability, and ethical considerations. Primary data collection involved the collection of information directly from the sample population using questionnaires, which were useful in structuring and finding a common measurement to the respondents' answers. The questionnaires also included demographic questions in addition to valid and reliable research instruments. The structure of a questionnaire contained an introduction, main issue, and a conclusion. The administration of the questionnaires was supervised to maximize the benefit from the purposive research sample frame. Overall, the study employed a mixed-methods approach to obtain in-depth research inquiry and gain deep insights from rich narratives while ensuring more reliable results and fewer ethical problems.

The study utilized a mixed-methods research approach, incorporating both qualitative and quantitative data analysis techniques.

Qualitative data were analyzed using thematic and content analysis methods, while quantitative data produced nominal and non-parametric data, which were analyzed using descriptive and inferential statistics. Thematic analysis was chosen as the appropriate method for analyzing qualitative data since it facilitates a thorough examination of current developments in the field, enabling the identification of ways themes or patterns develop from qualitative data. The thematic data analysis processes involved several closely related operations that were performed to summarize and organize the collected data in a manner that answered the research questions. These processes include reading and annotating transcripts, identifying the main themes, assigning codes to the main themes, classifying the responses under the main themes, and integrating themes and responses into the research report. The researcher had to take great care when using the thematic approach since it lacks clear and concise guidelines which means that "anything goes," nonetheless, it is still a preferred option given the advantages of its flexibility. Overall, the qualitative data analysis processes followed were designed to thoroughly examine the collected data, identify themes or patterns, and answer the research questions.

RESULTS

The qualitative findings from the interviews were triangulated with the findings from the documentary analysis. The analysis revealed that there were various challenges faced by teacher-trainees and tutors in integrating ICT in teaching and learning practices. The major challenges included a lack of access to ICT infrastructure, lack of training and professional development opportunities, lack of confidence and

competence, and inadequate curriculum integration. However, the government of Tanzania has made some efforts to enhance the availability of ICT resources in teacher training colleges.

Training on integrating ICT in teaching and learning activities

Tutors (T) and teacher-trainees (TT) indicated training to be important for ensuring sustainable ICT skills competence development to future learners.

We have plans and policies initiated by government. But, to put those government plans and policies into actual practice we have formulated our own ICT policy guided by the slogan "turn ICT knowledge into action." Actually, we have three computer labs in which two of them are typically for our internal uses and one of them we use to offer computer short courses for external customers [T1].

I access computer laboratory, but most of the time is closed. When it is open, I find a lot of my fellow students have occupied all the computers. There is a challenge also of getting internet [TT45].

In our college electricity is not available all the time. Sometimes our I face challenges during teaching and learning as electricity goes off while I present a lesson using projectors (T 33].

The training on integration of ICT in teaching and learning was hindered by a number of factors including access to resources including computers and the internet. Using SPSS version 25, the regression analysis indicated that access to ICT resources for tutors is important to ensure use of competence-based approach to enhancing ICT integration in education.

The Model

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	1.000[a]	1.000	1.000	.000	1.000	20384714102834832.000	4	172	.000

a. Predictors: (Constant), Do you have access to the Internet outside the college? Is the college connected to the Internet? Do you have a computer in your office? Do you have a computer at home?

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	185.435	4	46.359	20119977556044772.000	.000[b]
	Residual	.000	172	.000		
	Total	185.435	176			

a. Dependent Variable: Access to ICT infrastructure

b. Predictors: (Constant), Do you have access to the Internet outside the college? Is the college connected to the Internet? Do you have a computer in your office? Do you have a computer in your home?

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.000	.000		40116025.082	.000
	Do you have a computer in your home?	1.000	.000	.471	117129245.841	.000
	Do you have a computer in your office?	1.000	.000	.397	100286825.965	.000
	Is the college connected to the Internet?	1.000	.000	.246	69293787.476	.000
	Do you have access to the Internet outside the college?	1.000	.000	.486	133501460.073	.000
a. Dependent Variable: Access to ICT infrastructure						

The coefficient of the regression model on ICT infrastructure demonstrate they positively predict developing a competence-based approach to integrating ICT in teacher education as follows: having a computer at home (β=0.471, p=0.000), having computer in office (β= 0.397, p=0.000), having internet connectivity (β =0.246, p=0.000) and having internet connectivity outside the college (β=0.486, p=0.000).

The study's findings show that 80% of tutors and 20% of teacher-trainees had a computer in their homes. Furthermore, 88% of tutors and none of the teacher-trainees had a computer in their offices, and 88% of tutors used ICT in their teaching. The study also found that 96% of tutors and 35% of teacher-trainees often used ICT resources for their own professional development. Moreover, 100% of tutors and 41% of teacher-trainees were trained in ICT. The study found that 100% of the colleges had a computer lab and a computer teacher, were connected to electricity and the internet, and had back-up power supply. However, only 65% of tutors and 51% of teacher-trainees had access to the internet outside the college. The study found that 100% of the respondents had undertaken ICT training programs. Tutors and the principals indicated to improve access to ICT resources teacher colleges government have to increase accessibility to internet including increasing WI-FI hotspots, ICT equipment like projectors to be mounted in each classroom, having sustainable energy, increase access to training and increase number of computers to reduce number of students sharing a computer and number of students per tutor. On the other hand, teacher-trainees said:

I think to increase accessibility to ICT resources for teacher-trainees there is a need to increase number of ICT professional tutors for example in my college there are only two tutors who teach ICT to all teacher-trainees, also government have to increase availability of internet, availability of ICT equipment, and availability of equipped ICT laboratories, one laboratory is not enough as poses resources managerial challenges [T2]

I feel increasing access to ICT resources to college, the government have to increase provision of computer in our college and free Wi-Fi for the student to use it for searching materials [T33]

Apart from government support college itself is responsible for installation and maintenance of ICT technologies. This is possible through the use our own finance and some of our staff including tutors who have basic knowledge about ICT [T1]

I think to increase access to ICT resources the government have to improve ICT infrastructure / tools used in ICT laboratory for example enough computer, enough electricity and enough place for undertaking ICT activities [TT122].

Findings showed that all respondents indicated that the teacher colleges had computer teachers. However, most teacher-trainees (30%) had not attended any ICT training compared to tutors (8%). Among those who received training, the most common courses were MS Word (65%) and ICT integration in education (11%).

The teacher-trainees mentioned that they had studied different programs in ICT, including MS Word, Ms Publisher, Excel, PowerPoint, and web design using coding techniques. However, they rarely received training on multimedia, integration of ICT in teaching practices, video conferencing, and MOODLE, and rarely learned about online teaching using different platforms, including the MOODLE.

Findings indicate that teacher-trainees and the tutors are in agreements on improving access to ICT resources in teacher colleges. Whereas tutor require more training, the teacher-trainees are in high demand of increasing ICT professional tutors to facilitate their learning. Teacher-trainees have a view that ICT infrastructure have to improved also in secondary school level. This indicates that the teacher-trainees feel the time at the college is too short for them to grasp all needed skills as such ICT skills have to start at secondary level. In addition, tutors use of ICT resources, do motivate teacher-trainees' learning of ICT (Brun & Hinostroza, 2014)

Use of ICT in teacher colleges

According to the study, a significant percentage (79%) of respondents, including principals, tutors, and teacher-trainees, were not aware of the ICT Competence Standards for Teachers in Tanzania. This lack of awareness suggests that many teachers and future teachers are facing challenges related to the implementation of ICT in teaching and developing their ICT competences.

The teacher-trainees who participated in the study expressed a strong need to develop their ICT competences. They recognize that the Government is supporting schools in Tanzania to procure ICT resources, including computers and online resources from the Tanzania Institute of Education, in order to simplify e-learning. Additionally, they understand that as future teachers, they will need to teach ICT in school and how to apply it at home due to the changes in life and advancements in science and technology.

Furthermore, the teacher-trainees believe that it is essential to develop their competence and confidence in ICT to prepare their future students for the 21st century world. They recognize that their future students will need to be proficient in using ICT resources to perform different activities in society and in real life. They believe that developing ICT competences will equip students with the necessary skills to solve problems related to communication, use ICT in business, and in everyday life.

Respondents were also asked to indicate use of available ICT equipment and software (Fig.1).Responses indicated variations in the percentages of usage of ICT applications and hardware among in the researched teacher colleges the most used ones being word processing, Email, printer projector and internet.

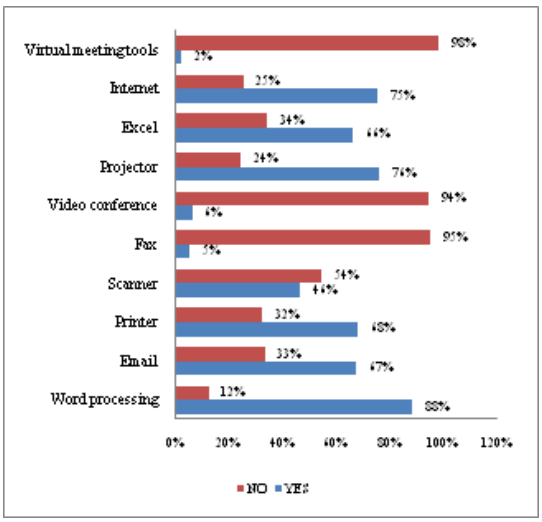

Figure 1: Usage Percentages of ICT applications and hardware in teacher colleges

The findings of the study suggest that ICT competence among tutors varies depending on several factors, including the availability of training and the use of updated ICT tools that require continuous training. The majority of tutors have an average level of knowledge about ICTs, and their interest in using ICTs varies mostly due to personal factors.

Tutors and teacher trainees indicate training as lacking component and more so the pedagogical training on ICT integration.

I propose that teacher colleges improve internet connectivity to all part of the college because in some part of the college there is low internet connection, also increase number of trainers for maximum quality of training on ICT integration in teaching and learning [TT 21]

I think there is a need to review college/school curricular to align with ICT uses in T/L processes and national examination (Assessment) and that the National internet optical fibre has added no value to education systems as internet is still too expensive for colleges to afford [T43]

I think the ongoing and current training should be offered to be able to build the competency of tutors in the use of ICT [T44]

The study also revealed that while there are Continuous Professional Development (CPD) opportunities and programs for tutors provided at both the national and college levels, the frequency of CPD provided at the national level is less satisfactory. However, the majority of tutors in the selected teachers' colleges received formal and informal training in ICT integration in teaching and learning activities. This training was provided nationwide by the Ministry of Education, Science, and Technology through the Teacher Education Support Program (TESP).

Overall, the findings suggest that there is a need for increased awareness among teachers and future teachers about the ICT Competence Standards for Teachers in Tanzania. This awareness will help to gauge their skills in relation to what is expected of them and support the integration of ICT in teaching and learning activities. Additionally, the findings highlight the importance of providing regular CPD opportunities and programs for teachers to improve their knowledge and skills in ICT integration. The study surveyed college principals, tutors, and teacher-trainees on the use of ICT in teaching and learning. The majority of respondents use ICT in the teaching and learning process (with a Pearson Chi-Square significance of 0.000) for both tutors and teacher-trainees. Most respondents also use ICT resources for their own professional development, with 47 out of 49 tutors and 45 out of 128 teacher-trainees indicating that they do so. However, respondents suggested a need to increase human resources with relevant ICT knowledge and skills, and for colleges to be equipped with ICT tools to be used during the teaching and learning process.

The study's findings revealed that the use of ICT in teaching and learning practices is limited, with respondents mostly using ICT for face-to-face instructions, online discussions with colleagues, and searching for and downloading teaching resources. Respondents suggested enhancing efforts to use ICT among tutors and teacher-trainees, including using emails, publishing materials online, doing assignments, file management, using online discussion forums, accessing social media, incorporating ICT in face-to-face instructions, facilitating online instructions, and effectively preparing presentations.

Respondents made several suggestions on how to improve the integration of ICT in teacher colleges, including ensuring adequate use of ICT in teacher colleges so that teacher-trainees learn practically using computer technology, providing in-service training about ICT, improving infrastructure related to ICT, improving internet connectivity, providing laptops and other accessories to all tutors, and ensuring continuous availability of electricity and enough facilities to facilitate the integration of ICT in teaching and learning practices.

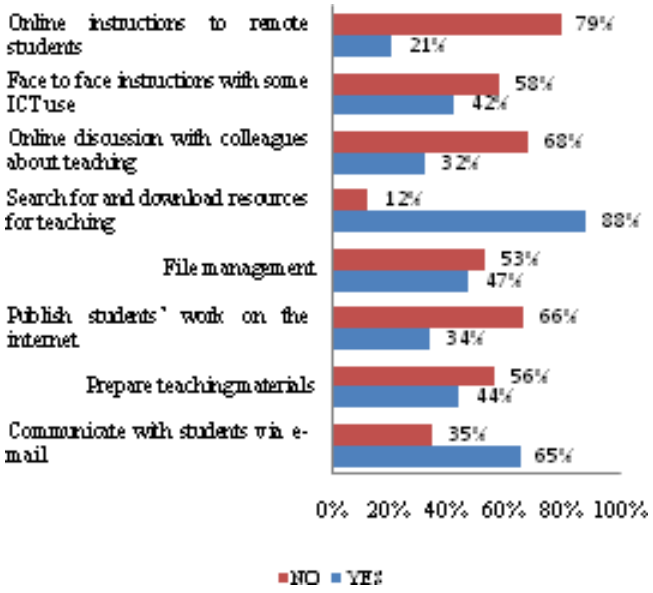

Figure 2: Percentages of ICT Uses among Tutors in Teachers Colleges

The study identified several factors that influence the integration of ICT in teacher education. The study found that individual, technological, organizational, and institutional factors need to be considered when examining ICT adoption and integration. The use of ICT in teaching and having online discussions with colleagues about teaching were identified as factors that increase ICT integration in teaching and learning practices. The study suggests that the adoption and integration of ICT into the teaching and learning environment could play a significant role in education.

DISCUSSION

The data analysis results demonstrated the increased need for professional competency and attitudes of teachers in integrating ICT teaching and learning more so during teacher preparation in teacher training colleges, as trainees. This section discusses these factors in reference to the bodies of literature. It also interprets these findings in the context of implementation of a competency-based approach to ICT integration in Teacher Education in Tanzania through interviews with tutors and teacher-trainees.

First, this study found out that teachers' professional competency in the educational use of ICT can be improved through hands-on experiences. This finding is in line with the argument that three principles of teacher training activities are important to improve teachers' professional competency: Activities are practice focused (Korthagen, 2017; Morris, 2010); teachers themselves are trainers (Jung, 2005); and sufficient time is allocated for training activities (Syahid et al. (2019). In facilitating ICT integration sufficient time can be hindered by the availability of ICT tools, ICT laboratories and Tutors ability to facilitate the training. Teacher-Trainees had a view that training in ICT integration have to be practice based for developing the needed competences. Apart from being practice based had a view that have to be trained on the tools like MOODLE, ZOOM and Google Meet instead of being trained in general aspects of Ms Office.

The basic ICT literacy of tutors and teacher-trainees has been observed to have increased according to their perception. Scholarly literature has posited that the attainment of fundamental ICT literacy by educators through training initiatives is deemed a necessary condition for their pedagogical utilisation of ICT (Fulgence, 2020; Falloon, 2020). [44]. In the majority of instances, the difficulties encountered were attributed to the insufficient training received by teacher-trainees in the utilisation of multimedia, which

subsequently hindered their ability to effectively integrate information and communication technology (ICT) into the teaching and learning process. The progression of teachers' ICT literacy is apparent as it has advanced beyond fundamental ICT competencies to improve the standard of instruction by adapting to their individual requirements using the resources at their disposal.

Subsequently, educators and prospective teachers reported an increased sense of autonomy in incorporating information and communication technology (ICT) following a sequence of instructional sessions. Prior research has underscored the significance of a collaborative leadership approach in the process of policy formulation, delegation of autonomy, having an open vision, and being willing to take risks in the integration of Information and Communication Technology (ICT) into educational practises (Bryderup & Kowalski, 2002; Rana & Rana, 2020; Lee & Nie, 2017). According to interviews conducted with tutors who oversee teacher training activities, it was confirmed that college leaders were cognizant of the benefits of utilising information and communication technology (ICT) in teaching and learning. As a result, teacher-trainees were encouraged to incorporate ICT into their instructional practises. Additionally, according to tutors' reports, the utilisation of Information and Communication Technology (ICT) in the creation of training and teaching materials fostered a culture of sharing and collaborative learning, thereby enhancing the knowledge and skills of educators. Hence, the presence of adequate resources fosters the inclination of tutors and teacher-trainees to introduce novel approaches and facilitate collaborative learning, which ultimately contributes to the enhancement of teachers' autonomy to innovate.

Findings

CONCLUSION

The study highlights the importance of ICT integration in teacher education. The study identifies several factors that influence the integration of ICT in teacher education, including individual, technological, organizational, and institutional factors. The study suggests that the adoption and integration of ICT into the teaching and learning environment could play a significant role in education. The study recommends that investment in ICT infrastructure should be done after considering the needs assessment of teachers. The study also recommends that classes should be fitted with infrastructure for ICT integration in teaching and learning.

In conclusion, this study focused on a competency-based approach to ICT integration in teacher education. It aimed at exploring the views of principals, tutors, and teacher-trainees. Areas of focus on the views related to access to ICT resources, ICT training opportunities, use of ICT in teacher colleges, and barriers to the use of ICT in teaching and learning. The findings indicate that access to ICT resources and training opportunities are crucial components of ICT integration in teacher education, as they can increase confidence, competence, and access to ICT resources including tools, software, and hardware. Moreover, the study revealed that the use of ICT in teacher colleges is minimal, and that there are several barriers to the integration of ICT in teaching and learning, including funding, availability of ICT equipment, access to internet, plans for integration, technical support, and training opportunities. To overcome these barriers, it is recommended that teacher colleges enhance their ICT infrastructure, provide support services, develop ICT policies, and provide basic and pedagogical ICT skills training. Additionally, there is a need to improve the motivation of tutors and teacher-trainees to try out new ideas and practices that integrate ICT in teaching and learning. Overall, this study provides important insights into the challenges and opportunities for ICT integration in teacher education and highlights the need for ongoing efforts to enhance ICT competencies among teacher-trainees and tutors.

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