

# Enhancing Instructors Digital Competences in Teaching Practices: A Case of Teacher Education in Tanzania

Faith Shayo<sup>1</sup> and Dr. Cosmas Mnyanyi<sup>2</sup>

Faculty of Education, The Open University of Tanzania (OUT), Dar es Salaam, Tanzania

[faithshayo@yahoo.com](mailto:faithshayo@yahoo.com)<sup>1</sup>, [cosmas.mnyanyi@yahoo.co.uk](mailto:cosmas.mnyanyi@yahoo.co.uk)<sup>2</sup>;

**Abstract:** *This study investigated prospects and challenges for enhancing instructors' digital competence in teaching practices, a case of teacher education in Tanzania. The study employed a mixed-methods approach. A total of 179 respondents (49 tutors, 128 teacher trainees, and 2 college principals) from two teacher colleges in Tanzania's Mainland participated. The study was guided by two theoretical foundations: the TPACK model and, as a complement, computer self-efficacy (CSE). Data were collected using a questionnaire, an interview guide, and observation checklists. Through analysis of self-reported challenges facing ICT integration in teacher education and the need for enhancing digital competence in teacher education, results show that tutors and teacher trainees were rarely trained on technology-enhanced pedagogy, which resulted in tutors and teacher trainees not using digital tools primarily for pedagogical purposes. The study highlights the need for ongoing pedagogical support in developing digital teaching and learning environments for tutors and teacher trainees. To increase motivation and provide efficient, subject-focused examples, educators must understand the potential of digital tools and identify pedagogical added value in their context. The role of teacher educators in incorporating digital technology is crucial for meeting students' learning requirements across various subjects in teacher education. document is a "live" template and already defines the components of your paper [title, text, heads, etc.] in its style sheet.*

**Keywords—** computer self-efficacy, digital competence, tutor, teacher-trainees, teacher colleges

## 1. INTRODUCTION

This study examines opportunities and barriers for improving digital competency in teacher education. Teachers play a crucial role in preparing them to use ICT in their instruction and are more likely to integrate technology when they see its value. Interventions can help reduce the time students take to become functional in online environments. Digital technologies are protean, unstable, and opaque, making them challenging to adapt to. Integration of Information, Communication, and Technology (ICT) in education refers to the use of computer-based communication that incorporates into daily classroom instructional process [12]. There are international and regional ICT conventions, protocols and agendas aiming at promoting ICT integration in areas of education, science and technology including the Education 2030 Agenda (Sustainable Development Goal no. 4 and the African Union Commission Agenda 2063's Continental Education Strategy for Africa (CESA).

Information and Communication Technologies (ICT) has a unique capacity to improve quality of life by increasing access to education to all, including the most remote, underprivileged, and disadvantaged communities [21][22][25]. The importance of ICT calls for developing digital competences in teacher education [20]. Teachers are pivotal in creating knowledge society, a society that embrace use of ICT in everyday life (UNESCO, 2015). In general, technological advancement has facilitated the widespread and quick change and development of human civilization from the information to the knowledge age in practically all areas, including agriculture, leisure, communication, banking, and education [6][18].

The use of technology in educational practices contributes significantly towards improving teaching, learning and pedagogical instructions by enhancing the imparting of knowledge and skills through ICT tools and applications [16]. The performance of numerous cultural and social pursuits has been made possible by the new generation of working tools, and activities that affect every aspect of daily life, including teaching and learning in schools and colleges [3][6]. The embraced use of technology in general life and in education calls for enhanced digital competences. Digital competence refers to the skills and literacies needed for the average citizen to be able to learn and navigate in the digitalized knowledge society [18].

It is important to review and improve teacher training quality in the education sector [18]. The Education 2030 Framework for Action (CESA) aims to harness the capacity of ICT to improve access, quality, and management of education and training systems. The GoT in Tanzania promotes ICT integration in education and training, including teachers' colleges, since mid-2000. The GoT's ICT policy and institutional measures, including the creation of the Ministry of Higher Education, Science, and Technology, aim to develop and strengthen teachers' and students' ICT skills for 21st-century teaching and learning.

School systems and teacher training programs worldwide aim to bridge traditional and electronic teaching methods with digital tools [5]. However, the use of ICT in teacher training may be mandatory or optional depending on the nation. Digital technology also allows universities to rationalize administration, improve student-teacher interaction, and promote technology-enhanced teacher professional development (TETPD) [19].

The development of digital competences for integration of ICT in teacher education is crucial for providing equitable and quality education, as outlined in the Education 2030 Agenda [18]. In 2005, the Ministry of Education and Science and Technology (MoEST) initiated a program to integrate ICT in teaching and learning, preparing students and teachers for a knowledge society in the digital age [17]. In 2014, the GoT launched a new Education Policy, emphasizing the importance of ICTs in improving education standards and quality. The Tanzania National ICT Policy (2016) raised concerns about the lack of programs for training teachers on computers and multi-media utilization. The URT (2016) highlighted the deficiency in ICT training programs, which hindered the slow uptake of computer studies in primary and secondary schools [12]. To implement the ICT policy's ambitions, the Ministry of Education and Vocational Training introduced an ICT pedagogy curriculum in Teachers Colleges (TCs) in Tanzania, aiming to train student teachers on how to integrate ICT in teaching and learning [17].

Training significantly influences technology use, with participants' perceived value of teaching and learning influencing online teaching self-efficacy [5][8][9]. There is a moderate relationship between emotional intelligence and online teaching self-efficacy [4]. Lack of self-efficacy and technology use among teachers is linked to insufficient exposure to ICT in training programs. Further research is needed to understand digital tools, evaluation, and training requirements. This study, therefore, sought to identify factors that influence the development of digital competences in teacher education in Tanzania mainland guided by the following research questions: What is the usage of ICTs in teacher education in Tanzania mainland? What factors inhibit the development of instructor's digital competences in teacher education in Tanzania mainland?

## 2. THEORETICAL PERSPECTIVES

This study analyses the development of digital competences in teacher education using the TPACK model [32] and computer self-efficacy [11]. The three knowledge domains, pedagogical, technical, and content, interact to explain effective teaching with digital technologies [5][12]. The interaction between technical and pedagogical knowledge, and technical and content knowledge, demonstrates how teachers can incorporate technology into subject content and employ content in teaching practice. TPACK focuses on effective teaching with technology. It involves understanding pedagogical techniques, technologies, and knowledge of students' prior knowledge, epistemology theories, and how technologies can build on existing knowledge to develop new epistemologies or strengthen existing ones [32].

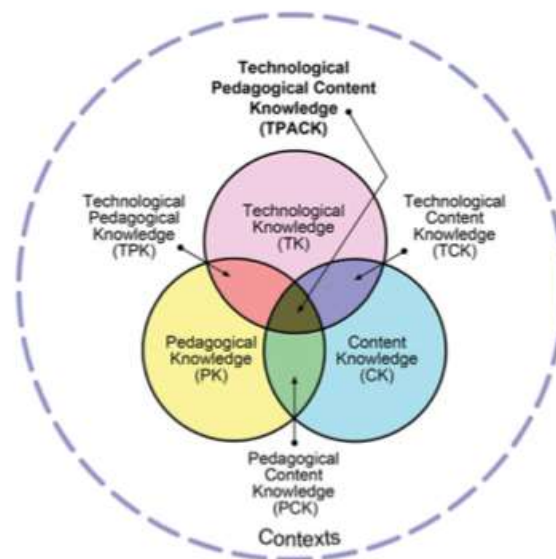


Fig 1. TPACK model by Mishra & Koehler, 2006.

It is important to understand the interaction between pedagogical, technical, and subject knowledge in teaching and learning. The TPACK paradigm, widely used, is contested due to its overlapping areas of knowledge, and often contradicting each other [32]. Teachers' expertise and ideas about pedagogy and technology influence the decision to use technology in the classroom. Active participation in designing and implementing technologically improved courses for TPACK development is beneficial, as research shows substantial gains in all TPACK categories when participants use technology to apply their training and knowledge.

Bandura's self-efficacy theory was expanded to provide a framework for computer self-efficacy (CSE) [11]. They identified four components: mastery experience, mediated experience, social persuasion, and physiological condition. CSE's size, strength, and generalizability are interconnected aspects, reflecting instructors' cognitive knowledge processes and their ability to manage information, communicate, comprehend ideas, and analyse subject matter. CSE's strength is the capacity to impart expertise, demonstrate pedagogical knowledge, and teach using technology to address student issues. The generalizability of CSE measures the technical expertise required to link various technologies to learning objectives and the most effective applications of specific technologies for subject-matter learning.

## 3. METHOD

Methodically, this study adopted both quantitative and qualitative data from a teacher education digital use survey with closed-ended and open-ended questions from two teacher education in Tanzania Mainland.

#### 4. PARTICIPANTS

Respondents in this study were teacher-trainees (128), college tutors (49) and principals (2). The respondents' characteristics are as presented in Table 1.

**Table 1:** Respondents' characteristics (N=179)

Characteristic	Description	Number	Percent
Categories	Tutors	49	27.7
	Teacher-trainees	128	72.3
Tutors	Male	28	57.1
	Female	21	42.9
Teacher-Trainees	Male	57	44.5
	Female	71	55.5
Respondents' Age	Below 25years	100	56.5
	26-35 Years	30	17.0
	36-45 years	28	15.8
	46-60	19	10.7
Tutor qualifications	Diploma	1	2.05
	Bachelors' Degree	13	26.5
	Masters	34	69.4
	PhD	1	2.05
Administrative Positions	College Principals	2	100
Teacher-trainees' year of study	Year 1	43	34
	Year 2	85	66
Tutors working Experience	0-5 years	1	2
	6-10 years	8	16.3
	11 and above	40	81.7

Source: Field Data collection 2021

Of the 49 tutors, 26 were teaching Diploma Course and 23 were teaching both Diploma and Certificate courses.

#### 5. INSTRUMENTATION

The researcher collected data in the two colleges. The respondents were informed that participation was voluntary, that they could withdraw from the study at any time, and that confidentiality was assured. Moreover, they were informed that the purpose of the project was to investigate the development of digital competence in teacher education looking at the prospects and the challenges of within two different areas of importance for teachers and the teacher-trainees: using digital technologies in teaching and learning, and the challenges faced on developing digital competences. The survey included a questionnaire, an interview guide, and an observation checklist for the purpose of this study, the questions regarding usage and the development of digital technologies were analysed. The survey took approximately 20–40 minutes to complete. Respondents were given chances to ask questions for clarification where necessary.

#### 5.1. Instruments

This study used two questionnaires (for the tutor and for the teacher trainees), interview guide and observation tool. A questionnaire for tutors had six background variables (academic institution, gender, age, teaching experience, teacher qualifications and courses teaching); Awareness of ICT in education, access, and usage; and the challenges on developing digital competence for ICT integration in teaching and learning. In total 15 questions were asked on awareness of ICT in education, access, and usage. Both closed and open-ended. There were 10 questions on the challenges on developing digital competence for ICT integration in teaching and learning. The questions were open-ended, closed questions and Likert scale questions.

#### 6. ANALYSIS

The analysis was exploratory, with an emphasis on the empirical data, and the analysis concepts of TPACK and CSE were based on the two research questions of how teacher educators use digital tools and assess their proficiency to use ICT in teaching situations, as well as what kind of training they require to prepare students for success online. Statistical analysis was carried out with the use of Pearson Chi-Square and regression analysis using IBM SPSS Statistics 25. To explore research questions with quantitative data descriptive analysis was performed on each item, whereas qualitative data, content analysis was performed.

#### 7. RESULTS AND DISCUSSION

The study focused on the usage of ICTs in teacher education in Tanzania mainland and the factors inhibit the development of digital competences in teacher education in Tanzania mainland.

##### The usage of ICTs in teacher education in Tanzania mainland

On the aspect of usage of ICT, the study focused on to what extent are tutors and teacher trainees are aware on use of ICT?

##### 7.1. Awareness on use of ICT

College principals, tutors and teacher trainees were asked on whether or not they used ICT in teaching and learning. Findings indicate that teachers and teacher trainees use ICT in teaching and learning process ( $P=0.000$ ) and in professional development in which  $P=0.000$  (Table 2).

**Table 2:** Awareness on use of ICT

Characteristic	Description	Yes	No	Pearson Chi-Square significance
Do you use ICT in teaching?	Tutor in Teacher-trainees	43	6	0.000
Do you use ICT resources for your own professional development?	Tutor in Teacher-trainees	47	2	0.000
	Teacher-trainees	45	83	

According to respondents to improve ICT integration there is a need to increase human resources with pertinent knowledge and skills in ICT.

I think teacher-trainees need to have access to computers; Periodic training to update myself on the use of computers; Free and speed internet availability; 4) Availability of computer which can be installed even graphical software and high-quality video software; and computers with enough space and processing speed [T35]

Teaching teacher-trainees on integration of ICT in teaching and learning is one thing as such the government should ensure the provision of adequate ICT equipment in different schools so that the program can be accessible to the great extent in different parts of the country at least three quarters of the schools [T5]

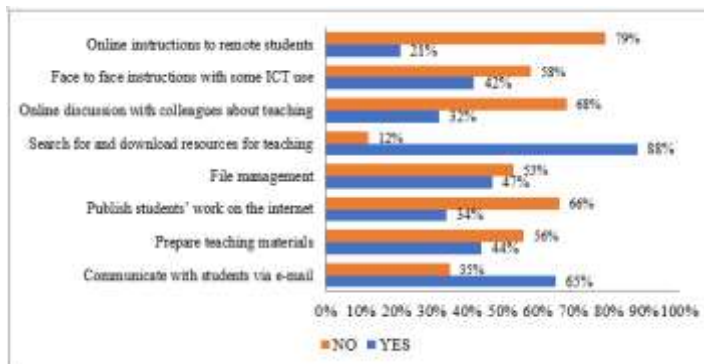
Few teachers use computers for teaching and learning purposes while majority of them use computers for administrative purposes [18]. Most of the teachers had limited confidence in using technology to facilitate specific concepts or skills, to support creativity, and to support students to learn complex concepts [18]. It is important for teacher colleges and schools to explore strategies for ICT integration that focus more on making a shift from teaching technology or using technology for administrative purpose to appropriate pedagogical uses that could enhance student learning [18].

**Use of ICT in teaching and learning practices**

Tutors and Teacher-Trainees provided their views on use of ICT in teaching and learning practices. Aspects of use of ICT in teaching and learning included: email, Learning Management System (LMS), games, searching for and downloading resources, search for news and updates, access to social media sites, preparation of presentations, reading online books, file management, facilitating online discussions and facilitating online learning (Figure 2).

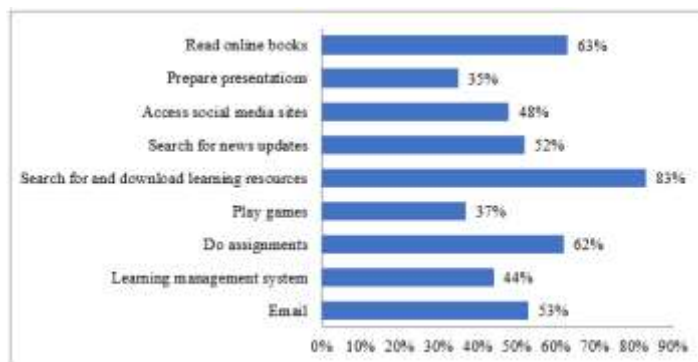
**Fig 2:** Percentages of ICT Uses among Tutors in Teachers Colleges

From Figure 2 most used ICTs for face-to-face instructions with some ICT use while, use ICTs for online discussion with colleagues about teaching, use ICTs to search for and



download teaching resources.

**Fig 3:** Percentages of ICT Uses among teacher-trainees in Teachers Colleges



Findings indicate a need to enhance efforts on using ICT among tutors and teacher-trainees. Emphasis has to be increased on use of emails, publishing materials online, doing assignment, file management, using online discussion forums, access to social media, incorporating ICT in face-to-face instructions, facilitating online instructions and effective preparation of presentations.

**Table 3:** Use of ICT in teaching and learning practices

Characteristic	Description	Available	Not Available	Pearson Chi-Square significance
Communication with students via emails	Tutor	30	19	0.000
	Teacher Trainees	0	128	
Email	Tutor	40	9	0.000
	Teacher Trainees	55	73	
	Tutor	24	25	0.000

Publish teaching materials	Teacher Trainees	0	128	
Learning Management System	Tutor	18	31	0.348
	Teacher Trainees	57	71	
Publish student work on the internet	Tutor	14	35	0.000
	Teacher Trainees	0	128	
Do assignment	Tutor	14	35	0.000
	Teacher Trainees	83	45	
File management	Tutor	31	18	0.000
	Teacher Trainees	0	128	
Play games	Tutor	24	25	0.271
	Teacher Trainees	51	77	
Searching and downloading resources	Tutor	42	7	0.359
	Teacher Trainees	102	26	
Online discussion with colleague on teaching	Tutor	18	31	0.000
	Teacher Trainees	0	128	
Search for news updates	Tutor	24	25	0.949
	Teacher Trainees	66	62	
Face to face instruction with some ICT use	Tutor	24	25	0.028
	Teacher Trainees	40	88	
Access to social media	Tutor	34	15	0.001
	Teacher Trainees	54	74	
Online instruction to remote students	Tutor	9	40	0.000
	Teacher Trainees	0	128	
Preparing a presentation	Tutor	27	22	0.005
	Teacher Trainees	41	87	
Reading online books	Tutor	38	11	0.210
	Teacher Trainees	87	41	

Tutors and teachers were asked to rate the level of ICT usage in teaching and learning activities in teacher colleges vis-à-vis the traditional methods (Table 4).

**Table 4:** Level of ICT usage in teaching and learning practices

Type of respondent	Level of ICT usage in teaching and learning activities in teacher colleges vis-à-vis the traditional methods	Pearson Chi-Square
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	Very high	Fair	Low	Very low	Total	significance
Tutors	7	41	1	0	49	0.013
Teacher-Trainees	42	74	9	3	128	
Total	49	115	10	3	177	
Percentage	28%	65%	6%	2%	100%	

### Factors influencing ICT Integration in Teacher Education

In this study respondents were asked to rate factors that influences ICT integration in teacher colleges. In each of the participating colleges, tutors, and teacher-trainees' were given question items eliciting awareness of ICT in education and accessibility to ICT infrastructure and tools for facilitating teaching and learning process. Despite the huge investments into ICT infrastructure by government there were still inequalities in ICT competencies among teachers as teachers were seen to be side-lined in the decision-making processes regarding educational matters [18]. As such investment without focusing on teacher needs assessment does not provide required level of integration of ICT in teacher colleges. Tutors (T) and Teacher-trainees' (TT) indicated received training on integration of ICT in teaching and learning.

Through teachers support programme every tutor attended the ICT training where participants were categorised in 2 levels (level 1 and 2) [T12]

Yes, because I have learnt how to use computer though opening word processing and how to switch it off [TT15]

Yes 2020 I was taken to ICT training on integration of ICT in teaching and learning (TESP) level one and two [T17]

Yes, I have undertaken ICT training programs like designing websites through coding techniques [TT45]

Yes, I have undertaken the ICT training programs such as spread sheet and word processing [TT56]

I have skills of using computer software. The common software I use more often includes Microsoft word, PowerPoint, [and] Publisher. I am so interested in using Publisher because I can make my designs [T28]

The ICT basic skills training are important for ensuring ICT integration in teacher colleges. ICT is playing a bigger role in both our daily lives and our educational system [12]. There is an increasing call for educational institutions to employ ICT to impart to pupils the knowledge and skills they need for the digital era. Teachers and students have greater opportunity to collaborate more effectively in the globalized digital age with the adoption and integration of ICT into the teaching and learning environment. ICT has the potential to play a significant role in education, whether it is in the classroom, in

administration, in online learning, or in other activities [1]. The power of ICT may be effectively used by teachers and students to raise the standard of instruction and learning in the classroom.

The use of ICT in teaching and learning is essential to both the tutors and teacher-trainees'. As a tutor I can use website such as You Tube and Google to search for relevant materials for my lesson and use them to teach the teacher-trainees, everyone would like to integrated ICT in his/her lesson, the main challenge we face at is that we have only one laboratory with computers and a media room that is having a smart board and computer facility and the rooms are always booked, if all classes could be facilitated with at least a projector we could use our own laptops [T42].

The views from the tutor, T42, indicate a need to have class fitted with infrastructure for integration of ICT in teaching and learning. Characteristic of an innovation as perceived by individual in a social system affect the rate of adoption and identified five innovation characteristics that may contribute to the adoption or acceptance of an innovation: relative advantage, compatibility, complexity, observability and trialability [26].

All respondents indicated that colleges were connected to electricity, had a computer laboratory, was connected to internet, and had a computer teacher (See Table 4 and Table 5.

**Table 5:** Factors influencing integration of ICT in teacher education (N=177)

Description	Tutors	Teacher - Trainees
Do you have a computer in your home?	80%	20%
Do you have a computer in your office?	88%	0%
Do you use ICT in your teaching?	88%	0%
Do you often use ICT resources for your own professional development?	96%	35%
Are you trained in ICT?	100%	41%
Is the college connected to electricity?	100%	100%
Does the college have back-up power supply e.g., a generator	96%	91%
Does the college have a computer lab	100%	100%
Is the college connected to the Internet?	90%	95%

Does the college have a computer teacher?	100%	100%
Do you have access to the Internet outside the college?	65%	51%
Have you undertaken any ICT training programs?	100%	70%

Source: Field data 2021

User characteristics, organisational factors, attitudes towards technology, content characteristics, technological considerations and organisational capacity as factors influencing ICT adoption and integration into teaching, suggesting that individual, technological, organisational, and institutional factors have to be considered when examining ICT adoption and integration [13].

### Regression analysis on ICT use in the teaching and learning

The model summary indicates that use of ICT increases ICT integration in teaching and learning practices. Factors indicating ICT integration are using ICT in teaching ( $\beta=0.409$  and  $p=0.001$ ) and having Online discussion with colleagues about teaching ( $\beta=0.173$  and  $P=0.035$ ) this is evidenced when tutors [T] and Teacher-trainees [TT] commending that

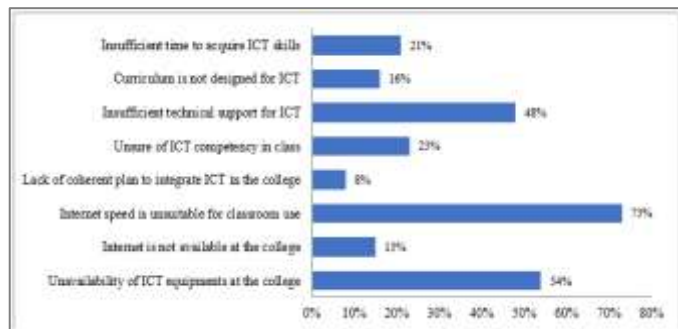
I think there should be a program of providing basic ICT education to tutors not only on how to use them but also on how to integrate ICT in their teaching subjects. I really need to know how to use ICT to teach mathematics and I believe if I have proper training on how to use internet and computer, I will be able to search relevant materials for my teacher-trainees [T25]

The Government should support in provision of equipment such as computer or laptop in order to support education services. Because are simplify learning process and students search differences materials at schools [TT33]

I think in order to improve ICT integration in teaching and learning process it needs improvement of the teacher's college support the integration in information and communication technology [TT 49]

The Tanzania government should employ more ICT experts so that ICTs integration in Teaching and learning at the teacher's college may be more accessible [T6]

I think ICT integration have to see used in teaching every time during preparation of the lesson, searching materials, communicating during teaching process and communicating with fellow tutors on issues related to integration of ICT in teaching [T9]



**Model Summary**

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.427 <sup>a</sup>	7.463	16	160	.000

a. Predictors: (Constant), Online instructions to remote students, Face to face instruction with some ICT use, Search for news updates, Search for and download resources for teaching, Learning Management System, Communicate with students via e-mail, Access Social Media sites, Do assignment, Email, Publish students' work on the Internet, Publish my teaching materials, Play games, Online discussion with colleagues about teaching, File management, Do you often use ICT resources for your own professional development?, Do you use ICT in your teaching?

**Factors inhibiting the development of digital competences in teacher education.**

Tutors, colleges principals and teacher-trainees' were asked to provide their views on the challenges facing integration of ICT in Teachers Colleges in Tanzania Mainland. The aspects that were included were barriers to the use of ICT in teaching and learning process, barriers related to ICT training programmes for educational purposes, support from college administration on integration of ICT and barriers related to available initiatives in colleges to support integration of ICT in teaching and learning practices. Teacher colleges face challenges in integrating ICT in teaching and learning as a result of ICT tools, ICT resources and shortages of INSET [14][15].

To determine challenges in ICTs integration in teaching and learning activities in the selected teachers' colleges several related question items were asked to the sampled tutors and student teachers using questionnaires. One among the question items asked respondents to select three biggest barriers among others in integrating ICTs in teaching and learning activities (Figure 3).

**Fig 5: Respondents' Suggestions on Common Barriers in ICT Integration**

From the Figure 4, insufficient technical support for ICT, unsuitable internet speed for classroom uses and unavailability of ICT equipment at the college are the three biggest barriers to the use of ICTs in teaching and learning activities, as further pointed out by the respondents in the selected teachers' colleges. Apart from the above three-pointed challenges also in another question item majority of respondents admitted that their respective colleges do not have adequate funding to purchase ICT equipment (Table 6).

**Barriers to the use of ICT in teaching and learning process**

Barriers to the use of ICT explored from the teachers were related to familiarity with ICT competence standards, funding to purchase ICT equipment and tools, availability of ICT equipment, access to internet, plans to integrate ICT in teaching and learning, technical support, curriculum for ICT subjects and opportunities for ICT skills training. Rarely, budgets for purchase of ICT equipment in teacher colleges is made available (Table 6).

**Table 6: Barriers to the funding of ICT equipment**

Funding for ICT equipment	Type of respondent	Yes	No	Pearson Chi-Square significance
Do you think the Teachers College has adequate funding to purchase ICT equipment?	Tutor	4	45	0.000
	Teacher-trainees	61	67	
Total		65	112	
Percentage		37%	63%	

Findings are in line with studies that identified funding or budget limitations as a barrier to ICT integration in higher education institutions more specifically contributes on shortages of access to equipment/resources and shortages of training opportunities for enhancing integration of ICT in teaching and learning [24][28][30]. In developing nations like Tanzania, it is difficult to manage the enormous funds needed for effective technology integration into educational systems

for software, internet, instructional aids, and other accessories that enable ICT as are quite expensive [1][19]. Most tutors do not use ICT in teaching and learning due to shortages of funding for the essential hardware and software. Equitable access to resources by instructors, students, and administrative personnel as well as the availability of hardware and software are essential for efficient and effective use of technology [2]. Most low- and middle-income countries including Tanzania, cannot cover these prices since they are frequently unaffordable.

**Table 7: Barriers to the use of ICT in teaching and learning process**

Barrier	Type of respondent	A challenge	Not a challenge	Pearson Chi-Square significance
Unavailability of ICT equipment at school	Tutor	22	27	0.134
	Teacher-trainees	42	86	
Internet is not available at school	Tutor	12	37	0.626
	Teacher-trainees	27	101	
Internet speed is unsuitable for classroom use	Tutor	38	11	0.210
	Teacher-trainees	87	41	
There is no coherent plan to integrate ICT at the Teachers College	Tutor	6	43	0.420
	Teacher-trainees	22	106	
Unsure of ICT competency in class	Tutor	11	38	0.574
	Teacher-trainees	34	94	
Insufficient technical support for ICT	Tutor	22	27	0.606
	Teacher-trainees	52	76	
Curriculum is not designed for ICT	Tutor	9	40	0.953
	Teacher-trainees	24	104	
Insufficient time to acquire ICT skills	Tutor	9	40	0.000
	Teacher-trainees	66	62	

**Barriers related to ICT training programmes for educational purposes.**

Tutors and teacher-trainees were asked to give their opinion on what might be reasons that made them not to undertake ICT training programme for educational purposes (Table 8). The idea behind was that most of the time educators are trained in ICT aspects and not on how ICT can be used to improve teaching and learning process. Factors contributing to

ICT training according to the respondents include encouragement from the ministry of education, support from teacher college administration, availability of hardware and software, availability of training programmes, and having training content that do meet the needs of the trainees (Table 8).

Barriers related to ICT training for educational purposes are related to financial constraints, governments of developing countries including Tanzania, spend the major amount of the educational budget for the rehabilitation and maintenance of school buildings and teachers' salaries [27]. As a result, little if any is set for equipping ICT facilities and training teachers on how best to integrate ICT in teaching and learning. Developed and developing nations alike are striving hard to change education by investing in capital, expertise, and ICT resources for the seamless integration of ICT in classrooms to improve teaching and learning [27].

**Table 8: Barriers related to ICT training programmes for educational purposes.**

Barrier	Type of respondent	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Pears on Chi-Square significance
Lack of Ministry of Education encouragement	Tutor	1	3	29	14	2	0.126
	Teacher-trainees	8	18	54	34	14	
Lack of College administrative support	Tutor	0	1	30	14	4	0.187
	Teacher-trainees	4	9	61	33	21	
Lack of computer hardware and software at the College	Tutor	1	6	30	8	4	0.150
	Teacher-trainees	6	15	53	32	22	
No such programs were available to me	Tutor	0	4	29	10	6	0.181
	Teacher-trainees	7	10	54	39	18	
Attendance at training programs is not a priority for	Tutor	1	2	28	9	9	0.440
	Teacher-trainees	4	2	59	38	25	



me at this time							
I do not have the time to attend any training programs	Tutor	0	1	29	6	13	0.058
	Teacher - trainees	2	5	55	41	25	
Content of training programs does not meet my training needs	Tutor	0	4	29	5	11	0.104
	Teacher - trainees	4	9	60	34	21	

Again, we face the challenge of reluctance of some tutors to integrate ICT in their teaching activities. But, in terms of external challenges honestly, there are frequent damage of our ICT facilities due to various special activities such as seminars and workshop trainings which are directed from the central government authorities to be conducted at our college [P1]

It is useless to provide ICT resources in schools where teachers are not trained with basic ICT skills and knowledge. The lack of professional development and lack of experience in using technologies prevent teachers for using ICT in their teaching practice. Teachers’ enthusiasm and willingness to the use of technologies motivates integration of ICT tools in teaching and learning [26]. ICT based teachers’ training must be relevant to pedagogy, applicable to classroom instructions and related to the school policy [7][10][21]. Teachers faced challenges of developing technological skills and self-training for using ICT in their teaching practice. On the whole lack of provision of opportunities for capacity building of teachers was a major impediment in the integration of ICT.

Barriers to ICT integration in teacher education are related to lack of training or the professional development of teachers that hinders tutors and the teachers to acquire ICT based training. Issues related to the training among tutors and the teacher-trainees are sufficient time for training, didactic training to relate curricula with ICT and basic ICT training skills. It is important to provide pedagogical training to teachers rather than simple training them about the use of ICT tools [13]. Similarly, teachers who have attended professional development courses related to ICT were not confident enough to relate ICT with their lessons [18].

**Support from college administration on integration of ICT**

The lack of confidence of the trained teachers was a result of training that mainly was about basic ICT skills and not training teachers how to incorporate these ICT tools with their lessons. As such, inappropriate teachers’ training programs are not helping teachers to prepare ICT based lessons and to use these tools effectively in their teaching practice.

To integrate ICT in teaching and learning support from different angles is needed, more so in teacher colleges, support from administration is of more importance. It is the college administration that becomes a gate keeper for use of ICT in teaching and learning. Respondents indicated importance of support from teacher college administration on integration of ICT in teacher colleges (Table 9).

I attended a number of training but was about the software itself and not about how I can use the software in facilitating teaching and learning. I also do the same to my teacher-trainee as it is the way I was trained. If we need any changes in education, I think training have to focus on the curriculum we implement and how we can integrate ICT in those available lessons we teach (T34).

*Table 9: College administrative support on integration of ICT*

Support	Type of respondent	Minimal	Some Support	Adequate Support	Very Supportive	Pearson Chi-Square significance
To what extent do you feel the administration at the Teachers College supports the integration of ICT into teaching and learning?	Tutor	1	10	27	11	0.002
	Teacher-trainees	12	28	33	53	
Total		13	38	60	64	

I am trained on how to use the computer and software. I was not trained on how to use these tools in my teaching and learning process. It is therefore difficult for me to teach using ICT. I would love to have a training on how to use what I am learning as basic ICT skills to my practice of teaching any curriculum lesson (TT 87)

Well, apart from various initiatives but still barriers or challenges are available. To start with internal ones most of our students lacks ICT backgrounds. Also, we face the shortage of ICT facilities in our college without forgetting unreliable internet service in terms of bandwidth, speed, and capacity as you understand the operation of ICTs mostly requires internet service.

Percentage		7%	21%	34%	36%	
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The respondents including the tutors and the teacher-trainees indicated teacher college administration provided support. Above all, the respondents indicated colleges had ICT development strategies (Table 10).

**Table 10:** College development initiatives in ICT

Support	Type of respondent	Needs Improvement	Weak	Fair	Good	Excellent	Pears on Chi-Square significance
How would you rate the college's development initiatives in ICT?	Tutor	3	2	18	25	1	0.000
	Teacher-trainees	38	4	19	48	19	
Total		41	6	37	73	20	
Percentage		23%	3%	21%	41%	11%	

**Regression analysis between access of ICT resources, Use of ICT resources, ICT training opportunities and use of ICT in teaching**

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.669 <sup>a</sup>	.448	.438	.322	.448	46.765	3	173	.000

a. Predictors: (Constant), Use of ICT resources in teaching and learning, Access to ICT resources, ICT training Opportunities

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.578	3	4.859	46.765	.000 <sup>b</sup>
	Residual	17.976	173	.104		
	Total	32.554	176			

a. Dependent Variable: Do you use ICT in your teaching?

b. Predictors: (Constant), Use of ICT resources in teaching and learning, Access to ICT resources, ICT training Opportunities

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error				Lower Bound	Upper Bound
1 (Constant)	-1.221	.271		-4.511	.000	-1.756	-.687
Access to ICT resources	.154	.024	.407	6.301	.000	.106	.202
ICT training Opportunities	.032	.012	.190	2.599	.010	.008	.055
Use of ICT resources in teaching and learning	.034	.011	.222	2.997	.003	.012	.056

a. Dependent Variable: Do you use ICT in your teaching?

**Table 11:** Correlations of access to ICT resources, Use of ICT resources in teaching and learning and ICT skills training.

Correlations		1	2	3
Access to ICT Resources (1)	Pearson Correlation	1		
	Sig. (2-tailed)			
Use of ICT in teaching and learning (2)	Pearson Correlation	.447**	1	
	Sig. (2-tailed)	.000		
ICT training Opportunities (3)	Pearson Correlation	.421**	.611**	1
	Sig. (2-tailed)	.000	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Teacher training institutions should consider their teacher educators to be gatekeepers when preparing future generations of teachers for the learning environments of the twenty-first century [31]. Analysing self-reported use, competency, and need for professional training in digitalization in teaching, teacher educators do not use digital technologies primarily for pedagogical goals. To create digital teaching, teacher educators therefore require considerable pedagogical support. Additionally, in order to improve motivation for concrete, efficient, and subject-focused successful examples as offered

by experienced instructors, teacher educators need to find the pedagogical value in their own teaching and learning context when using digital resources [5][29][31]. Teacher educators face challenges in developing digital competence due to rapid technological changes [29]. Barriers include time and insufficient knowledge. Support from technology and pedagogy is crucial for ICT deployment. Research shows educators' readiness to integrate e-learning increased from 40% to 78% after professional development programs in online forums and communities of inquiry [18]

## 8. METHODOLOGICAL CONSIDERATIONS

The study has advantages and disadvantages, including a small sample size, limited representativeness and generalizability, and a cross-sectional design. The study's small sample size may have contributed to the low response rate and limited generalizability. A larger sample size could have better examined the relationship between teacher educators' use of digital tools and self-reported competency in using ICT in teaching circumstances. Additionally, the responses to the question about the type of digital technology respondents use in their work may not necessarily imply teaching situations specifically. The study's goal was to examine how teacher educators use technology in the classroom, but the findings revealed that this was not the primary usage of digital technology. Integrating three researchers and inserting quotes from the transcribed text improved reliability.

## 9. CONCLUSIONS

The research highlights the need for ongoing pedagogical support in developing digital teaching and learning environments for teacher educators. To increase motivation and provide efficient, subject-focused examples, educators must understand the potential of digital tools and identify pedagogical surplus value in their context. The role of teacher educators in incorporating digital technology is crucial for meeting students' learning requirements across various subjects in higher education.

## 10. REFERENCES

- [1] Adarkwah, M. A. (2021). "I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. *Education and Information Technologies*, 26(2), 1665-1685.
- [2] Afshari, M., Abu Bakar, K., Luan, W., Abu Samah, B. & Fooi, F. (2009). Factors affecting teachers' use of information and communication technology. *International Journal of Instruction*. 2.
- [3] Ahmed, S. T. S., Qasem, B. T., & Pawar, S. V. (2020). Computer-Assisted Language Instruction in South Yemeni Context: A Study of Teachers' Attitudes, ICT Uses and Challenges. *International Journal of Language Education*, 4(1), 59-73.
- [4] Ali, N., Ali, O., & Jones, J. (2017). High level of emotional intelligence is related to high level of online teaching self-efficacy among academic nurse educators. *International Journal of Higher Education*, 6(5), 122.
- [5] Amhag, L., Hellström, L., & Stigmar, M. (2019). Teacher educators' use of digital tools and needs for digital competence in higher education. *Journal of Digital Learning in Teacher Education*, 35(4), 203-220.
- [6] Barakabitze, A. A., Fue, K. G., and Sanga, C. A. (2017). The use of participatory approaches in developing ICT-based systems for disseminating agricultural knowledge and information for farmers in developing countries: The case of Tanzania. *The Electronic Journal of Information Systems in Developing Countries*, 78(1), 1-23.
- [7] Baylor, A. L. & D. Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? *Computers & Education*, vol. 39, no. 4, pp. 395-414.
- [8] Çetin, E. (2021). Digital storytelling in teacher education and its effect on the digital literacy of pre-service teachers. *Thinking Skills and Creativity*, 39, 100760.
- [9] Chen, R. (2010). Investigating models for pre-service teachers' use of technology to support student-centered learning. *Computers & Education*, 55(1), 32-42. SEP
- [10] Cohen, D. K & Hill, H. C. (2008). *Learning Policy: When State Education Reform Works*. New Haven, CT: Yale University Press.
- [11] Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.
- [12] Ghavifekr, S. & Rosdy, W.A.W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)*, 1(2), 175-191.
- [13] Grimalt-Álvarez, C., Ametller, J., & Pintó, R. (2019). Factors shaping the uptake of ICT in science classrooms. A study of a large-scale introduction of interactive whiteboards and computers. *International Journal of Innovation in Science and Mathematics Education*, 27(1).
- [14] Hardman, F. and Dachi, H. (2012). Evaluation of school-based INSET pilot programme. Final report submitted to UNICEF, Dar es Salaam.
- [15] Hardman, F., Abd-Kadir, J. and Tibuhinda, A. (2012). Reforming teacher education in Tanzania. *International Journal of Educational Development*, 32, 826-834.
- [16] Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T., & Grimbeek, P. (2013). Development of the TTF TPACK Survey Instrument. *Australian Educational Computing*, 27(3), 26-35.

- [17] Joel, N. F., & Mungwabi, H. (2016). Factors constraining effective application of ICTs in teachers training colleges in Tanzania. *University of Dar es Salaam Library Journal*, 11(1), 53-70.
- [18] Kafyulilo, A., & Keengwe, J. (2014). Teachers' perspectives on their use of ICT in teaching and learning: A case study. *Education and Information Technologies*, 19, 913-923.
- [19] Khan, M. S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the introduction of ICT into education in developing countries: The example of Bangladesh. *International Journal of instruction*, 5(2).
- [20] McGarr, O., & McDonagh, A. (2019). Digital competence in teacher education. Output 1 of the Erasmus+ funded Developing Student Teachers' Digital Competence (DICTE) project, 40.
- [21] Mfaume, H. (2019). Awareness and Use of a Mobile Phone as a Potential Pedagogical Tool among Secondary School Teachers in Tanzania. *International Journal of Education and Development using Information and Communication Technology*, 15(2), 154-170.
- [22] Mnyanyi, C. (2021). Creating lifelong learning opportunities for persons with disabilities using Information and Communication Technology. *International Journal of Academic Pedagogical Research (IJAPR)* Vol. 5 Issue 10, October - 2021, Pages: 19-27.
- [23] Mnyanyi, C. Bakari, J. & Mbwette, T (2010) Implementing e-learning in higher open and distance learning institutions in developing countries: the experience of the Open University of Tanzania, MIT LINC 2010 Conference May 23rd-May 26, available at <https://linc.mit.edu/linc2010/proceeding> [11.10.2022]
- [24] Nikolopoulou, K., & Gialamas, V. (2015). Barriers to the integration of computers in early childhood settings: Teachers' perceptions. *Education and Information Technologies*, 20(2), 285-301.
- [25] Ngonyani, J. C., & Mnyanyi, C. B. (2021). Assessing the relevance of assistive technologies for persons with disabilities in higher learning institutions: a case of university of Dar Es Salaam in Tanzania. *European Journal of Special Education Research*, 7(2).
- [26] Rogers, P. L. (2000). Barriers to adopting emerging technologies in education, *Journal of Educational Computing Research*, vol. 22, no. 4, pp. 455-472
- [27] Salam, S., Zeng, J., Pathan, Z. H., Latif, Z., & Shaheen, A. (2018). Impediments to the integration of ICT in public schools of contemporary societies: A review of literature. *Journal of Information Processing Systems*, 14(1), 252-269.
- [28] Shaikh, Z., A., & Khoja, S. A. (2013). Higher education in Pakistan: An ICT integration viewpoint. *International Journal of Computer Theory and Engineering*, 5(3), 410-413.
- [29] Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50(1), 37-56.
- [30] Suliman, A. A. E., Fie, D. Y. G., Raman, M., & Alam, N. (2008, May). Barriers for Implementing ICT on Higher Education in Underdeveloped Countries" Sudan: Case Study". In *CONF-IRM 2008 Proceedings* (p. 12).
- [31] Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. *British Journal of Educational Technology*, 50(3), 1189-1209.
- [32] Koehler, M. J., & Mishra, P. (2006). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research*, 32(2), 131-152.
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