FACTORS CONSTRAINING EFFECTIVE APPLICATION OF ICTs IN TEACHERS' TRAINING COLLEGES IN TANZANIA

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ABSTRACT

This study investigated the impediments to the effective application of ICTs in Tanzania's teachers' training colleges (TTCs). It was conducted in 2015 at Bunda, Butimba, Morogoro, Murutunguru TTCs and the Ministry of Education and Vocational Training headquarters. Data were collected from 134 students, tutors and other officials using questionnaires, interviews, focus group discussions, and observations. The study established purposes for which respondents made use of the pedagogical ICTs and identified the constraints that hamper the adoption of ICTs to be unreliable connectivity, inadequate pedagogical skills, low broadband, lack or inadequate technical support, lack of necessary ICT equipments or unreliable ICT equipments/facilities and power interruption. Basing on these findings, the study recommends recruiting ICT technicians for technical support, providing adequate and reliable ICT facilities, improving power supply to colleges, and ensuring reliable connectivity to colleges in a bid to to enhance pedagogical ICT integration in teachers' training colleges.

Introduction

In 2005, The Ministry of Education and Vocational Training (MoEVT) initiated a programme of integrating information and communication technology (ICT) in teaching and learning as the country needed to prepare students and teachers well-versed for a knowledge society as world evolves into a digital age. This initiative provided teachers' training colleges (TTCs) with various ICT facilities in addition to training tutors in ICT basics. Several years later, Mwalongo (2011), Lubuva (2012) and Nihuka (2012) found that the country had yet to achieve the effective integration of ICT in the pedagogical process using ICT as new pedagogical tool in day-to-day educational delivery in schools and teachers' colleges as originally intended by the ICT drive.

This study, therefore, sought to identify factors that hinder the effective pedagogical ICT integration and application in teachers' training colleges in Tanzania. It was guided by the

following research questions: For what purpose are ICTs used for teaching and learning? What factors inhibit the adoption of pedagogical ICT in the selected teachers' training colleges?

Research methodology

This study was conducted in purposively selected institutions, namely Butimba TTC in Mwanza region, Murutunguru TTC in Ukerewe, Bunda TTC in Musoma region and Morogoro TTC in Morogoro Municipality as these colleges had been involved in the pedagogical ICT integration programme. The study employed a mixed methods research approach in which both qualitative and quantitative primary data generated from 134 respondents were gathered through the use of questionnaires, interviews, observations and focus group discussions. Quantitative data were analysed using the Statistical Package for Social Sciences (SPSS) version 17 which enabled the researchers to derive tables, frequencies and percentages. Qualitative data, on the other hand were subjected to content analysis.

Literature review

This section reviews literature related to this study. The review is twofold: The first part focuses on the bottlenecks in integrating pedagogical ICTs whereas the second part reviews literature on strategies towards enabling effective and efficiency ICT integration in teaching and learning.

Constraints of Pedagogical ICT integration in Educational Institutions

Constraints in this study refer to any impediments or conditions that hamper the effective adoption of pedagogical ICT in Tanzania's teacher training colleges (Schoepp, 2005). Generally, paramount constraints include lack of time, lack of knowledge/competence, lack of training, inadequate facilities, age, fear and lack of confidence, lack of support and poor infrastructure such as networks and power supply. These constraints may be grouped into psycho-sociological factors related directly to the educators' use of technology or social contextual factors (Chigona *et al.,* 2010). Educators' knowledge and willingness to adopt ICT, for instance, are often associated with sociological factors such as age and teaching experience. Educators' approach to pedagogy may impact the integration of ICT into the teaching and learning process. If an educator believes in traditional teaching methods, he/she may not be likely to change his/her pedagogy to embrace ICT in teaching and learning. Conversely, educators who hold constructivist principles are more likely to view learners as active participants in the learning process and, therefore, readily integrate ICT in their teaching and learning practices (Chigona *et al*., 2010). Furthermore, constraints may also arise as a result of institutional incapacity to organise both materials and non-materials such as time and available facilities or lack of infrastructure required which include physical space, furniture, electricity and internet

connectivity to facilitate the integration and application of ICTs in teaching (DERSA, 2004; Chigona *et al*., 2010; Nihuka, 2010).

Chigona *et al. (2010*), in their empirical survey on ICT in schools in disadvantaged communities in South Africa pointed out that effective pedagogical ICT integration was also hindered by lack of sound management. They point out that "even though schools/colleges and educators appreciate the benefits of ICTs in the teaching and they are willing to adopt the technology, there are a number of other factors that impede the integration of ICT in teaching and learning" (ibid.) such as lack of sound management. They further clarify:

> In environments where there is a top-down management style with little consultation between levels, staff members feel coerced into using ICT and therefore do not use it effectively. Staff members feel constrained by a lack of institutional support and vision and many feel unsure of the direction they should take and the purpose that the use of ICT is meant to serve (Chigona *et al.,* 2010).

This implies that visionary leadership and management provided in well-managed institutions enable the members of staff to use ICTs more productively than their counterparts in institutions that are not well-managed. Chigona *et al.*'s *(2010*) study focused on the technological constraints and individual factors such as skills and time spent on accessing and using ICT facilities and institutional factors in relation to motivation and kind of support available for enhancing ICT pedagogical integration.

Generally, ICT integration constraints that teachers face in many sub-Sahara African countries include inadequate initial training, insufficient motivation, absence of technical support, insufficient facilities, poor connectivity, limited time, unreliable power supply, inadequate bandwidth, school administration that does not embrace ICT usage and lack of administrative support (Nihuka, 2010; Lubuva, 2012, Katunzi-Mollel, 2013; Karsenti *et al.,* 2012). On the

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whole, successful adoption of any innovation or technology (and ICT pedagogy in particular) calls for a positive attitude to changes or new technology and having sound skills related to innovation, availability and accessibility of infrastructures and facilities. Similarly, practitioners need to have adequate time, support and motivation to effect the desired changes effectively.

ICT Policy on basic education in Tanzania has provisions for training and capacity-building. It was towards this end that the process of integrating ICTs in teaching and learning in teachers' colleges in the country was initiated. However, since its inception no formal assessment has been undertaken to establish whether the adoption and integration of pedagogical ICT has been coupled with particular reference to skills' availability, ICT infrastructural growth, and the actual application of ICT in pedagogy as well as impeding factors that may be undermining the whole process of pedagogical ICT adoption. This was the gap this study needed to bridge.

Discussion of the findings

This section presents and analyses the demographic information of the respondents, usage of pedagogical ICTs, the constraints undermining the effective integration of pedagogical ICT in colleges and strategies needed to enhance the adoption of pedagogical ICT in teachers' education using graphs and tables coupled with narrative presentation. It also discusses the research findings.

Demographic Information

Respondents' demographic information was collected to establish their characteristics and the nature of the study sample. Whereas students were asked to indicate their gender and year of study, tutors were asked to specify their ages and work experiences in years.

Characteristics of Student respondents by Year of Study

Student respondents were asked to indicate their year of study. The results are presented in Table 1 below:

Table 1: Student Respondents' Year and Level of Study

	Year of study	Male	Female	TOTAL
Sample size=72	1st	19(26.4%)	9(12.5%)	28(38.9%)
	2nd	30(41.7%)	14(19.9%)	44(61.1%)
	Total	49(68.1%)	23(31.9%)	72(100%)

Source: Field Data (2014)

Table 1 shows that 44 (61%) of the student respondents were sophomores whereas 28 (39%) were first years. The intention was to determine the behaviour change after undergoing a two-year teacher education programmes in terms of utilising ICT in learning. As such, the respondents in this category were ideal for the study.

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Characteristics of Students by their Level of Study

Student respondents were also asked to indicate the teacher education programme they were

undertaking. The results are summarised in Table 2:

Table 2: Student-teachers' Level of Study

	Level	Male	Female	Total
Sample size=72	Certificate	14(19.4%)	6(8.3%)	20(27.8%)
	Diploma	35(48.8%)	17(23.6%)	52(72.2%)
	Total	49(68.1%)	23(31.9%)	72(100%)

Source: Field Data (2014)

Table 2 indicates that the majority, 52 (72.2%), of the student respondents were in diploma

teacher programmes with only 20 (27.8%) in Certificate in Education.

Tutor Respondents by Age

On their part, tutor respondents were asked to indicate their age groups. Their responses are

summarised in Table 3 below:

Table 3: Tutor Respondents' Age

	Age Group	Male	Female	Total
Sample size=62	20-29 years	7(11.3%)	3(4.8%)	10(16.1%)
	30 - 39 years	30(48.4%)	15(24.2%)	45(72.6%)
	40-49 years	2(4.7%)	0(0%)	2(4.7%)
	50-59 years	3(4.8%)	1(1.6%)	4(6.5%)
	60 and above	1(1.6%)	0(0%)	1(1.6%)
	Total	43(69.4%)	19(30.6%)	62(100%)

Source: Field Data (2014)

Table 3 shows that a majority, 55 (88.7%), of the respondents were aged between 20 and 39

years, six (11.2%) were aged 40-59 and only one (1.6%) was aged 60 and above. This implies

that most of the tutor respondents were young as they were aged between 20 and 39. In other

words, the bulk of the respondents were in the age brackets of those who can act as change agents in the adoption and integration of new pedagogical innovativeness.

Tutors' Work Experiences

Tutor respondents were also asked to indicate their teaching experience in years. The findings are summarised in Table 4:

Table 4: Tutors' Work Experience

	Category of years	Male	Female	Total
Sample size=62	Less than or equal to a year	2(3.2%)	0(0%)	2(3.2%)
	Two years- Three	11(17.7%)	0(0%)	11(17.7%)
	Four Years – Five	5(8.1%)	3(4.8%)	8(12.9%)
	Six to ten Years	15(24.2%)	12(19.4%)	27(43.5%)
	More than ten year	10(16.1%)	4(6.5%)	14(22.6%)
	Total	43(69.4%)	19(30.6%)	62(100%)

Source: Field data (2014)

Table 4 shows that 41 (66.1%) of the respondents had experience of six years and above. Almost a third, 31 (33.9%), had not worked for more than five years. This implies that most of the tutors had a reasonable experience in day-to-day teaching and learning activities and it likely that they employ different teaching and learning methodologies in classroom interaction.

Computer Laboratory

Finally, the student-teachers were asked to indicate the purpose for which they used the computer laboratory. The results are presented in Table 5:

Table 5: Uses of Computer Laboratory

Sample size	Response category	F	%
Sample	Accessing off line materials	32	44

	Searching materials from internet	26	36
	Learning ICT subject and application software	69	96
	Doing practical for ICT subject	50	78
	Communicating through e-mail	23	31
	Learning other subjects	18	25

Source: Field Data (2014)

Table 5 shows that the majority, 69 (96%), of the student respondents ranked learning ICT subject and application software first, followed by 50 (78%) who said they used them for doing practical for the ICT subject, 32 (44%) for accessing materials off-line, 26 (36%) for searching the internet, 23 (31%) for e-mail and 18 (25%) said they used it for learning other subjects. These results reveal that students were also in a position to use these facilities once available and accessible.

ICT Uses for Teaching

Both student and tutor respondents were asked to indicate whether they used ICT to support teaching and learning. The student-respondents were supposed to indicate their use and their respective tutors' application of such information and communication technology. On the other hand, the tutors were supposed to indicate whether they used ICT or not. The results are

summarised in figures 1 and 2:

Figure 1: Use of ICT to Enhance Learning

■ Learning ■ Others

18%

82%

Source: Field Data (2014)

Figure 1 shows that the majority, 59 (82%), of the student respondents usually used ICT in supporting their learning, whereas 13 (18.3%) said that they did not. As one of the students at Bunda TTC explained, "We usually use computers when learning ICT subject". Another student-teacher at Morogoro TTC said: "We sometimes use the computer laboratory to download off-line and on-line materials for our assignments". A tutor responsible for computer laboratory at Morogoro TTC said: "Students come to access e-resources stored in servers for their class assignments".

Figure 2: Tutors Use of ICTs

Source: Field Data (2014)

Figure 2 indicates that out of 62 tutor respondents, a majority, 44 (71%), said they used ICT for teaching. Only 16 (26%) said they did not use ICT whereas two (03%) did not respond at all. These results show that there was a willingness on the part of tutors to apply ICTs as pedagogy tools.

Purposes for which Students use ICT facilities

Students were asked to select from a list the purpose for which they use ICT in the teaching and learning purpose. Their responses are summarised in Table 6:

Table 6: Purposes for which Students Use ICT facilities

No	Purpose	Frequency	Percentage
Sample size =72	Document Processing	57	79
	Search Information	53	74
	Support Discussion	31	43
	Exams Results	21	29
	Display Animation	19	26
	Watching Movies	16	22
	Downloads Music	14	19
	Play Computer Game	13	18
	Read News Paper	12	17
	Trace Sports News	10	14
	Communication	8	11
	Assignments	7	10
	Internet Chatting	3	4

Source: Field Data (2014)

Table 6 shows that a majority, 57 (79%), of the student respondents used ICT for document processing; 53 (74%) for information searching; and 31 (43%) for support during discussions. Few seven (10%) and three (4.2%) said they used ICT for doing assignments and Internet chatting, respectively. These findings indicate that, like tutors, a good number of students do apply ICTs for academic learning.

Purposes for which Tutors use ICT facilities

Tutor respondents were also asked to select from a list the purpose for which they used ICT in the process of teaching and learning. Their responses are summarised in Table 7 below:

Table 7: Purposes for which Tutors Use ICT facilities

No	Purpose	Frequency	Percentage
Sample size =62	Search Information	46	74
	Document Processing	45	73
	Read Newspapers	43	70
	Internet Chatting	37	60
	Communication	32	52
	Assignments	29	47
	Writing Report	29	47
	Music Downloading	26	42

	Watching Movies	24	39
	Trace Sports News	24	39
	Calculating Marks	24	39
	Support Discussion	19	31
	Play Computer Games	17	27
	Display Animations	15	24
	Exams Results	15	24

Source: Field Data, 2014

Table 7 shows that a majority, 46 (74%), of the tutors respondents use ICT facilities in their search for information, 45 (73%) for document processing, 43 (69%) for reading newspapers, 37 (60%) for internet chatting and 32 (52%) for communication. These results suggest that the tutors preferred to use ICT for searching for information more than any other purpose. These results are contrary to Mwalongo's (2011) and Lubuva's (2012) findings which show that the tutors preferred using ICT for document processing. The finding indicates that tutors use ICT formally for searching for materials from the internet, reading newspapers, Internet chatting and communication. On the other hand, the findings suggest that ICT is not highly used in classroom interaction for displaying animations and in processing results. Similarly, Toprakçi (2006:6) affirms thusly: "*ICTs have been able to get into colleges but not in the classroom, and it has been mostly used for literacy rather than as a supportive medium for education in the classroom*".

Constraints Undermining the Application of ICT in Teachers' Training Colleges

All the respondents were asked to indicate the factors that compromise the application of ICT pedagogy. Under this question, the respondents were asked to select multiple answers from 5-point rating scale (strongly agree, agree, undecided, disagree, and strongly disagree). Other supplementary data were obtained through the use of interviews and open-ended questions. Table 8 presents the results:

Table 8: Factors Constraining Tutors' ICT Application in Teaching and Learning (N=62)

Sequential Number	Factor	Frequency	Percentage
1	Unreliable connectivity	50	81
2	Power Interruption	41	66
3	Inadequate technical support	37	60
4	Lack of ICT facilities	27	44
5	Lack of motivation	26	42

Source: Field Data (2014)

The results in Table 8 show that a majority of tutor respondents, 50 (81%), said that unreliable connectivity limited the adoption of ICT pedagogy, 47 (76%) indicated unreliable ICT facilities, 41 (66%) cited power interruption, 37 (60%) mentioned inadequate technical support, 27 (44%) cited lack of facilities and necessary equipment, and 26 (42%) indicated lack of motivation. Similarly, the student respondents cited lack of technical support as a factor constraining the effective application of ICTs, 45 (63%) cited unreliable equipment or ICT facilities, 43 (60%) cited lack of motivation, 42 (58%) cited inadequate ICT skills and colleges having no necessary ICT equipment, 37 (51%) cited unreliable connectivity and 36 (50%) cited inaccessibility to ICT facilities. Apparently, the problems cited by tutors and students were similar. In other words, they demonstrate that ICT pedagogy may be effectively used once problems such as unreliable connectivity, ICT facilities, power interruption and inadequate technical support are solved. In this regard, the Ministry of Education and Vocational Training should ensure that there is

reliable connectivity, adequate ICT facilities, power and technical support at all TTCs. Indeed, these problems must be addressed to promote the effective adoption of pedagogical ICT.

These findings are inconsistent with those of Nihuka (2010), Bingmlas (2009) and Rodden (2010) who observed that the most severe obstacles to the adoption of ICTs and technology in general are competencies, limited time and limited motivation. In this study, these factors have scored less than those four mentioned above. On the other hand, the study findings conform to the findings by Ntambala (2013) who points out that when there is lack of technical support in schools and teachers lack expertise in using ICT, teachers' readiness and confidence in using ICT during lessons tend to fade away. In other words, the effective utilisation of ICT in teaching and learning requires ensuring the accessibility of ICT facilities and training of tutors so that they acquire appropriate skills for effective integration of ICT in the teaching and learning process. In this regard, Ntambala (2013:9) points out: "There should be accessible technology environment, appropriate skills and time to make tutors gain confidence". In fact, the ICT facilities in teachers' training colleges were too inadequate to support fully the adoption and integration of pedagogical ICT.

Recommendations

On the basis of the findings arising from this research, the study makes the following recommendations in a bid to engender effective ICT application in teaching and learning:

- Regular troubleshooting, repairs and replacement of damaged ICT equipment and facilities in colleges should be made to enhance access to both computer hardware and software. Therefore, support staff employed in colleges should include ICT technicians to oversee day-to-day management and maintenance of ICT facilities. Failure of which could deny ICT users access to these facilities, especially when computers malfunction.

- The government needs to rehabilitate or reconstruct classrooms to turn them into smart classrooms capable of accommodating the use of ICT in teaching and learning as the

existing classrooms in colleges were too old and lacked proper facilities for ICT use in teaching and learning.

- As the problem of unreliable Internet connectivity was cited by both tutors and students alike, TTCs could partially solve it by improving and increasing the bandwidth to enable ICT to be effectively used in the teaching and learning process.

- There is also a need to enhance access to ICT facilities by providing tutors with personal computers (PC) and training to update their ICT application skills and knowledge. There have been frequent adverts in the mass media on ICT facilities and training but their attendant exorbitant costs were beyond the pocket of most of the tutors as their take-home salaries remained low. In this regard, the government should set aside a budget for catering for these tutors' ICT acquisition and training requirements.

- The government should sustain power supply and increase its accessibility throughout the day by providing alternative power supply in case of power cuts. Such contingency plans could include the supply of standby generators and use of solar power, which could easily be harnessed in the country. Also, harnessing of biogas is another viable option that colleges that keep cattle and poultry could embrace.

REFERENCES

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia journal and Mathematics, Science and Technology Education, 5*(3), 235-245.

Chigona, A., Chigona, W., Kayongo, P. & Kausa, M. (2010). An empirical survey on domestication of ICT in schools in disadvantaged communities in South Africa. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, *6* (2), 21-32: University of Cape Town, South Africa.

Department of Education-Republic of South Africa (DERSA) (2004). *White paper on e-Education:* Transforming learning and teaching through Information and communication technologies. Pretoria, RSA.

Karsenti, T., Collin, S. Et Harper-Merrett, T. (2012). Pedagogical Integration of ICT: Successes And Challenges From 100+ African Schools. *Computer and Education*, *37*, 163-178. Ottawa: IDRC Available at Www.Elsevier.Com/Locate/Compedu

Katunzi-Mollel, K. U. (2013). *Gender analysis of information communication adoption into teaching, learning and research: Faculty and students of selected University in Tanzania.* Unpublished PhD dissertation: University of Dar es Salaam.

Lubuva, E. E. (2012). *An Echo in implementation of the Tanzania ICT policy in Education in a teacher's colleges.* In: DEATA, Annual conference, Open University of Tanzania, Dar es Salaam, 24 August 2012, Aga Khan University Institute of Education Development Eastern Africa, Dar es Salaam.

MoEVT (2007). *Information Communication and Technology (ICT) academic and pedagogy syllabi for diploma in secondary education.* MoEVT: Dar es Salaam.

Mwalongo, A., (2011). Teachers' Perceptions About ICT For Teaching, Professional Development, Administration And Personal Use. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT), 7*(3), 36-49.

Nihuka K. A. (2010). *The feasibility of e-learning integration in course delivery at the open university of Tanzania*. Unpublished dissertation for degree of Masters of educational science and technology: University of Twente.

Ntambala, Y. W. (2011). The role of information and communication technology (ICT) on teacher education: perception and practices; the case of diploma teachers colleges in Tanzania. Unpublished dissertation for masters of art in education: University of Dodoma.

Rodden, N. B. (2010). *An investigation into the barriers associated with ICT use in the Youthreach classroom: A case study of a centre for education in the North West*. Submitted to the University of Limerick.

Schoepp, K. (2005). Barriers to technology integration in a technology–rich environment. Learning and teaching in high education. *Gulf perspectives, 2*(1), 1-24.

Toprakci, E. (2006). Obstacles at integration of schools into information and communication technologies by taking into consideration the opinions of the teachers and Principles of Primary and secondary schools in Turkey(sic), *Journal of Instructional Science and Technology*, *9*(1), 1-16.