Enhancing Curriculum Implementation in Teacher Training Colleges through Information and Communication Technology Integration: A Study in Northern Zone, Tanzania

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Abstract: This study investigated the impact of Information Communication and Technology (ICT) integration on curriculum implementation in teacher training colleges within the northern zone, Tanzania. The objectives assessed were the degree of ICT integration and comprehending its influence on curriculum implementation. Following the technology acceptance model, the research employed a mixed methods approach, encompassing both qualitative and quantitative methodologies. A convergent design was adopted suitable for collecting qualitative and quantitative data. The target group included tutors and teacher trainees from four colleges, with a sample of 164 respondents chosen via probability and non-probability sampling methods. Data gathering involved questionnaires and interviews. Validity was fortified through expert inputs, while reliability employed the split half method. Qualitative data underwent thematic analysis. The findings revealed a considerable integration of ICT in the curriculum implementation process across teacher training colleges. The application of ICT was evident in multiple facets of curriculum implementation including resource selection, lesson planning, presentation, examination setup, and students' records. Its integration was perceived as simplifying teaching, alleviating workload, and enhancing enjoyment, while providing access to diverse learning materials, thereby elevating student engagement and motivation. Furthermore, ICT integration fostered greater teaching commitment among tutors. The study concluded that effective ICT implementation in teacher training colleges significantly impacted on curriculum implementation. Recommendations entailed prioritizing and supporting ICT integration through adequate facilities, internet access, and fostering tutor ICT literacy. Active promotion of ICT adoption in teaching practices was encouraged among tutors and college principals.

Keywords: *Influence, Integration, ICT, Curriculum Implementation, Teacher Education*

1. Introduction

In response to the dynamic changes occurring in societies, the field of education continuously seeks effective methods that align with these shifts. Teacher education has undergone notable transformations. Pieters et al. (2019) emphasize the inevitability of innovations in teacher education, particularly concerning curriculum implementation. Innovations in this domain arise from the evolving needs of teacher trainees, the teaching profession, and society itself (Yang and Li, 2019; Ellis et al., 2019). Among the most significant innovations in 21st century, teacher education is the integration of information and communication technology (ICT) into curriculum implementation.

Countries worldwide, including the United States of America, European nations like Portugal, Poland, and Turkey, as well as Asian countries like Nepal, have embraced ICT integration in their teacher education systems. Brevik et al., (2019) highlight the policies enacted in the USA to equip teacher educators with ICT skills for effective curriculum implementation. Similar trends are observed in Europe, where ICT gains momentum in learning institutions, including teacher training colleges. Furthermore, Rana and Rana (2020) discuss the transformation of teacher preparation programs in Nepal through the integration of ICT, signifying the global shift towards modernized education.

African countries, including Ghana, Kenya, and Zambia, have also joined this trend, incorporating ICT to modernize teacher education and curriculum implementation. Agyei (2015) noted that Ghana introduced ICT in teacher training to align with 21st-century developments. Kenya, on the other hand, ensures internet availability to facilitate tutor preparation, as reported by IJEDICT (2017). Zambia has witnessed a paradigm shift through ICT integration in classrooms (Mulenga et al., 2018). These cases underscore the widespread adoption of ICT across different education levels, with teacher education embracing these innovations.

Tanzania's efforts to integrate ICT in teacher education reflect the global trend of enhancing teaching and learning through technological integration. Dongo et al. (2021) elaborate on Tanzania's focus on strengthening ICT adoption in education. The United Nations Educational, Scientific and Cultural Organization (UNESCO) recognize the transformative influence of ICT on people's lives, prompting the integration of ICT in curriculum implementation (UNESCO, 2018). Hooker (2017) highlights ICT's contributions to advancing science and technology, thereby increasing its demand in curriculum implementation.

Various projects in Tanzania, such as the UNESCO-Chinese Fund in Trust project, have aimed to enhance ICT integration in education. These initiatives provide computers and internet access points to teacher colleges for effective teaching (UNESCO, 2018). The country's education policies, such as the National ICT policy of 2016, underscore the importance of integrating ICT in curriculum implementation. Teacher training colleges in Tanzania have introduced ICT as both a subject and a pedagogical tool. Learning management systems have been implemented to facilitate content delivery and student engagement (Nabahany and Juma, 2019).

Despite these efforts, challenges persist, including tutors' limited skills, inadequate ICT facilities, poor internet access, and low self-esteem in utilizing ICT. Andersson et al. (2019) discuss the low motivation among tutors to use ICT due to skill gaps, while Dalton (2021) points out the shortage of essential ICT resources in teacher colleges. Additionally, Banele (2019) and Nabahany and Juma (2019) highlight the negative impact of inadequate internet access and low self-esteem on ICT integration. These challenges prompt the government to seek measures to improve ICT integration in curriculum implementation. Therefore, this study was conducted to investigate the influence of ICT integration on curriculum implementation in teacher training colleges in the Northern Zone, Tanzania despite the existing challenges stated by previous researchers.

1.1 Research Questions

The following research questions guided the study:
1. How does ICT integration influence curriculum implementation in teachers' colleges in northern zone, Tanzania?
2. To what extent has ICT influenced curriculum implementation in teachers' colleges in Northern Zone, Tanzania?

2. Literature Review

The study was grounded in Technology Acceptance Model developed by Fred Davis.

2.1 Theoretical Framework

The technology acceptance model explains how organizations have come to accept and start using technology. The theory was developed by Fred Davis in 1989 to explain the behaviour of users of the computer. According to the model, the success and failure of the adoption of new technology depend on how useful the technology is perceived, the perceived easiness and the

attitudes of the users towards the technology to be adopted (Granić and Marangunić, 2019). The model assumes that the acceptance of an information system depends on the intentions of using that system. The intention of using any information system is influenced by the attitudes of users and such attitudes are influenced by the perceived usefulness of the information system. Teachers' colleges being one of the social organizations also perform different facilitations and training practices and there is a concern about adopting technology by using different equipment such as computer, projector, smart board, video recorder, tablet, internet facility, printers, photocopy machine and smart phones.

2.1.1 Application of the Theory to the Current Study

According to the theory, the adoption of any technology is influenced by how it is perceived by the users and the management. This being the case, the theory will help the researcher to investigate the influence of integrating ICT on curriculum implementation in teachers' colleges in northern zone Tanzania. Therefore, in the current study, the researcher determined how ICT integration influences curriculum implementation in teachers' colleges in northern zone Tanzania.

2.2. Literature Review

The researcher reviewed empirical studies under the following study objectives: to investigate the influence of integrating ICT on curriculum implementation in teachers' colleges in northern zone Tanzania and then determine the extent to which such ICT integration has influenced curriculum implementation on teachers' colleges.

2.2.1 Influence of Integrating ICT on Curriculum Implementation in Teachers Colleges

Research efforts have been dedicated to assessing the extent of integrating ICT within curriculum implementation. Artacho et al. (2020) conducted a study in Spain and reported that ICT integration was observed in teacher education, and its integration was associated with enhanced collaboration in content development. Bariham et al. (2019) explored the integration of Computer Based Instruction (CBI) in Ghanaian schools and found positive attitudes among teachers toward CBI as a tool for teaching and learning, despite challenges related to digital infrastructure and technical support.

Belay et al. (2020) studied tutor attitudes towards integrating ICT in classroom instruction in Eritrea,

revealing that majority of Biology teachers had a positive attitude towards using ICT to enhance teaching and learning. Murithi and Yoo (2021) conducted a study in Kenya, uncovering challenges related to inadequate ICT facilities and teacher training in primary schools. Chirwa (2018) investigated the usage of the Internet for academic purposes in Tanzanian teacher colleges, revealing varying degrees of utilization for academic tasks. These studies collectively highlight the varying levels of ICT integration and utilization in diverse educational contexts.

2.2.2 The Extent to Which ICT Integration Influence Curriculum Implementation on Teacher Colleges

The impact of integrating ICT on curriculum implementation has been explored by scholars. García-Lázaro et al. (2022) conducted a bibliometric review in the United States and emphasized the importance of technological preparation for pre-service teachers during practicum experiences. Njuguna et al. (2022) examined the impact of ICT integration in Kenyan primary schools, revealing positive effects on student engagement, motivation, and teaching quality. Williams et al. (2023) delved into factors influencing teacher candidates' self-efficacy in technology integration within teacher preparation programs in the United States, providing insights into how program culture shapes technology-infused teacher preparation. Mensah et al. (2022) investigated knowledge and perceptions of Geography teachers in Ghana regarding technology integration in their classrooms, emphasizing the need for integrating Information and Communication Technologies (ICTs) in higher education courses for teachers. Sanusi et al. (2022) explored the initial conceptions of teaching machine learning by African in-service teachers, emphasizing the importance of teacher training, co-designing of resources, and integrating machine learning into the curriculum. These studies collectively underline the transformative potential of ICT integration in enhancing teaching practices and improving student learning experiences.

There is a gap in the existing research regarding the comprehensive understanding of the influence of ICT integration on curriculum implementation in Tanzanian teacher training colleges, particularly within the Northern Zone. While studies have explored ICT integration in teacher education (Artacho et al., 2020), Internet usage for academic purposes in Tanzanian teacher colleges (Chirwa, 2018), and attitudes towards ICT integration in diverse contexts (Bariham et al., 2019; Belay et al., 2020), there is a lack of in-depth investigation into the extent of ICT integration's impact on curriculum implementation in this specific context. Moreover, studies assessing the impact of ICT integration predominantly focus on contexts outside Tanzania (García-Lázaro et al., 2022;

Njuguna et al., 2022; Williams et al., 2023; Mensah et al., 2022; Sanusi et al., 2022), leaving a gap in understanding the unique dynamics faced by Tanzanian teacher training colleges, particularly in the Northern Zone, when integrating ICT into curriculum implementation. Thus, there is a need for a study that delves into the specific context of Tanzanian teacher training colleges to provide insights into the influence of ICT integration on curriculum implementation within this region.

3. Methodology

The study employed a convergent mixed methods approach, integrating both qualitative and quantitative research methods, thereby leveraging the strengths of both approaches to address the research objectives effectively. as advocated by Creswell and Creswell (2018). This approach was selected to examine in-depth the influence of integrating ICT on curriculum implementation in these colleges. Similarly, the approach facilitated a comprehensive exploration of the influence of integrating ICT on curriculum implementation in Northern Zone teacher training colleges. This design allowed for the simultaneous collection of qualitative and quantitative data, the study was conducted within the Northern Zone of Tanzania, encompassing four regions: Kilimanjaro, Arusha, Manyara, and Tanga. The concurrent use of qualitative and quantitative methods ensured a well-rounded understanding of the research problem. The research design chosen was a convergent design, following Creswell's conceptualization (2012). The area was chosen due to its concentration of teacher training colleges, ensuring accessibility for data collection. The target population included 626 tutors and 1020 second year teacher trainees from seven teacher training colleges. The tutor group was relevant due to their role in integrating ICT into teaching, while teacher trainees were included as recipients of such instruction. Vasileiou (2018) stated that a sample of 10% to 30% of the target population is representative enough for the research study. As a result, 62 (10% of 626) tutors and 102(10% of 1020) teacher trainees were selected. Therefore, a sample size of 164 respondents was drawn, involving tutors, teacher trainees, and academic deans from four selected colleges. This sample size was deemed representative and suitable for the homogenous teaching and learning environment across these institutions.

For data collection, questionnaires and interview guides were utilized. Questionnaires included closed-ended and open-ended questions aligned with research objectives. These instruments were selected for their efficiency in gathering relevant data from tutors and teacher trainees. Additionally, interview guides were used to collect data from academic deans. Instruments' validity was enhanced through content and criterion-related validation, with input from peer researchers and experts. After conducting a pilot study involving 10% of sample size that did not take part in the actual study, reliability of the instruments was assessed using the split-half method, resulting in reliability coefficients above 0.7, demonstrating their appropriateness. Pilot testing was conducted to enhance the instruments' reliability, refining items based on feedback from participants. Data analysis involved descriptive statistics for quantitative data using SPSS version 23 software, presenting information through frequencies, percentages, and means. Qualitative data underwent thematic analysis, resulting in identified themes aligned with research questions. Ethical considerations were paramount, with measures taken to protect participants' rights and ensure anonymity and confidentiality. Informed consent was obtained, and data were solely used for research purposes.

4. Results and Discussion

4.1 The Integration of ICT on Curriculum Implementation in Teachers Colleges in Northern Zone

The first objective of this study aimed at assessing the integration of ICT on curriculum implementation in teacher training colleges in northern zone, Tanzania. To achieve the objective, teacher trainees and tutors were provided with a rating scale with eleven aspects of curriculum implementation and asked to rate from much applied up to not applied. Then, the percentages of responses were computed and mean scores were also calculated. In calculating the mean scores, numbers (1 to 5) were given to the responses whereby 5 stood for much applied (MA), 4 stood for applied (A), 3 stood for somehow applied (SA), 2 represented rarely applied (LA) and 1 stood for not applied (NA). The responses from teacher trainees and tutors have been summarized in table 1.

Table 1: Teacher Trainees' and Tutors' Responses on the Integration of ICT

ICT used for	Teacher trainees response						Tutors' responses					
	MA	A	SA	LA	NA	Mean	MA	S	SA	LA	NA	Mean
	%	%	%	%	%		%	%	%	%	%	
i. Preparing learning resources	39.2	45	6.7	8.3	0.8	**4.13**	35	60	2.5	2.5	0	**4.28**
ii. Selecting learning resources	30.8	57.5	5	6.7	0	**4.13**	27.5	55	17.5	0	0	**4.1**
iii. Preparing lesson plans	27.5	51.7	10.8	6.7	3.3	**3.93**	55	40	5	0	0	**4.5**
iv. Presenting lessons	37.5	37.5	12.5	6.7	5.8	**3.94**	45	45	10	0	0	**4.35**
v. Setting examinations	40	48.3	7.5	2.5	1.7	**4.23**	70	27.5	2.5	0	0	**4.68**
vi. Demonstrating lessons	22.5	55.8	19.2	0.8	1.7	**3.97**	47.5	42.5	5	5	0	**4.33**
vii. Illustrating diagrams during lessons	25	53.3	11.7	8.3	1.7	**3.92**	20	47.5	25	7.5	0	**3.8**
viii. Keeping students' academic records	35.8	52.5	6.7	2.5	2.5	**4.17**	50	30	15	5	0	**4.25**
ix. Conducting online learning	31.7	40.8	18.3	5	4.2	**3.91**	15	50	15	12.5	7.5	**3.53**
x. Reporting learners academic progress	40.8	37.5	11.7	6.7	3.3	**4.06**	27.5	47.5	17.5	5	2.5	**3.93**
xi. Evaluating the teaching and learning process	31.7	49.2	7.5	8.3	3.3	**3.98**	22.5	52.5	15	5	5	**3.83**
Average mean score						**4.03**						**4.14**

Looking at Table 1, it can be observed that the mean scores for the integration of ICT in different aspects of curriculum implementation varied. In general, the ratings suggest a moderate level of ICT integration across most aspects. For example, in terms of preparing learning resources, both teacher trainees (39.2%) and tutors (35%) indicated a relatively high level of ICT usage, while only a small percentage rated it as not applied (0.8% for teacher trainees and 0% for tutors). This finding aligns with the study conducted by Artacho et al (2020) in Spain, which found a positive relationship between ICT integration and collaboration in content development. This implies that ICT is being effectively utilized in the preparation of learning resources, benefiting both teacher trainees and tutors.

The integration of ICT in the lesson preparation and presentation was also pointed out by the key informants during the interviews. For instance, one informant noted:

> We insist that tutors should use the projector during teaching, where they use the projector in class to project notes, photos and various videos, especially in science lessons. Tutors prepare power point; they use tablets or personal computers. But in the ICT department there are a few computers where some tutors borrow them to prepare power points (Academic Dean, College One, personal interview, June 5, 2023).

Another key informant also highlighted the use of tablets in lesson preparation by reporting the following:

> We also urge the tutors to use tablets because there are tablets assigned to them, so we urge them to use those tablets in preparing lessons. When preparing lessons, we no longer receive hard copies but only soft copies. Therefore, the schemes of work, lesson plans and notes are all received as soft copies" (Academic Dean, College Two, personal interview, June 5, 2023).

The integration of ICT in the aspects of lesson preparation and presentation was also cemented by another key informant who remarked:

> First, in preparing the lesson, we use ICT in the sense that we use the computer to search for material in order to prepare the content that you expect to teach...Ordinarily, we prepare content, for example I teach English, I prepare content for various topics and then I

upload it, when I upload it, I give information to the teacher trainees. (Academic Dean, College Four, personal communication, June 5, 2023).

Generally, the quantitative data and qualitative interviews converge in showing that there is a significant level of ICT integration in the aspects of lesson preparation and presentation. Both teacher trainees and tutors reported a high level of ICT usage, and the academic deans confirmed the utilization of projectors, tablets, and computers for these purposes. This alignment indicates that the integration of ICT in lesson preparation and presentation is well-established and supported by both sets of data.

Another aspect is the use of ICT for conducting online learning. The ratings suggest that a portion of teacher trainees (31.7%) and tutors (15%) reported using ICT for online learning. However, a considerable percentage of respondents also indicated that it was rarely applied (18.3% for teacher trainees and 12.5% for tutors). This finding is consistent with the study conducted by Belay et al (2020) in Eritrea, which found that tutors had a positive attitude towards integrating ICT in classroom instruction. Despite the positive attitude, the actual integration of ICT for online learning seems to face challenges. This echoes the findings of the study by Murithi and Yoo (2021), where tutors reported difficulties in integrating technology into their lessons despite perceiving its importance.

In terms of selecting teaching and learning resources, the mean scores for both teacher trainees and tutors are relatively high (4.13 and 4.1, respectively), indicating a considerable level of ICT application. This finding aligns with the study conducted by Belay et al (2020), which revealed that tutors had a positive attitude towards integrating ICT in classroom instruction. The use of ICT in selecting learning resources can facilitate access to a wide range of multimedia materials, supporting diverse learning styles and catering to individual learner needs. The presence of ICT devices such as printers and computers simplify the process. According to Belay et al. (2020) tutors like using ICT in their lessons, as it made learning interesting, understandable, and improved learners' performance. This therefore shows that in the teacher training colleges, tutors make use of ICT facilities in selecting the teaching and learning resources.

Regarding preparing lesson plans, the mean scores suggest a moderate level of ICT application by both teacher trainees and tutors (3.93 and 4.5, respectively). This finding is consistent with the study conducted by Murithi and Yoo (2021), where tutors faced difficulties integrating technology into their lessons despite

perceiving its necessity. Although there is room for improvement, the integration of ICT in preparing lesson plans can enhance the organization and presentation of instructional content, promoting learner-centered and interactive teaching approaches. The use of computers to prepare lesson plans indicates ICT literacy among the tutors. However, the presence of a small percentage indicating less applied ICT suggests that some tutors may have limited knowledge of using computers.

The mean scores for the item "Keeping students' academic records" indicate a relatively high level of application of ICT in this aspect of curriculum implementation. Both teacher trainees and tutors rated it with a mean score of 4.17 and 4.25, respectively. These scores suggest that ICT is widely used for keeping students' academic records. The findings of Kilag et al. (2022) from the Philippines support the interpretation of the mean scores. Their study revealed that teachers in the Philippines use smart devices for keeping student records and communicating the information to stakeholders. Likewise, the study conducted by Ibrahim et al. (2022) in Ghana also supports the interpretation of the mean scores. They found that higher learning institutions in Ghana are increasingly utilizing ICT in various aspects of the teaching process, including the management of student records. This reinforces the idea that the high mean scores observed in the data reflect a similar trend in the integration of ICT for record-keeping purposes. The integration of ICT in record-keeping processes can bring several benefits, such as improved efficiency, accuracy, and accessibility of student information, which ultimately contribute to effective educational management and communication with stakeholders.

Furthermore, results in table 1 show that while a good number of tutor respondents (47.5%) reported applying ICT for demonstrating lessons, the ratings from teacher trainees were relatively lower (22.5%). This difference in perception suggests a gap between the tutors' and trainees' experiences and abilities in utilizing ICT for demonstrating lessons. The study by Chirwa (2018) on the access and use of the internet in teaching and learning in Tanzanian teachers' colleges supports this finding. It highlighted that participants in teacher colleges used the internet primarily for academic purposes, indicating a relatively high level of ICT usage. However, the study also revealed that some participants used the internet for games and entertainment, suggesting a need for further guidance on utilizing ICT for educational purposes effectively.

The mean scores for the item "Setting examinations" indicate a high level of ICT integration in this aspect of curriculum implementation. Both teacher trainees and tutors rated the integration as "much applied" (MA), with

the mean score of 4.23 for teacher trainees and 4.68 for tutors. These scores suggest that ICT is extensively used for setting examinations in the teacher training colleges in the northern zone. These findings agree to what was reported by Swai et al. (2021) who found that in most teacher training colleges, the setting of examinations is done digitally. Moreover, the study conducted in Finland by Aidoo et al. (2022) highlights the appreciation and usefulness of ICT integration in colleges, particularly in conducting assessment practices such as assignments and tests. By making use of ICT facilities, it becomes easier for the tutors to assess the trainees and hence simplifying the assessment burden. Data from the interviews also confirmed what was indicated by teacher trainees and tutors concerning the integration of ICT in assessing teacher trainees as well as evaluating the teaching and learning process. For instance, one key informant pointed out that:

> *In evaluating the teacher trainees, we use tests and the tests are typed by the tutors themselves. After typing they bring it to the academic office in a soft copy where we print it and produce copies ready to be sent to the teacher trainees. When the test is done, we process the results using excel where the grades and positions are organized and the academic progress reports for each teacher trainee are provided using a computer* (Academic Dean, College Three, personal interview, June 5, 2023).

On the same issue of integrating ICT for examination and evaluation purposes, another key informant added:

> *But another aspect is in the preparation of exams, we also use ICT in the sense that the examinations are printed, there is also a learning management system where the tutor prepares the exam in the learning management system, the teacher trainees do it online and after that the tutor can print the results and give a report to each teacher trainee* (Academic Dean, College Four, personal interview, June 5, 2023).

From the two sets of data (qualitative and quantitative), both the quantitative and qualitative data sources, as well as previous research studies, indicate agreement regarding the good integration of ICT in setting examinations and conducting evaluations. The mean scores, statements from teacher trainees, tutors, and academic deans, and the supporting research findings all point to the significant role of ICT in streamlining assessment processes and simplifying the assessment burden in teacher training colleges.

For the purpose of determining the general views of teacher trainees and tutors on the extent to which ICT is integrated in the process of curriculum implementation, teacher trainees and tutors were asked to give their general rating. This was a closed ended question whereby the respondents were requested to rate from very high rate to very low rate. The responses from teachers and tutors have been summarized in figure 1.
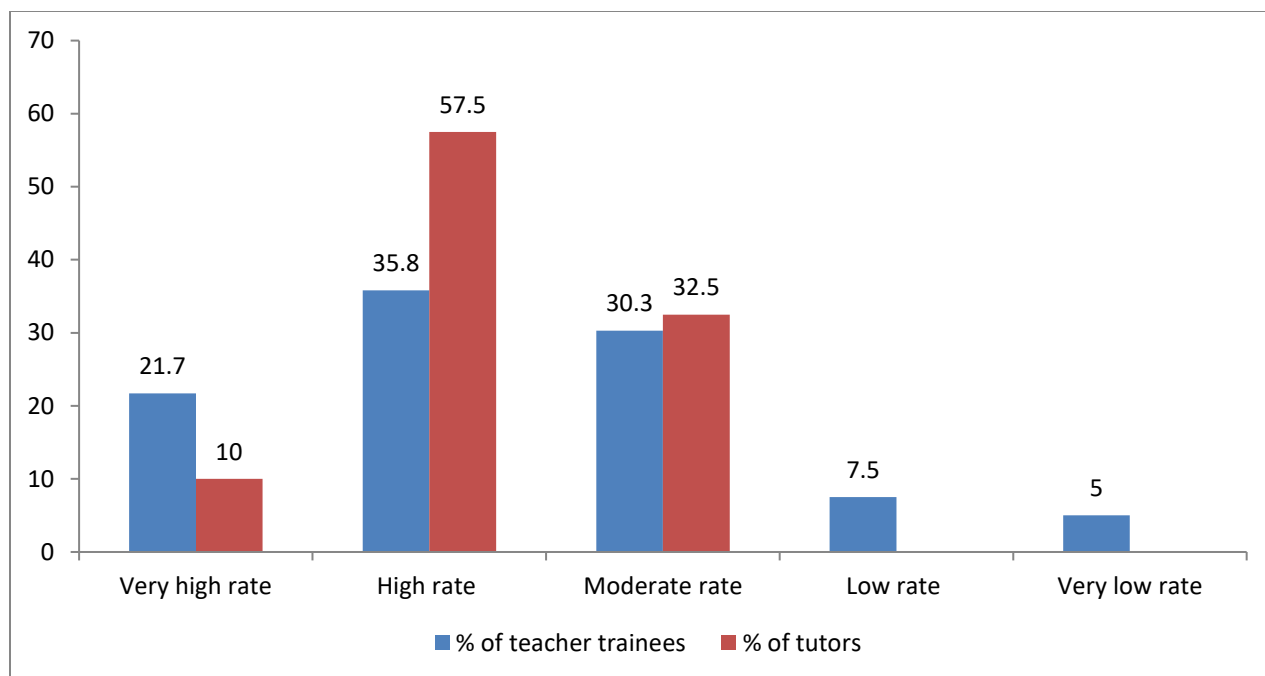
Figure 1: Responses on the General Rating of ICT Integration

Source: Field data (2023)

Figure 1 presents the general rate of integrating ICT in teacher training colleges in the Northern Zone of Tanzania, based on the responses of teacher trainees and tutors. The findings show that both groups perceive the integration of ICT to be relatively high, with a significant percentage indicating a high or very high rate. This suggests that ICT integration is being embraced and implemented in the educational context of the Northern Zone. The findings agree with Istiningsih (2022) who also reported a good level of ICT integration, highlighting how tutors are becoming capable of resolving issues during learning activities and providing appropriate learning assessment values for their students. The findings are also supported by Pang et al. (2022) who also found out that teachers have positive attitudes towards ICT and they make a significant change from analogy into digital methods of teaching. Similarly, a study conducted by Daramola (2023) in Nigeria reported lecturers in the colleges of education to be exploring the available ICT resources for instructional purposes. Thus, the responses in figure 1 indicate a generally high rate of integrating ICT in teacher training colleges in the Northern Zone of Tanzania. These rates align with previous studies that highlight the positive attitudes of teachers, the adoption of

digital teaching methods, and the exploration of ICT facilities for instructional purposes. The integration of ICT in this context is likely to drive improvements in teaching practices and educational outcomes.

4.2 Influence of ICT Integration on Curriculum Implementation in Teacher Training Colleges in Northern Zone

The second research question aimed at finding out the influence of ICT integration on curriculum integration in teacher training colleges. To address this question, teacher trainees and tutors were provided with 10 statements and requested to indicate whether they agreed or disagreed with each of the given statements. Percentage responses for each statement were computed and their corresponding mean scores were also calculated. In calculating the mean scores, 1 score was given for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree. The percentages and mean scores from the tutors and teacher trainees have been summarized in table 2.

Table 2: Trainees' and Tutors' Responses on the Influence of ICT on Curriculum Implementation

Statements	Teacher trainees' response (% and mean)						Tutors' responses (% and mean)					
	SA	A	N	D	SD	Mean	SA	A	N	D	SD	Mean
Integration of ICT simplifies the teaching task	44.2	46.7	46.7	1.7	1.7	4.30	37.5	52.5	2.5	2.5	5	4.15
Integrating ICT makes the teaching enjoyable	34.2	50	50.0	0.8	5	4.08	37.5	55	2.5	2.5	2.5	4.23
Integration of ICT improves students' learning	41.7	42.5	42.5	6.7	0.8	4.18	27.5	57.5	7.5	5.0	2.5	4.03
Integrating ICT reduces the teaching burden	42.5	55	55	0.0	0.0	4.40	32.5	57.5	2.5	2.5	5.0	4.10
Students understand better when ICT is integrated	33.3	52.5	52.5	0.8	0.8	4.17	35	52.5	5	5.0	2.5	4.13
Integrating ICT makes the lesson interesting	50.8	41.7	41.7	0.0	0.0	4.43	35	52.5	7.5	0.0	5.0	4.13
Students are motivated to learn when ICT is integrated	39.2	51.7	51.7	1.7	0.8	4.27	32.5	57.5	5	2.5	2.5	4.15
ICT integration enhances tutors' teaching commitment	40	51.7	51.7	3.3	0.8	4.27	32.5	52.5	10	2.5	2.5	4.10
The teaching becomes easier when ICT is integrated	39.2	50.8	50.8	3.3	1.7	4.23	40.0	47.5	2.5	5.0	5.0	4.13
ICT integration simplifies teaching preparation	35	52.5	5	5	2.5	4.13	42.5	47.5	5	2.5	2.5	4.25
Grand mean scores						**4.25**						**4.14**

Source: Field data (2023)

Data in table 2 shows that the mean scores of teacher trainees and tutors on the statement "integration of ICT simplifies the teaching task" were 4.30 and 4.15 respectively. This means that high percentages of teacher trainees and tutors agreed with the statement. The implication is that teacher trainees and tutors believed that by integrating ICT there is a great possibility of sampling the teaching task. These findings agree to what was reported by Aldahmash et al (2019) in Saudi Arabian who also found out that the integration of ICT in curriculum implementation simplifies the teaching task by minimizing the teaching difficulties that were hampering the process of implementing the curriculum before the introduction of ICT in the colleges. Therefore, most of the teaching difficulties that tutors were complaining about are now being minimized by the integration of ICT in the process of curriculum implementation in the teacher training colleges.

On the same basis, the mean scores for the statement "The teaching becomes easier when ICT is integrated" as indicated in table 2 were 4.23 for teacher trainees and 4.13 for the tutors. This means that most of the tutors and teacher trainees agreed with the statement. Similarly results in table 2 also show that the mean scores for teacher trainees and tutors on the statement "Integrating ICT reduces the teaching burden" were 4.40 and 4.10 respectively. This means that most of the teacher trainees and tutors agreed that the integration of ICT reduces the teaching burden. The implication is that the integration of ICT is perceived to make the teaching process easy and hence facilitating the implementation of curriculum. This

is due to the fact that the tutors can display pictures and diagrams using projectors and hence making the explanation of concepts easy compared only using words without supportive pictures. These findings are in line with the ones revealed by Ngao et al., (2022) who found out that the application of different software and learning platforms makes the teaching and learning process simple as there is a possibility of students to learn even in the absence of the tutor.

The simplicity in obtaining the teaching and learning resources to both tutors and teacher trainees was also pointed out during the interview with the key informants. For instance, one of the key informants remarked that:

> *In fact, ICT is very helpful in the implementation of the curriculum. There are many things that have changed in modern times compared to the past. For example, the books that are provided by Tanzania Institute of Education (TIE), to get them, you have to go to their office in Dar es Salaam. But at the moment, all the books are available on the internet, so it's just a matter of downloading and giving them to the teacher trainees or instructing the teacher trainees how to get those books on the TIE website* (Academic Dean, College Four, personal interview, June 5, 2023).

Another key informant added:

> *ICT helps us a lot in the implementation of the curriculum because we are not at work all the time, particularly during weekends. Therefore, at any time, the teacher trainees have the freedom to access material. But also, at any time tutors have the ability to prepare questions and put them in the learning management system. Therefore, at any time the teacher trainees can study and do assignments without the presence of the instructor* (Academic Dean, College Four, personal interview, June 5, 2023).

The quantitative data from the previous studies and qualitative data all indicate agreement regarding the positive perception of integrating ICT in the teaching process. The high mean scores and statements from teacher trainees, tutors, and academic deans, along with the supporting research findings, demonstrate the perceived benefits of ICT in making teaching easier, reducing the teaching burden, enhancing the explanation of concepts, and providing easy access to teaching and learning resources.

Table 2 also shows that the response mean scores for teacher trainees and tutors on the statement "integration of ICT improves students' learning" were 4.18 and 4.03 respectively. The mean score values indicate that high percentages of tutors and teacher trainees agreed with the statement. This implies that integration of ICT is perceived to improve the learning of teacher trainees and hence facilitating the acquisition of knowledge skills and values required in the teaching profession. This agrees to Ngao et al., (2022) who also found out that the use of different software and online information enables the teacher trainees to access learning materials and therefore improves their learning. When ICT is used, the teacher trainees will have access to different information even when they are not around the college. For instance, if the tutors upload the learning resources into the college management systems, it becomes easy for the teacher trainees to access them even if they are not at the college campuses. This leads to improving the curriculum implementation process as the teaching and learning may be conducted at any time and any place.

Data from table 2 also shows that the mean scores for the statement "ICT integration enhances tutors' teaching commitment" were 4.27 and 4.10 for the teacher trainees and tutors respectively. These mean score values indicate that most of the teacher trainees and tutors agreed with the statement. This implies that integration of ICT in the teaching and learning process is perceived to be enhancing teaching commitment. This is because tutors will be required to prepare learning modules and post them onto the college website, design assessment schemes and also evaluate the learners using computer aided facilities. This is in line with Murithi and Yoo (2021) who reported that computer knowledge is necessary for tutors since it makes them able to effectively implement a wide range of activities pertaining to the teaching profession. Therefore, the use of computers makes the teachers committed as he or she will have to search for materials, prepare the notice and look for appropriate diagrams for the purpose of improving the teaching and learning process.

The grand means scores across the ten statements were 4.25 and 4.14 for teacher trainees and tutors respectively. This means that most of the teacher trainees and tutors agree with most of the statements. The implication is that both teacher trainees and tutors perceived that ICT integration has a positive influence on the process of curriculum implementation. These findings agree to Mensah et al., (2022) who reported that the integration of

ICT has great impacts on the curriculum implementation process as it simplifies the teaching and learning process. Thus, by integrating ICT in the teaching and learning process, the workload for tutors is likely to be minimized, students will be motivated to learn and most of the teaching and learning resources will be made available.

5. Conclusion and Recommendations

5.1 Conclusion

Based on the study findings, the following conclusions were drawn:

First, ICT is reasonably integrated into the process of curriculum implementation in teacher training colleges in the northern zone of Tanzania. The utilization of ICT is evident in various aspects of curriculum implementation, including the preparation and selection of learning resources, lesson planning and presentation, examination setting, lesson demonstrations, and student record-keeping. The presence of ICT facilities, access to the internet, and ICT literacy among tutors play significant roles in facilitating this integration. Although there were slight variations in the perception of tutors regarding the extent of integration across different areas, the overall assessment suggests a moderate level of ICT integration in the curriculum implementation process. The findings indicate that ICT is well-integrated and utilized in teacher training colleges, highlighting its importance in enhancing teaching and learning practices.

Second, the integration of ICT has a positive influence on curriculum implementation in teacher training colleges. Both teacher trainees and tutors perceive ICT integration as beneficial and impactful in various aspects of teaching and learning. The simplification of the teaching task, reduction of the teaching burden, and increased enjoyment in teaching are recognized benefits of ICT integration. Moreover, the availability of a wide range of learning materials and resources through ICT enhances student learning and motivation. The integration of ICT also fosters greater teaching commitment among tutors, as they engage in activities that utilize ICT tools and resources. Overall, the findings suggest that ICT integration in curriculum implementation has a positive influence on both teachers and students, supporting the notion that ICT plays a valuable role in enhancing the teaching and learning process in teacher training colleges.

5.2 Recommendation

Based on the study conclusions, the following recommendations are made:

1. For enhancing the integration of ICT on curriculum implementation in teacher training colleges, it is recommended that policy makers and college principals continue to prioritize and support the integration of ICT on curriculum implementation. They should ensure the availability of adequate ICT facilities, internet connectivity, and promote ICT literacy among tutors. This can be achieved through the development and implementation of policies that prioritize the allocation of resources for ICT infrastructure and training.

2. Given the positive influence of ICT integration on curriculum implementation, it is recommended that tutors and college principals actively embrace and promote the use of ICT in teaching and learning practices. They should encourage the simplification of the teaching task through the effective use of ICT tools, leverage the availability of a wide range of learning materials and resources, and foster a culture of commitment and engagement in the teaching process. Additionally, policy makers should consider providing incentives and support for tutors to further develop their ICT skills and knowledge.

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