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Tanzania Institute of Accountancy (TIA)
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# TABLES CONTENTS

# The use of ICT for Teaching and Learning among Secondary Schools Teachers in Mtwara, Tanzania

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## Abstract

The use of ICT in teaching and learning improve the quality and performance of education delivery, administration and management. As the world is moving fast technologically, it is important to assess teachers' awareness and abilities in using ICT for teaching, and if ICT tools are available in secondary schools. The study had three specific objectives ; to assess teachers' awareness of ICT policy for Basic Education in Tanzania, teachers' abilities in using teaching and learning ICT tools, and the availability of basic teaching and learning ICT tools. From seven public secondary schools, about 110 teachers were involved in this descriptive study which was conducted under a mixed approach. Questionnaire and in-depth interview were applied to assess teachers' awareness and current skills and practices in the application of the available ICT for teaching and learning. The results of this study indicate that a moderate number of secondary schools' teachers were aware of the ICT policy for basic education in Tanzania. Also, the results show that the majority of secondary schools possess fewer teaching and learning ICT tools. In addition, the findings indicate that most teachers have moderate abilities in using ICT tools for teaching and learning. However, 91.5 per cent of male teachers possessed more ICT skills than did female teachers. *The paper recommends that the Government of Tanzania invest more efforts and resources to integrate ICT in secondary school education and raise teachers' awareness of ICT policy through seminars or workshops.*

**Keywords:** ICT, Secondary schools, Teachers, Teaching, Learning, Tanzania

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## 1.0 Introduction

The progresses in Information and Communication Technologies (ICTs) have created numerous changes in the political, economic and social life worldwide. ICTs have been a driving force of various activities, which in due course influences national growth and development. Thus, countries worldwide advocate the ICTs integration into various sectors that encourage social and economic growth and development (Yonazi, 2012; Ngeze, 2017). In the education sector, the influences of ICTs include improved education delivery (Mubashrah et al., 2017), increased access to resources, information and knowledge (Shafika, 2015), the emergence of new methods of teaching and learning (Brás, Miranda & Marôco, 2014) and increased effectiveness in the education system and infrastructure (Kihoza, 2016). Others include increased learners motivation (Hennessy et al., 2010), improvement in teachers' training and teaching itself (Mwalongo, 2011; 2018) and improved understanding of how to make effective use of technology (Shafika, 2015). ICT in the education system empowers teachers, educators, managers, learners, and leaders to expand learning opportunities and ensuring educational quality and relevance in all levels including secondary school education.

The importance ICTs in secondary school education in the present-day world is undebatable (Swarts & Wachira, 2010; Kira & Mahumbwe, 2015). ICT facilitates the teaching and learning process in secondary schools through the help of technologies, which enable easy and quick access to knowledge and skills (Crallet, Ismail & Manyilizu, 2016). ICT has managed to transform teaching from traditional to modern method thus enabling learners to have a wide access of educational resources that improve performance and enhance cognitive skills (Adebayo & Fagbohun, 2013). In this regard, ICT based skills are essential tools in promoting development of the educational system, which professional teachers and learners must have in today's world. Therefore, ICT training for secondary school teachers is a key factor in this modern age of information explosion, and thus empowering learners with skills on how to use technology is inevitable. That is why the United Republic of Tanzania (URT) has put many efforts in making sure that her education system is integrated with ICTs (URT, 2007).

The Government of Tanzania acknowledged the role of ICT in teaching and learning by integrating the basic education system with ICT, which is considered critical to the country in achieving its education and development objectives. To do so, the Government of Tanzania through her Ministry of Education and Vocational Training (MoEVT) introduced the national ICT Policy for basic education in 2007 to enhance and improve the quality of education delivered in primary schools, secondary schools and teachers training colleges. The overall objective of the policy was to build a well-educated and skilled workforce with the application of ICT in every area of life (URT, 2007). Apart from the ICT policy for basic education, in 2009, the MoEVT together with the Global e-Schools and Communities Initiative (GESCI) developed the framework for ICT that was aimed to be used in teacher professional development in Tanzania so as to integrate ICT in the teacher education system in the government owned Teachers' Training Colleges. Moreover, Tanzania beyond Tomorrow (TBT) program was set to define an e-education program for basic education for 2011-2020. Particularly, TBT was implemented in order to enhance the use of proper ICT tools in education, supply and improve ICT infrastructure to sustain teaching and learning (URT, 2011).

However, despite these nationwide efforts to integrate ICT in teaching and learning and to improve ICT infrastructures, skills, knowledge and competencies of teachers, studies in Tanzania reported contradicting results (Nihuka & Bussu, 2015; Kira & Mahumbwe, 2015; Crallet et al., 2016; Malekani, 2018). Some of the studies have reported that secondary school teachers are aware and capable of using ICT tools for teaching and learning (Nihuka & Bussu, 2015; Ngeze, 2017), while others reported that secondary school teachers lack ICT skills and capabilities for teaching and learning (Crallet et al., 2016; Mabiki, 2017; Malekani, 2018). Similarly, studies (i.e., Kihoza 2016; Berhane, 2012; Mabiki, 2017) reported that secondary schools lack ICT infrastructures such as computer hardware and software.

The inconsistencies mentioned suggest a need for a further study to assess the status of teachers' ICT awareness and capabilities, ICT infrastructural capabilities in secondary schools. Thus, much needs to be known on the use of ICT for teaching and learning process for teachers in Tanzania. In order to

accomplish this task, this paper intends to assess teachers' awareness of the ICT policy; knowledge, skills and capabilities based on the applications of ICT; and adequacy of ICT infrastructure (computer, printer, Smartphone, PowerPoint, television, and internet access) for teaching and learning in public secondary schools in Mikindani municipality, Mtwara region. Since the policy, programs and initiatives to integrate ICT into education were implemented nationwide, so Mikindani secondary schools were used as representatives of all schools in the country. Accordingly, this paper sought to achieve three specific objectives:

- To assess teachers' awareness about ICT policy for basic education in Tanzania
- To evaluate teachers' abilities in using ICT tools for teaching and learning in secondary schools
- To find out the adequacy of ICT infrastructures for teaching and learning in secondary schools

Moreover, this study answered three questions in order to fulfil the research objectives

- What is the level of teachers' awareness about ICT policy for basic education in Tanzania?
- To what extent do secondary school teachers have the ability to use ICT tools for teaching and learning in Tanzania?
- To what extent do secondary schools have ICT infrastructure for teaching and learning in Tanzania?

The rest of this paper is arranged as follows: section 2.0 is about the review of relevant literature, which was conducted to gain insights into the teachers' ability of using ICTs in the teaching and learning. Section 3.0 is on research methods used during the selection of study area and participants, data collection and the analysis. Section 4 presents the findings of the study, followed by the discussion of each specific objective. The last two sections 5 and 6, comprise conclusion and recommendations based on the study findings.

## 2.0 Literature Review

Information and communication technology (ICT) in education plays an important role in improving quality and performance (Jones, 2010). Different governments worldwide focus on empowering teachers with teaching and learning skills. As Baishakhi and Kamal (2016) observe, today ICT is transforming education systems and changes the way people work. Shafika (2007) posit that ICT has become an important tool in producing productive teaching, increasing learners' creativity and intellectual resources of most educational institutions over the world and that technology travels with people. Secondary school teachers at all academic levels require different skills to present knowledge and information to students (Crallet et al., 2016). During learning students come across new concepts or theories which are caused by new learning environment which is different from the one they are familiar with. Teachers nowadays have become facilitators who teach in new learning environments. Due to a rapid change in the teaching environment, teachers are required to have several skills including ICT (Anderson et al., 2014). Balanskat (2007) acknowledged this in his study which revealed that pupils are attentive and more motivated when ICT devices are used.

A study by Desai (2010), found out that students who used ICT performed better compared to students who did not use. The study revealed further that ICT facilitates secondary knowledge and skills; ICT has managed to transform teaching method from traditional to modern method thus enabling learners to have a wide access to educational resources, improving performance and enhancing cognitive skills (Mafang'ha, 2016). Elsewhere, Oliver (2010) revealed that different computer programs used to prepare school timetable and other teaching work which reduced administration costs and improved time management among staff and students. Similarly, Adebayo and Fagbohun (2013) observed that in this era ICT is an essential tool in promoting the educational system. Apanpa and Lawal (2009) revealed further that ICT for professional teachers in today's world have become essential skills.

According to Kihoza (2016), secondary school teachers play a vital role in the education sector, thus ICT training for teachers is a key factor in this modern

age of information explosion that helps in the achievement of learning and teaching objectives. Therefore, empowering secondary school teachers with skills on how to use technology is inevitable. As observed by Kihoza (2016), the main objective of information technology for teaching and learning are to ensure maximum output from the teaching and learning process, faster and better comprehension and appreciation of the subject matter. Secondary school teachers in Tanzania need skills of new technology to get along with the changes that occur (Chirwa, 2018). According to the Sultan and Vian (2015), training plays a significant role in ICT implementation and that teachers perceived ICT as an important tool in improving collaboration, performance, learning experiences, and learning outcomes. However, one of the challenges hindering the application or success of ICT implementation is lack of ICT training, thus training is unavoidable.

Bingimla (2009) in the investigation of barriers to the successful integration of ICT in teaching and learning environments showed that teachers competence in ICT utilization creates confidence and a positive attitude toward change. Secondary school teachers training is a vital investment that helps teachers acquire technology and new skills relevance to their working environment. In this era of modern development of innovative technologies, it is important for secondary school teachers to continuous be trained on the latest development technology. As indicated by Abuhmaid (2011) it is necessity of teachers to be confident, competent and creative users of technology. In another study, Ngeze (2017) found that secondary school teachers in Tanzania are ready to use ICT in their teaching and learning, but they lack skills and knowledge, adding that most of secondary school teachers possess ICT tools which indicate how teachers are ready to utilize ICT when empowered.

## 3.0 Research Methodology

The study was conducted in Mikindani Municipality, which is in Mtwara region. The area of study is located in the southern zone of Tanzania. Since the policy, programs and initiatives to integrate ICT into education were implemented nationwide, Mikindani secondary schools was used as representatives of all schools in the country. Mikindani municipality was selected also due to

its duo features of urban-rural settings. Hence, a sample which was a good representative of schools located in urban and rural areas was drawn from the study area. As a result, the research findings were generalised to all public secondary schools in the country. Also, Mikindani was chosen for this study because it was easily accessible by the researcher.

The municipal has 13 public secondary schools, but the study was conducted in seven secondary schools which have installed ICT tools for teaching and learning. The target population comprised 150 teachers that consisted of 96 teachers who participated in the ICT integration development program including ICT coordinator, 7 heads of schools and 7 Academic Teachers. To select a sample, this study used both probability and non-probability methods. In total, 110 teachers were selected out of 150 and all agreed to participate in the study. Therefore, 21 teachers were selected purposively from the seven secondary schools; 7 head of schools, 7 Academic Teachers and 7 ICT Coordinators. The remaining 89 teachers were randomly selected among the remaining 129 teachers. Statistically, the sample size was large enough to make generalisations about the population basing on the rule of thumb which suggests 30 people as the minimum sample size for statistical analysis (Saunders et al., 2007). Three Ward Education Officers were selected as key informants because they have in-depth knowledge regarding ICT policy for basic education and its implementation process.

In fact, this study explained the awareness of teachers regarding ICT policy for basic education, the capabilities of teachers to integrate ICT tools in teaching and learning and availability or adequacy of ICT tools for teaching and learning. Based on this nature, this study, applied a cross-sectional descriptive design to collect and analyse data regarding the use of ICT tools for teaching and learning among secondary schools' teachers. The use of cross sectional is based on the fact that data were captured at one point in time. The study employed survey questionnaire method to collect the primary data. The questionnaire comprised closed and open-ended questions to collect quantitative and qualitative data respectively. This method collected data focused on assessing teachers' awareness about ICT policy, teachers' abilities in using ICT tools and availability of adequate basic ICT tools for teaching and learning in secondary

schools. This study also gathered secondary data from published government documents such as ICT for education policy, reports and guidelines and journal articles and internet resources.

Qualitative data were analysed using thematic analysis method. The qualitative data were summarised and categorised based on their themes and linked to research objective and then reported as quoted narrations. Quantitative data were cleaned, coded, entered and analysed using Statistical Package for Social Scientist (SPSS) version 21. The descriptive statistics (frequency and percentage), measures of central tendency (mean and standard deviations), test of independence (Chi-square) and correlations (Kendall's tau-b) were used to analyse quantitative data. The chi-square test for independence was used to discover if there was a relationship between two categorical variables. Then, Kendall's tau-b correlation coefficients were applied to test the strength and direction of association (Cohen, 1988; Thompson, 2009). The use of Kendall's tau-b correlation coefficients was dictated by the fact that one of the variables (ICT skills of teachers) was ranked or ordered.

## 4.0 Findings and discussion

### 4.1. Teachers' awareness of ICT policy for basic education in Tanzania.

The first research question investigated the level of teachers' awareness about ICT policy for basic education in Tanzania. The findings on teachers' awareness regarding the ICT policy for basic education, its implementation and its benefits are presented in Table 1. The study was interested in finding out the awareness of ICT policy for basic education among secondary school teachers in Tanzania. In this regard, teachers had to respond to six survey statements as presented in Table 1. Information given in Table 1 was sought to establish the teachers' awareness of ICT policy for basic education and its implementation and benefits to teaching and learning in secondary schools.

**Table 1:** Awareness Regarding ICT policy for Basic Education (n=110)

| S/N | Indicator / parameter | SDA N (%) | DA N (%) | NAND N (%) | AG N (%) | SA N (%) | Mean | Std. Deviation |
|---|---|---|---|---|---|---|---|---|
| 1 | You are aware about ICT policy for basic education | 25(22.7) | 6(5.5) | 11(10.0) | 34(30.9) | 34(30.9) | 3.42 | 1.535 |
| 2 | You get information regarding ICT policy from your head of school | 19(17.3) | 13(11.8) | 7(6.4) | 37(33.6) | 34(30.9) | 3.49 | 1.470 |
| 3 | Got information of ICT policies in basic education at teachers' training college during my studies | 19(17.3) | 13(11.8) | 14(12.7) | 37(33.6) | 27(24.5) | 3.36 | 1.419 |
| 4 | Your school implement the national ICT policy for basic education | 19(17.3) | 13(11.8) | 9(8.2) | 30(27.3) | 39(35.5) | 3.52 | 1.501 |
| 5 | Using ICT in teaching and learning can improve our education performance | 26(23.6) | 14(12.7) | 5(4.5) | 32(29.1) | 33(30.0) | 3.29 | 1.512 |
| 6 | Government provide ICT tools for teaching and learning activities | 27(24.5) | 12(10.9) | 4(3.6) | 31(28.2) | 36(32.7) | 3.34 | 1.610 |
| | **Overall mean** | | | | | | **3.40** | **1.508** |

**Key:**

SDA= Strongly Disagree, DA= Disagree, NAND= Neither Agree Nor Disagree, AG= Agree, SAG= Strongly Agree, N= Number

**Source:** Field Data, 2021

The results in Table 1 indicate that the majority of teachers were aware of the existence of ICT policy for basic education. About 62 per cent of the public secondary school teachers agreed and strongly agreed that they were aware of ICT policy for basic education while only 28 per cent disagreed and strongly disagreed of being aware. When asked if they got information regarding ICT policy for basic education from their heads of schools, more than half (64.5%) of

the surveyed respondents agreed and strongly agreed that they got information regarding the ICT policy for basic education form their heads of schools. In addition, more than half (58.1%) agreed and strongly with the statement they got information of ICT policy for basic education at teachers' training college during their studies, 29.1 per cent disagreed and strongly disagreed. Similarly, Li et al. (2014) found that 91 per cent of the respondents agreed and strongly agreed that they got information about ICT policy in education from heads of schools. Also, the overall mean suggests that, on average teachers' awareness regarding ICT policy for basic education is moderate (SD=1.508, M=3.40).

The implication of these results is that the government of the United Republic of Tanzania has provided enough awareness to teachers about ICT policy for basic education, which enhances education and improves the quality of delivery of education in all areas. The conclusion was that teachers in majority agreed that they knew about the existence of the ICT policy for basic education. Moreover, Li et al. (2014) posted that in order to enable teachers to implement ICT in their daily teaching and learning practices, the preconditions such as the availability of proper hardware and software, adequate teacher training and support, ICT laboratory, and awareness of ICT policy for educational matters need to be met. In Tanzania, ICT policy for basic education focuses on integrating ICT in education system by equipping secondary schools with ICT tools, training teachers on ICT and introducing ICT as a pedagogical tool for teaching and learning. These policy initiatives and reforms shape teachers' thinking and guide policy implementation process of educational activities and programs.

Regarding the implementation of the national ICT policy for basic education at their schools, about 62.5 per cent of the surveyed of secondary school teachers in the study reported that their schools implemented the national ICT policy for basic education. Additionally, 59.1 per cent of secondary school teachers agreed and strongly agreed with the statement that using ICT for teaching and learning can improve education performance, while 36.3 per cent disagreed and strongly disagreed. Though more than half agreed that ICT are beneficial in teaching and learning the number of those who disagreed is also substantial and cannot be ignored especially when the world is integrating ICT

with the education system especially because ICT is beneficial to education delivery. However, there is undisputed truth about the positive effects of ICT on teaching and learning remains.

In responding to the statement whether government provides ICT tools for teaching and learning activities, the majority (60.9%) of teachers were reported that the government of Tanzania provided the ICT tools for teaching and learning, whilst 35.4 per cent of teachers reported that the government did not provide ICT tools for teaching and learning. The teachers who said that the government does not provide ICT tools constitute a significant percentage. However, based on the quantitative results, this study has a view that the government of Tanzania to a moderate extent provided secondary schools with ICT tools for teaching and learning activities. Similar findngs are reported by Ndibalema (2014) who revealed that there were very few governments secondary schools with ICT facilities and the government initiatives to provide ICT tools are low. On the contrary, Mgaiwa (2018: p. 259) reported that ICT infrastructure in Tanzanian secondary schools is poor and does not support teachers teaching and learning activities. However, the efforts such as TBT program were still on the implementation when Mgaiwa (2018) study was conducted, and that the program impact could not have yet to be fully realised. This study however, was conducted in 2021 a year after TBT was finalised, and thus its impact was already realised.

In conformity, during an in-depth interview, the study was informed that in the financial year 2021, the government has decreased its efforts to provide secondary schools with ICT tools. During the advent of ICT policy for basic education in 2007 and the subsequent initiatives, SIDA and other development partners provided larger quantities of ICT tools to schools than in recent times. One of the key informants had this to say,

> "…government sponsoring of ICT tools has declined tremendously compared to those days when the policy was new and every officer in the Ministry of Education was singing and dreaming about it… now days the policy has been implemented in a decreasing trend based on the provision of ICT tools and seminars/trainings…"

In general, the majority of government secondary school teachers accepted that ICT in teaching and learning has improved education performance regardless of dwindling of the contribution of government provision of provision of ICT tools. This indicates how public secondary teachers are ready to utilize ICT when empowered. The values of mean scores of all constructs indicate that teachers' awareness of ICT policy for basic education is moderate. However, through interview a large proportion of the head of schools were of the opinion that the government should provide ICT tools to secondary school teachers to improve teaching and learning process.

### 4.2 Teachers' abilities in using ICT tools

The second research question investigated the level of teachers' abilities in using ICT tools for teaching and learning in secondary schools. The results are presented in Tables 2 3. To answer this question the study investigated the level of ICT-based skills of secondary school teachers at Mikindani Municipality in Tanzania. Ten constructs were considered in this component. Information given in Table 2 was sought in order to establish the teachers' skills, knowledge and competencies regarding the use of ICT tools for teaching and learning in secondary schools. Table 3 indicates the differences of teachers' abilities on the use ICT for teaching and learning based on the teachers' demographic characteristics.

**Table 2:** Teachers Abilities of using ICT Tools for Teaching and Learning (n=110)

| S/N | Indicator/parameter | VL N(%) | Low N(%) | Moderate N(%) | High N(%) | VH N(%) | Mean | Std. Deviation |
|---|---|---|---|---|---|---|---|---|
| 1 | Ability to use computers for teaching and learning | 3(2.7) | 5(4.5) | 2(1.8) | 69(62.7) | 31(28.2) | 4.09 | .852 |
| 2 | Ability to use projector for teaching such as to make a presentation | 37(33.6) | 32(29.1) | 12(10.9) | 15(13.6) | 14(12.7) | 2.43 | 1.404 |
| 3 | Ability to use scanner to scan and distribute materials | 22(20.0) | 22(20.0) | 13(11.8) | 25(22.7) | 28(25.5) | 3.14 | 1.499 |
| 4 | Ability to use the printer to print notes and tests | 17(15.5) | 18(16.4) | 2(1.8) | 42(38.2) | 31(28.2) | 3.47 | 1.444 |
| 5 | Ability to use MS word to create documents/ text | 9(8.2) | 5(4.5) | 4(3.6) | 49(44.5) | 43(39.1) | 4.02 | 1.165 |
| 6 | Ability to use excel | 12(10.9) | 27(24.5) | 7(6.4) | 37(33.6) | 27(24.5) | 3.36 | 1.373 |
| 7 | Ability to use PowerPoint for presentation | 26(23.6) | 39(35.5) | 4(3.6) | 22(20.0) | 19(17.3) | 2.72 | 1.460 |
| 8 | Skills to use internet for forum discussions | 11(10.0) | 9(8.2) | 5(4.5) | 44(40.0) | 41(37.3) | 3.86 | 1.281 |
| 9 | Ability to use internet to share information | 20(18.2) | 10(9.1) | 3(2.7) | 36(32.7) | 41(37.3) | 3.62 | 1.508 |
| 10 | Ability to use internet to search for educational materials to develop myself professionally | 14(12.7) | 9(8.2) | 7(6.4) | 42(38.2) | 38(34.5) | 3.74 | 1.352 |
| | **Overall mean** | | | | | | **3.45** | **1.334** |

**Key:** VL= Very Low, VH= Very High, N= Number

Secondary school teachers were asked to state whether or not they were using the ICT tools for teaching and learning process, to assess their level of skills, knowledge and competencies. The results in Table 2 indicate that 90.9 per cent of the surveyed secondary school teachers reported using computers for teaching and learning. Based on mean score (Mean=4.09, SD=.852), the study establishes that most teachers used computers. During in-depth interview it was found that computers were used to prepare teaching notes and examinations. Moreover, when teachers were asked if they were able to use the projector, a scanner and a printer, the majority reported that they did not know how to use a projector for presentation (62.7%) while 26.3per cent said they can use a projector. The mean value of 2.43 and standard deviation of 1.404 imply that secondary school teachers have moderate abilities of using a projector for class presentation.

In case of a scanner, the results show no difference between those who can use a scanner and those who cannot. The results show that less than half (48.2%) of the surveyed teachers reported being happy and able to use a scanner whilst 40 percent reported being not happy and able to do so. On average, the findings show that teachers were able to use a scanner to a considerable extent (M=3.14, SD=1.499. Regarding printers, most teachers admitted that they can use printers to print prepared notes and other teaching materials as well as students' examinations. These findings were validated by key informants during an in-depth interview. One key informant had this to say,

> "Now days computers (laptops) are a necessary device in everyday life of human being because it is used for many functions apart educational purposes. Most teachers own laptops and use them for both educational and social issues such as entertainment. In education, laptops are used for preparing teaching notes, teaching aids, worked examples, test and examinations… scanners and printers are also used for the same purposes…

Another key informant also had this to say,

> "computers and printers are frequently used by teachers… these tools are commonly used together; teachers prepare notes and examination

> using computer then the printer transform the notes from the soft copy into a hard copy which can easily be distributed to students for learning purposes…, very few teachers use a projector for projecting notes or any educational materials in classrooms because they lack the expertise…in this rate of using ICT tools the targets of ICT policy for basic education will be hard to be fulfilled in a recent future."

These findings concur with the findings in a study by Mwalongo (2011) and another by Ndibalema (2014) who found that the most commonly reported use of ICT for teaching among teachers in Tanzania include the preparation of notes, teaching and learning resources and examinations. However, in order to realise the potentials of ICT on education the ICT policy for basic education had stipulated that the ICT tools must be used as a pedagogical tool. In this way, ICT will enhance the delivery and availability of educational materials effectively and efficiently. Similar findings are reported in a study by Malekani (2018) who revealed that ICTs facilities available in secondary schools are not adequately utilised for the intended purposes due to poor motivation and lack of required skills and competencies. Similarly, Muriithi (2017) found that the use of these tools depends on the possession of proper skills on operating them. The unskilled teachers cannot use them in the classroom where the students might possibly be more knowledgeable in using the gadgets than the teachers (Kihoza, 2016). As a result, in order to increase the impact of ICT tools, teachers' training is the area that needs improvement. Thus, this study establishes that teachers in secondary school have moderate skills on how to use ICT tools for teaching and learning.

Regarding the use of computers to prepare notes and other learning materials, the study revealed that teachers use MS-word, MS-excel and to a lesser extent MS-PowerPoint. The results in Table 2 show that 83.6 per cent of teachers reported using MS-word widely for creating documents or texts. Similarly, the mean value of 4.02 (SD=1.165) signifies that MS-word was widely used. Considering the use of MS-excel, 58.1 per cent of the surveyed teachers agreed having high and very high ability to use MS-excel. On the other hand, more than half (23.6%) of the surveyed teachers possessed very low ability and 35.5 per cent possessed low abilities to use a PowerPoint for presentation

in classrooms. Based on the mean value (M=2.72, SD=1.460) it means that teachers have low skills, knowledge and competency in using projectors for teaching and learning in secondary schools. The implication is that most of the teachers are still using the old method of chalk and talk, the practice which makes them lag behind the world of ICT.

When asked to rate their abilities of using the internet for sharing and searching of educational materials, majority (77.3%) of teachers indicate having good skills, knowledge and competency of using the internet for forum discussions, 70.0 percent had the ability of using the internet to share information and 72.7 per cent possessed skills and knowledge of using the internet to search for educational materials and to develop themselves professionally. Thus, it can be argued that the Internet is regarded as one of the most important resources in teachers learning rather than teaching in secondary schools in Tanzania. This indicates a lack of awareness among teachers on the importance of the Internet in teaching. This is one of major challenges to the ICT integration in secondary schools. Thus, this study established that except for PowerPoint, teachers in secondary school have high skills on how to use the internet, MS-word and Excel for teaching and learning.

According to Chirwa (2018), important technologies for learning such as computer application and the internet connection was ranked as the top most by the respondents. In a similar view, this study found that teachers possess high skills and knowledge regarding computer application in preparing teaching notes and other materials using MS-word and spread sheets. This is because computers and the internet are widely used in today world for different purposes other than teaching and learning. As a result, it is likely that most teachers have the ability of using the computers to prepare teaching notes, materials and to sharing or searching for educational materials online. The results in a study by Kihoza (2016) showed that teachers combine different resources in their teaching, as well as utilising various ICT tools with more than 90 per cent using computers and more than 70 per cent using the internet. It is also evident that textbooks are still considered fundamental in the educational systems worldwide.

However, the use of PowerPoint was found to be low in this study. The low usage of projector and PowerPoint can be attributed to the relatively high level of skills required by users. However, for teaching purposes, the knowledge and skills of using PowerPoint and projectors is essential and non-negotiable. These results corroborate with the results in other studies (i.e., Kilale, 2011; Kira & Mahumbwe, 2015; Crallet et al., 2016; Kihoza, 2016) who observed that secondary school teachers in Tanzania still depend on chalk and blackboard regardless of the prospect presented by the emergence of ICT especially PowerPoint presentation. In most cases, low adoption of ICT in teaching is attributed to lower levels of skills in using the projector for PowerPoint presentation in the classrooms and inadequate support in case of malfunctioning.

According to Schiller (2015) and Egwali and Igodan (2012), competences in the use of ICT are affected by sex, age, education level and teaching experience of teachers. The results on the association between demographic features and the teachers' ability of using ICT tools for teaching and learning are presented in Table 3. The results revealed that teachers who have teaching experience of more than 8 years were significantly more likely to have high skills on how to use ICT tools for teaching and learning in secondary schools. Thus, the difference was significant $\chi^2$ (2, N=110) = 21.186, p=.007, which implies that there is a relationship between teachers' teaching experience and their level of ICT skills and knowledge. Moreover, the results of a Kendall's tau-b coefficient of correlation depict a weak, positive correlation between the two variables, which was statistically not significant ($\tau_b$=.115, ρ=.220).

**Table 3: Association between ICT Skills and Demographic Characteristics of Teachers**

| Variables | Teachers' skills on how to use ICT tools for teaching and learning | | | Chi square | Degree of freedom (df) | P-value | Correlation coefficient (Kendall's tau-b) | Kendall's tau-b (P-value) |
|---|---|---|---|---|---|---|---|---|
| | Low N(%) | Medium N(%) | High N(%) | | | | | |
| **Teachers' teaching experience** | | | | **21.186** | **2** | **.007** | **.115** | **.220** |
| 1-3 Years | 2(20.0) | 2(20.0) | 6(60.0) | | | | | |
| 4-7 Years | 0(0.0) | 8(20.0) | 32(80.0) | | | | | |
| 8-11 Years | 0(0.0) | 3(15.0) | 17(85.0) | | | | | |
| 12-15 Years | 0(0.0) | 2(25.0) | 6(75.0) | | | | | |
| 15+ Years | 0(0.0) | 5(15.6) | 27(84.4) | | | | | |
| | | | | | | | | |
| **Sex of surveyed respondents** | | | | **11.022** | **8** | **.004** | **.311** | **.001** |
| Female | 2(3.9) | 15(29.4) | 34(66.7) | | | | | |
| Male | 0(0.0) | 5(8.5) | 54(91.5) | | | | | |
| | | | | | | | | |
| **Education level of teachers** | | | | **3.768** | **4** | **.438** | **.141** | **.122** |
| Diploma | 2(3.9) | 11(21.6) | 38(75.5) | | | | | |
| Bachelor | 0(0.0) | 9(16.1) | 47(83.9) | | | | | |
| Masters | 0(0.0) | 0(0.0) | 3(100.0) | | | | | |
| | | | | | | | | |
| **Age of teachers** | | | | **1.298** | **4** | **.862** | **-.034** | **.718** |
| 20-29 | 2(2.5) | 13(16.5) | 64(81.0) | | | | | |
| 30-39 | 0(0.0) | 6(22.2) | 21(77.8) | | | | | |
| 40-49 | 0(0.0) | 1(25.0) | 3(75.0) | | | | | |
| **Total** | **2(1.8)** | **20(18.2)** | **88(80.0)** | | | | | |

Moreover, results from cross-tabulation in Table 3 of sex and skills on how to use ICT tools for teaching and learning indicate that male teachers are likely (91.5%) to be more skilled in using ICT tools than female teachers. The difference was significant $\chi^2$ (8, N=110) = 11.022, p=.004, which implies that there is a relationship between the sex of teachers and the level of skills. Moreover, a Kendall's tau-b coefficient of correlation results depict a moderate, positive correlation between the two variables, which was statistically significant ($\tau_b$=.311, ρ=.001). Though male teachers were found to possess more ICT skills than female teachers, female teachers were found to possess higher abilities of using ICT tools. The association between education level and the age of

teachers was found insignificant, which implies that there is no relationship between the variables. The findings are in contrast with the common belief that highly experienced teachers are less skilled and reluctant to apply new technologies.

The findings conform with the findings in a study by Peralta and Costa, (2007) that teachers experience is one of the factors which determine the teachers' skills of using ICT tools in teaching and learning in secondary schools. Teachers with long experience tend to have more skills and knowledge in teaching than newly recruited teachers. Accordingly, the level of skills was expected to be high among long experienced teachers. As Mafang'ha (2016) observes long experienced teachers are highly skilful in teaching and using different methods and tools in delivering knowledge to students. New teachers might face difficulties in teaching and learning due to lack of experience and skills but not knowledge. This is because teachers are trained on how to use ICT tools in teaching and learning activities. Thus, teaching and learning can be impacted negatively by the lack of pedagogical experience which could limit development of appropriate ICT integration among new generation of teachers (Pamuk, 2012). Thus, teachers must be exposed to ICT tools for teaching and learning during their training in order to increase their awareness and experience with ICT tools. This will allow them to use ICT tools confidently in the classrooms.

Furthermore, regarding the sex of teachers and ICT skills, the findings are in line with the findings of a study by Mafang'ha (2016) who revealed that male teachers were comparatively more skilful in the utilisation of ICT tools in the teaching and learning process than female teachers in Tanzania. This might be attributed to aggressiveness and readiness of males to learn difficult and new things especially science-based skills and knowledge such as ICT. In Tanzania and in most of Sub-Sahara African countries female teachers in science-based subjects are few (Andersson et al., 2014). During in-depth interview the study found that male teachers were more willing to use ICT tools in the learning and teaching process than was the case with female teachers. As a result, this study recommends to the government to increase efforts to eliminate or minimize this gap. The study is in conformity with a study by Schiller (2015)

who revealed that personal characteristics such as educational level, age, gender and teaching experience can influence the adoption and use of ICT in teaching and learning.

In general, this study findings confirmed the long belief that male workers in either public or private sectors possess higher skills regarding science and technology, and that they can cope with new technology faster than their female counterparts. Needless to say, males have ample time to devote to learning new and riskier things than females do, because of social responsibilities, and cultural norms including the beliefs that complex and difficult things are for males but females take care of the family. Studies in developed and developing countries (Andersson et al., 2014; Schiller, 2015; Mafang'ha, 2016) have confirmed this. Therefore, this study has added knowledge in the literature that experience and sex are the determinants of the level of ICT based skills among secondary school teachers in Mtwara region, Tanzania.

### 4.3 Availability of basic ICT tools for teaching and learning

The third research question sought to determine the availability and adequacy of ICT tools for teaching and learning in secondary schools. The study results are presented in Table 4. Eight constructs were considered in this study seeking to establish the adequacy of ICT tools for teaching and learning in secondary schools in Mikindani.

**Table 4: ICT tools for teaching and learning (n=110)**

| S/N | Indicator/parameter | SDA N (%) | DA N (%) | NAND N (%) | AG N (%) | SAG N (%) | Mean | Std. Deviation |
|---|---|---|---|---|---|---|---|---|
| 1 | The school is connected to a national power grid | 0(0.0) | 0(0.0) | 0(0.0) | 61(55.5) | 49(44.5) | 4.45 | .499 |
| 2 | The school have well equipped computer laboratory | 13(11.8) | 52(47.3) | 26(23.6) | 18(16.4) | 1(0.9) | 2.47 | .936 |
| 3 | School has relevant teaching computer software | 62(56.4) | 9(8.2) | 31(28.2) | 8(7.3) | 0(0.0) | 2.26 | 1.114 |
| 4 | School has relevant manuals to support ICT implementation | 53(48.2) | 0(0.0) | 11(10.0) | 20(18.2) | 26(23.6) | 2.69 | 1.728 |
| 5 | The school has adequate ICT tools | 50(45.5) | 20(18.2) | 14(12.7) | 22(20.0) | 4(3.6) | 2.18 | 1.301 |
| 6 | The school is connected to a national fibre cable (NICTBB) | 57(51.8) | 19(17.3) | 18(16.4) | 15(13.6) | 1(0.9) | 1.95 | 1.148 |
| 7 | School is connected to internet from other sources than NICTBB | 37(33.6) | 21(19.1) | 26(23.6) | 16(14.50 | 10(9.1) | 2.46 | 1.332 |
| 8 | Technical support for ICT is readily available at school | 70(63.6) | 8(7.3) | 17(15.5) | 11(10.0) | 4(3.6) | 1.83 | 1.226 |

**Key:** SDA= Strongly Disagree, DA= Disagree, NAND= Neither Agree Nor disagree, AG= Agree, SAG= Strongly Agree, N= Number

As to whether secondary schools were connected to the national electricity grid, the results show that all schools (100.0%) were connected to the national power grid. The results indicate that 55.5 and 45.5 per cent of the surveyed secondary school teachers strongly agreed and agreed that their schools were connected to the national electricity grid. Based on the mean score (Mean=4.45, SD=.499), the study established that all schools had electricity. On the contrary, 64.6 per cent of teachers reported not having relevant teaching computer software. Moreover, more than half (59.1%) of the teachers reported not having well equipped ICT laboratories in their schools. Similarly, 48.2 per cent of secondary teachers in the study area reported not having relevant manuals to support ICT implementation in school, 63.7 per cent reported not having adequate ICT tools, 69.1 per cent said the school is connected to the national fibre cable (NICTBB), 52.7 per cent said the school is connected to the internet from sources other than NICTBB and (70.9 per cent said Technical support for ICT is readily available in school. Though all secondary schools were connected to the national grid electricity, the study has established that schools in Mtwara were not equipped with ICT tools.

The study findings show that laboratories were not well equipped with computers and other ICT tools to meet the needs of both teachers and students in all the surveyed schools. The researcher observed that ICT facilities were not fixed in the classrooms either. These findings corroborate with the earlier findings by Crallet et al. (2016) that secondary schools had a shortage of computers and computer laboratories, projectors, internet and manuals. Chirwa (2018) reported the lack of computers and other ICT facilities in the Tanzanian secondary schools as a major factor that affect integration of ICT in teaching and learning. The study established that the schools did not have education software for teaching, a fact which was corroborated by key informants during the in-depth interviews. The interviews indicate that most of schools did not have software for teaching purposes and lack computers and projectors to enable teachers use ICT for teaching and learning. Lack of education software in secondary schools was posited in many researches in African context (Anderson et al., 2014; Kihoza, 2016).

However, this study revealed that secondary schools in Mtwara use open-source software, which are for free. This is due to limited funds to purchase

software from developers. Swarts and Wachira (2010) observed that, most of the computers in secondary schools in Tanzania and Africa do not have educational software. Another problem regarding the software is the use of open-source software which are freely available but with limited options. The limitations reduce the efficiency and effectiveness of demonstrating different material especially when teaching science subjects. Chirwa (2018) reported further that when genuine educational software is used, it can improve teaching and learning. On this ground, it is therefore crucial for secondary schools to have genuine education software and use it to enhance teaching and learning. This study confirms the hypothesis that secondary schools lack genuine software installed in the computers and other ICT tools for teaching and learning.

Further, the use of internet for teaching and learning activities is very crucial (Chirwa, 2018). E-mails and chats are among the resources that are reported to be most frequently used in teaching via the internet. The advantage of using the internet for e-mails and chats is that they can be used all the time regardless of school hours. Through e-mails students can be provided with lesson notes and other classroom activities and submit assignments to their teachers. This study found that very few schools in Mikindani were connected to the internet sources including the national fibre cable and other internet services. The results confirm the results of the earlier study by Kira and Mahumbwe (2015) who revealed that some schools in Dar es Salaam were connected to Tanzania Telecommunications Company Limited (TTCL); the government owned internet service provider for cost saving reasons. Also, internet services from other internet service providers have been procured by secondary schools. These internet services providers are tigo, vodacom, halotel and airtel.

## 5.0 Conclusion and Recommendations

It is evident that ICTs can offer great opportunity for teacher secondary schools to improve teaching and learning processes in developing countries. It was on this respect that the then Ministry of Education and Vocational Training (MoEVT) decided to prioritize ICT development and deployment in secondary schools. The findings of this study revealed that the majority of teachers were aware of the ICT policy for basic education. However, their level of awareness

is moderate. Needless to say, the mission statement in the ICT policy for basic education, focuses on integrating ICT to enhance access, equity, quality and relevance of basic education, while stimulating and improving teaching and everlasting learning. The previous ICT initiatives taken by the government and donor agencies put the foundation for ICT use in education, though they could not develop a sustainable ICT use solution.

The findings of this study showed that secondary school teachers in Tanzania had a medium level of ICT skills . Moreover, the skills level depend on the sex and teaching experience of the teacher and not on education level and age of the teachers. Therefore, teachers have to be equipped with sufficient ICT knowledge, skills and competencies in order to competently apply them for teaching and learning purposes. The lack of ICT tools and infrastructure in secondary schools jeopardizes the efforts of integrating ICT in secondary school education. These tools and infrastructure include access to computers, sustainable power supply, software, highly specialized skills on the use of ICTs among teachers in secondary schools and Internet connectivity. The lack of these attributes have continued to compromise the integration of ICT in secondary education.

Based on the findings, this study recommend to the Tanzania Government to ensure that all public secondary teachers are aware of the ICT Policy for basic Education through the provision of in-service training courses on the best use of ICT as compulsory and motivation of teachers into using ICT in the teaching and learning process. This will improve teaching skills and enable teachers to use modern technology effectively in teaching and learning. Tanzanian Government in conjunction with education stakeholders should increase ICT training through workshops and seminars to meet the technology needs of secondary teachers and thus improve the quality of teaching and learning and lead to better performance. The ministry responsible for education should have regular inspections to secondary schools to make sure that ICT training for teachers is conducted and ICT policy becomes well-understood. Tanzania Government and education stakeholders should invest in ICT tools in public secondary schools to improve all learning and teaching process. In addition, this study calls for more enquiries in this area to understand the benefits of ICT in Tanzanian context.

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