Utilisation of Information and Communication Technology in Teaching and Assessment of Secondary School Students in Tanzania

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ABSTRACT

This study assessed the implementation of ICT as a pedagogical tool in teaching and assessment of secondary school students in Tanzania. The study employed a survey design with 179 secondary school science teachers. One teacher was randomly sampled from each of 179 randomly selected secondary schools. The teachers responded to questionnaires. Responses from questionnaires were coded and numbers entered into M-Excel for processing. Results obtained were presented in Tables showing absolute numbers and percentages. The study established that 62 per cent of teachers were trained in ICT as a pedagogical tool. They used the knowledge in teaching and assessment aspects such as searching teaching materials through internet (90%), examination word-processing (81%), typing notes (80%), processing examination results (59%) and using projectors in classroom instruction (56%). However, no teacher was found to use computer technology for assessment. Teachers faced various challenges in utilisation of ICT such as inadequate number of ICT equipment (78%), inadequate knowledge and skills in ICT (59%), unreliable internet (35%) and absence of electricity or power cut-off (34%). The study recommends that all teachers should be trained in the use of ICT in both teaching and assessment. Moreover, the challenges observed in the use of ICT should be addressed for effective utilisation and integration of ICT in secondary education.

Keywords: Information and Communication Technology, teaching, assessment, secondary school

INTRODUCTION

We are living in globalized, scientifically, and technologically advanced world where ICT has simplified access of knowledge and delivery of information. ICT in education is seen as a means of facilitating not only teaching but also assessment of learners (Murithi & Yoo, 2021). The concern about ICT in education is not just an academic exercise but even the changes in labour market demands have necessitated production of highly skilled personnel, who can use ICT knowledge and skills in their day-to-day activities. The school therefore, cannot ignore the utilisation of ICT (Murithi & Yoo, 2021). Many countries which have invested in ICT such as Japan, China, USA, and several others have exploited it to attain high economic development (Niebel, 2018).

Tanzania is among the African countries that have recognised the importance of ICT integration in education. In 2014, the country developed a new Education and Training Policy partly for the purpose of enabling the implementation of ICT as pedagogical tool for teaching and educational assessment. To align ordinary secondary school curriculum with the education policy, the Tanzania Institute of Education (TIE) reviewed the curriculum and put forward the objective to ensure that ICT facilities such as computers, printers, photocopiers, scanners, and internet connectivity are available to all secondary schools to simplify the teaching process and assessment of learning.

Following the development of Education and training policy in 2014 that accommodated ICT as a pedagogical tool, much effort has been made in training teachers on the use of ICT in teaching and assessment. This has been done though projects run by various agencies such as: The African Digital Schools Initiative (ADSI) programme implemented in 40 secondary schools across Tanzania (GESCI, 2020) and Universal Communications Service Access Fund (UCSAF) Project (URT, 2020) all of which supported the schools with ICT laboratory. This paper

assesses the utilisation of ICT as a pedagogical tool in secondary schools. Specifically, the study aimed at; establishing the number of teachers who have acquired ICT knowledge and skills from 2016 to 2022; finding out the extent to which teachers apply ICT in teaching and assessment of learning; and highlighting challenges faced by teachers in applying ICT in teaching and assessment.
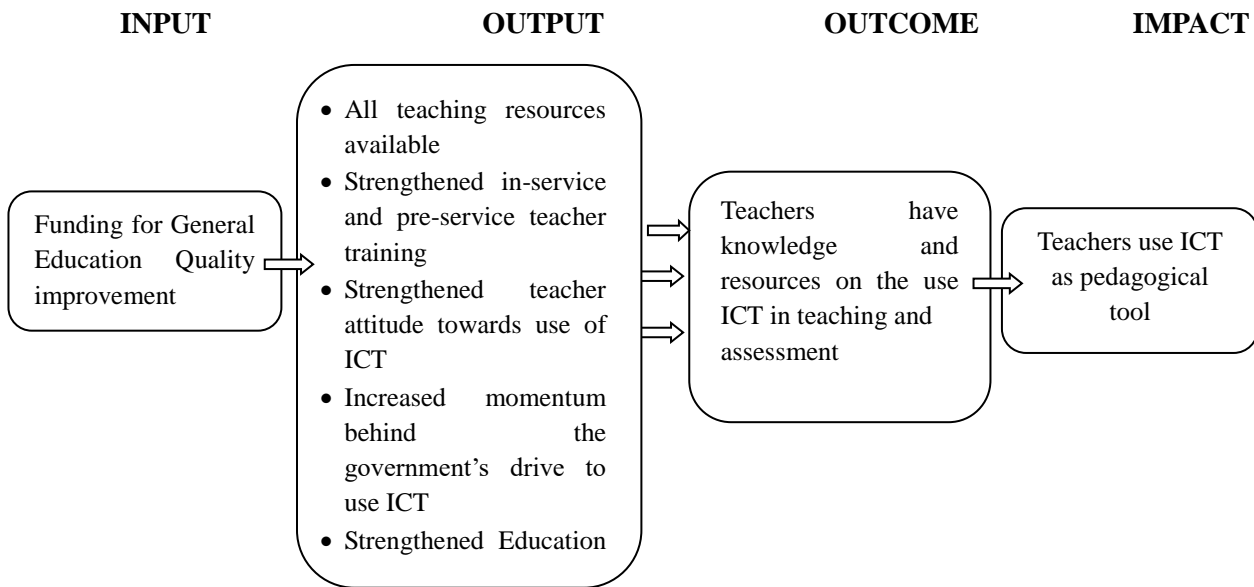
Research Questions

To achieve the research objectives, the following research questions guided the study:

1. How well are the teachers trained in the application of ICT in teaching and assessment of learning?
2. To what extent do teachers apply ICT in teaching and assessment of learning?
3. What challenges do teachers face in applying ICT in teaching and assessment of learning?

Conceptual Framework

The study thought to explore teachers' utilisation of ICT in teaching and assessment of students' learning. It was guided by a model which shows how activities are understood to produce a series of results that contribute to achieving the intended impact (Vogel & Zoe, 2012). The Model shows that good products result not only from investment but also proper planning and management of a set goal. This means that, utilisation of ICT in teaching and assessment requires teachers' training, and supply of ICT equipment and facilities to schools. The model is presented in Figure 1.

INPUT   **OUTPUT**   **OUTCOME**   **IMPACT**

Funding for General Education Quality improvement

- All teaching resources available
- Strengthened in-service and pre-service teacher training
- Strengthened teacher attitude towards use of ICT
- Increased momentum behind the government's drive to use ICT
- Strengthened Education

Teachers have knowledge and resources on the use ICT in teaching and assessment

Teachers use ICT as pedagogical tool

Conceptualization of ICT Integration in Education

Source: Adapted from Vogel and Zoe (2012, p.5)

Alkahtani (2017) defines ICT implementation in education as a wide process of applying technology to the curriculum to improve teachers' pedagogical skills. To Alkahtani, ICT is a tool that changes the way education is delivered as it helps teachers to organize and adopt high quality assessment. To Kirkland and Futurelab (2009), the implementation of ICT in education is the application of a new approach to questioning, the use of a new digital tool or a novel use of space – that brings about some value by altering the social practice of teaching and assessment. These definitions guided the concepts presented in this paper.

Teachers Training in the Application of ICT in Teaching and Assessment

The Education for All Global Monitoring Report, 2013/ 2014, explains that an education system is a function of teachers and it is only as good as its teachers. Teaching and assessing with the aid of technology

require deep knowledge and skillfulness in processing the subject matter contents and enriching learning (Mishra & Koehler, 2007; Turunen & Tuovila, 2012). In that stand, the advancement of technology has necessitated the need to capacitate teachers in order to increase their effectiveness and help them to use ICT innovations in teaching and assessing learners. SIPSE (2015) argues that, a suitable environment for ICT use should be made through the development of the ICT infrastructures, training of teachers on how to make the integration, and training of leaders on how to monitor and support teachers' integration of ICT in teaching and learning. Teachers' training on the use of ICT can be enhanced through teachers' network whereby, teachers from different schools meet at a certain place and undergo training by the experts (Lieberman & Wood, 2002), or teachers' professional communities of learning where teachers of same school share knowledge with the aim of improving their profession (Talbert, 1991).

Teacher's use of ICT in Teaching and Assessment of Learning

ICT as an educational tool forms a remarkable source of information for research, and class assignments. It also offers the means to broaden teachers' experience through interactive collaboration with other education stakeholders around the world (Alkahtani, 2017). Research has reveals revealed that the use of different approaches offered by ICT enhance not only teaching but also simplify preparation of assessment tools and processing of examination results (Mbodila & Muhandji, 2013). Agbobli (2002) contends that, given the clear goals of education in human life, the use of ICT is a great way for people to achieve the goals. From this point of view, proper investment in such technology allows the development and improvement of the education system. Moreover, Zhao, Pugh, Sheldon, and Byers (2002) observe that application of ICT in any school depends on the availability of resources which include equipment, web access, human resources

(such as experts) to support innovative activities, planning time and physical resources such as large classroom space. Innovation which requires a substantial change in teaching and assessment practices and a significant increase in resources, need more support to succeed than the one which needs less resources and less change from the teacher's current practice.

Challenges facing ICT Application in Education

Research carried out by Leung, Watters and Ginns (2005) in Hong Kong on the challenges facing the integration of ICT in teaching in secondary schools, found out that most of the schools had shortages of computers, computer-based equipment, computer software and classroom space. Likewise, Alkahtani (2016, 2017) found out that in Saudi Arabia integration of ICT in education is challenged by teachers' insufficient knowledge in using computers such that, teachers who are at the initial stage of using computers take more time to plan ICT-based lessons than planning a non-ICT based one.

Alkahtani also noted that maintenance of ICT equipment, improvement of infrastructure in the schools in terms of quantity and quality and lack of teacher training which focus not only on the operation of the ICT equipment but also on the curriculum, in terms of content and delivery techniques, are the major challenges. Further research by Mbodila, Jones and Muhandji (2013) revealed that in USA there is a limited regional infrastructure for the full ICTs integration in education. The authors cautioned that it is very important for policymakers and planners before carrying out any ICT implementation in education, to carefully consider the appropriate rooms or buildings available, availability of electricity and telephone as well as looking at the ubiquity of different types of ICT in the country in general and in the educational system in particular. Moreover, research by the European Commission (2013) reported challenges such

as insufficient ICT infrastructure, support from colleagues, inflexibility of the curricula and lack of enough digital skills. In general, the implementation of ICT in education has two facets which are opportunities and challenges. It is very important to ensure that good policy, proper planning, well trained teachers, and suitable level of implementation is in place for proper use of ICT.

Methodology

This quantitative study employed a survey research design, involving analysis of teachers' response on the training, and use of ICT in assessment as well as challenges they encounter. The study involved a total of 179 respondents (90 biology and 89 chemistry teachers), who were randomly sampled from 179 secondary schools. The data were collected through questionnaires, which were physically distributed to 179 teachers during the 2023 marking exercise. The questionnaires were used because it enabled easy collection of data from many teachers in a short duration. Responses from questionnaires were first coded and numbers entered into M-Excel for processing. Results obtained were presented in numbers and percentages or Tables showing absolute numbers and percentages.

Findings

This part presents, analyses, and discusses the results. The results are presented based on the research questions. The results presentation is organized along the objects of the study, ranging from teachers' capacity building, through actual use of ICT and experienced challenges.

Teachers' Capacity Building in the use ICT for Teaching and Assessment

Teachers are in the centre of any education innovation. That means every innovation should be accompanied with teacher training if success is targeted. In this case it was important to ascertain the

number of teachers who have received training on use of ICT in teaching and assessment of learning from 2016 to 2022. The information gathered from the participants through questionnaire indicate that, 114 (62%) of the participants received training on use of ICT in teaching and assessment since 2016. The gained knowledge and skills are important in triggering the use of ICT as a pedagogical tool.

Teachers' use of ICT in Assessment of Learning

Ariyo and Akitunde (2012) asserts that the use of ICT knowledge depends on teachers' altitude. That means, possession of teacher ICT knowledge does not guarantee its use because some teachers may have negative attitude towards use of ICT. Thus, the second question required the participant to demonstrate the use of ICT by putting a tick (√) to each of the outlined aspect of teaching and assessment if he/she practices it and cross (X) if he/she does not practice it. Responses provided by the participants are summarised in Table 1.

Table 1: Teachers' Utilisation of ICT in Supporting Teaching and Assessment (n = 179)

S/N	Teaching Aspects	% of Respondents	Assessment Aspects	% of Respondents
1.	Using computer for searching teaching materials	90	Using computer for typing examinations	81
2.	Using computer to preparing teaching notes	80	Using excel to process examination	59
3.	Preparing teaching notes on slides	67	Using computer for registering candidates	56
4.	Using projector for classroom instruction	56	Communicating examination results to parents using network	21
5.	Using e-book for searching notes	49	Using computer network for	00

assessment

Results from Table 1 reveal that most of the teachers utilise ICT in various aspects of teaching and assessment. Most of these teachers use ICT in searching for teaching materials. However, none of the teachers use computer networks for assessment.

Challenges faced by Teachers in Implementing ICT in Teaching, Learning and Assessment

Information extracted from the third research question concerning challenges that teachers face in implementing ICT as a pedagogical tool, reveal that there are numerous challenges which were pointed out by most of the participants while others were pointed out by only a few participants. For the sake of clarity, the researcher grouped the challenges into major and minor ones such that major challenges are those which were pointed out by more than half of the participant whereas those which were pointed out by less than half of the participants were termed as minor challenges. The challenges are summarized in Table 2.

Table 2: Challenges faced by Teachers in Using ICT

SN	Challenge	Number of teachers	Percentage
	Major challenges		
	Lack of or insufficient equipment	140	78
	Lack of or insufficient computer knowledge	105	59
	Minor challenges		
	Lack of internet	63	35
	Erratic/unreliable electricity	61	34
	Lack of maintenance and updating of computer software	22	12

and hardware

Table 2 shows that the major challenges which was pointed out by majority of teachers was insufficiency of ICT equipment. This indicates that although most of the teachers have acquired knowledge on ICT use in teaching and assessment, the lack equipment hinder them from applying the technology in their day-to-day classroom practices. Lack of or insufficient knowledge of computer was observed to be the second major challenge. Although most of the Biology and Chemistry teachers had acquired knowledge on the use of computers in teaching, learning and assessment, among them, there are some who are yet to have sufficient knowledge especially those who happen to have attended related capacity building programmes just once.

Lack or absence of internet connectivity and lack or unstable electricity in schools were pointed out as minor challenges against the use of ICT in teaching and assessment of learning. These challenges constrain teachers' access to information communicated electronically. Some schools are found in the rural or remote areas where there is no electricity, some of which are at least using generators, whereas other schools are found in urban areas where electrical power supply is not frequent. Therefore, both schools are not only facing the problems of no electricity but also absence of internet, hence failure to utilise ICT. Lack of maintenance and updating of computer software and hardware was pointed out by very few teachers who participated in this study. This is an indicator that most of the schools have managed to build well-equipped vanished computer rooms which are regularly maintained.

Discussion

Since the study has found out that there are at least nine ways through which Biology and Chemistry teachers utilize ICT in their work, it is clear that ICT has proved to be important in Tanzania's secondary education and that it is obviously being implemented. This is in line

with arguments that effective implementation of ICT can play important roles in education by transforming teaching and assessment process (Yoo & Murithi, 2021). Teachers who use ICTs thoughtfully make learners more interactive and enjoyable (Kirkup & Kirkwood, 2005). In addition, the use of ICT in assessment simplifies elaboration of concepts which seem to be difficult in science (Senzige & Sarukesi, 2003; Yoo & Murithi, 2021). However, it is very important to make sure that adequate teachers training, careful planning, and appropriate levels of investment in computer equipment and facilities are in place before implementing ICTs in education to achieve maximum educational return.

Conclusion

Tanzania has managed to train more than half of her Biology and Chemistry teachers in ICT use in learning and assessment since 2016. The teachers have been using the acquired knowledge in various aspects of teaching and assessment such as preparing notes, preparing examination, searching materials in internet. However, there remains a number of teachers who are not using computer networks for assessment of learning. It is also clear that, although more than half of the teachers have been trained in ICT for education, some of them have not been able to use the related knowledge and skills because of lack or insufficient ICT equipment, unreliable internet, and electricity in some schools.

Recommendations

Based on the findings from this study, the researcher recommends that for proper teachers' use of ICT in teaching and assessment, the government, training institutions and schools should ensure that all teachers are trained on the use of ICT as a pedagogical tool. Additionally, ICT equipment and facilities such as internet connectivity should be in place for effective implementation of ICT in secondary

schools. This study focused on the use of ICT by science teachers as a means to support teaching and assessment. Thus, other subject teachers and learners were not involved. Further research may therefore be undertaken to find out non-science subject teachers' and students' experience on the use of ICT in their day-to-day teaching-learning process.

Significance of the Study

It is important to ensure that our teachers have adequate knowledge of using ICT in various aspects of teaching and assessment such as preparation of notes and using examination web to communicating examination results to parents. Thus, the results obtained from this research will inform the education stakeholders so that they can take the required measures to ensure that every teacher apply ICT in teaching and assessment of students.

Limitation of the Study

This study is limited to examining the use of ICT as a pedagogical tool to Biology and Chemistry teachers only. Therefore, the results cannot be generalized to utilization of ICT by teachers of all subjects in Tanzania.

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