



Integration of Information and Communication Technology in Instruction of Geography: A Study of Public Secondary Schools in Manyoni District, Tanzania

Frank Zakaria Mwaluko¹, Musamas Josephine Kemboi² & Albert Paulo Tarmo³

¹Department of Educational Management & Policy Studies, Moi University, Kenya

Email: frankzakaria89@gmail.com

²Department of Curriculum, Instruction Educational Media, Moi University, Kenya

Email: musamaskem@yahoo.com

³The University of Dar es Salaam, Department of Educational Psychology and Curriculum Studies, Tanzania

Email: tarmoakonaay@gmail.com

Abstract

Information and Communication Technology (ICT) has become a significant aspect of teaching and learning. Despite its significance, ICT is not fully integrated into the teaching and learning of Geography in Tanzania. The purpose of this study was to investigate ICT integration in teaching and learning of Geography in public secondary schools in Manyoni district, Tanzania. The objectives were: to establish ICT resources available for teaching and learning Geography; to assess Geography teachers' preparedness to integrate ICT in teaching and learning and to determine the frequency and use of ICT resources in the teaching and learning of Geography. The Technological Acceptance Model (TAM) by Fred Davis guided the study. The target population for this study was all the public secondary schools in Manyoni district which has a total of 16 schools. The study used simple random sampling to select 9 secondary schools and 185 students in addition to purposively selected 30 Geography teachers and 9 headteachers as the study respondents. The study adopted a pragmatic paradigm and used a mixed-methods research approach. A concurrent triangulation mixed design was used where data was collected using questionnaires, document analysis, interviews and observation schedules. The quantitative data were analyzed by descriptive statistics using frequencies, tables and percentages, while qualitative data were analyzed thematically through content analysis. The study revealed that ICT resources for instruction of Geography in secondary schools were insufficient, Geography teachers had limited ICT skills, and many Geography teachers had never used ICT in their teaching. This study concluded that a number of factors have interacted to negatively impact and retard the integration of ICT in the instruction of Geography in secondary schools in Tanzania. The study therefore recommended that a serious effort should be put in by the different stakeholders to increase the provision of ICT tools to all schools and Geography teachers to be encouraged through in-service training to acquire not only skills but also enthusiasm to enable them effectively integrate ICT in their teaching.

Keywords: *Information and Communication Technology, Geography, integration, Instruction process, Secondary school teachers*

Email of Corresponding Author:

frankzakaria89@gmail.com

<https://journals.mu.ac.ke/index.php/edj/>

1.0 Introduction

The integration of ICT in teaching and learning brings about powerful learning environments and helps students to deal with knowledge in active, self-directed and constructive ways (Luhanya et al, 2017). Moreover, Mishra and Mahapatra (2021) noted that preparing students for the 21st Century requires the use of ICTs in the educational process. They continue to assert that ICT is undoubtedly advancing and being used in today's society particularly for teaching and learning. As cited by Nyakito et al, (2021), it can be said that ICT provides many tools that can be used in classrooms to improve the quality of teaching and learning of any subject. This implies that there can be no effective teaching and learning without the assistance of ICT. Similarly, Telore et al, (2021) presented that ICTs have primarily enhanced the interest in all learning particularly that of Geography. Considering the fact that Geography is a subject being taught in Tanzania secondary schools, it needs to integrate ICT to effectively make geospatial concepts well understood by learners.

1.1 Background to the study

There is a growing interest in integrating ICT in teaching and learning in schools and colleges in many countries. This study cited literature related to the integration of ICT in teaching and learning Geography. For example, in India, Nidhi (2019), in relation to the integration of ICT in Geography, indicated that the significance of ICT in teaching geographical content in schools was well reported, whereby geographical information systems (GIS), satellite images, and cartography have changed the way Geography should be taught and learned; as a result, geographical concepts are taught better using digital media to help learners understand abstract concepts. In England, a study done by Morgan & Tidmarsh, (2004) reported that integrating ICT in teaching and learning Geography enables students to draw graphs more quickly access a more comprehensive range of information more readily; and as for Geography teachers, ICT can help to produce better graphics and diagrams on the board.

In Tanzania, as noted by Selemani et al, (2021), ICT has transformed traditional teaching and learning methods and strategies at different levels of education. On the basis of the advantages of integrating ICT in the instructions of Geography, the study was designed to investigate the integration of ICT in teaching and learning Geography in Tanzania's setup.

1.2 Statement of the problem

ICT in teaching and learning activities have been essential to all education systems worldwide. More specifically, in Tanzania, the use of ICT in education has been proven to be a key milestone in improving the learning process at different levels of education (Malero et al., 2015). The authors continued to note that the Government of Tanzania has implemented a number of projects aimed at introducing and using ICT at different levels of education. Thus, teachers who teach Geography in public secondary schools must constantly integrate ICT into the instruction processes (Kadhim, 2020). Similarly, Many Studies in Tanzania have not focused on ICT in teaching and learning Geography in public secondary schools (Käyhkö et al, 2018; Sumari et al, 2018). Furthermore, Chirwa and Mubita (2021) noted that the value of ICT for teaching and learning is not in line with the realities of trying to integrate ICTs in the classroom. This study, therefore, investigated the integration of ICT in the instructions of Geography in public secondary schools in Manyoni district.

1.3 Purpose of the study

The purpose of this study was to investigate the integration of ICT in teaching and learning Geography in public secondary schools in Manyoni district, Tanzania.

1.4 Objectives of the study

The objectives of this study were:

- i) To establish ICT resources available for teaching and learning Geography in public secondary schools.
- ii) To assess the level of preparedness of Geography teachers for ICT integration in teaching and learning in public secondary schools.
- iii) To determine the frequency and use of ICT resources in teaching and learning Geography in public secondary schools.

1.5 Research questions

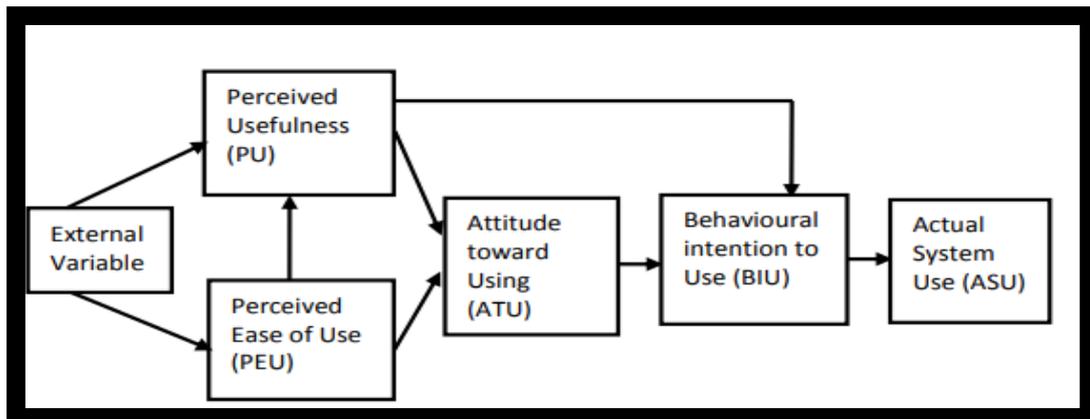
The study sought to answer the following research questions:

- i) What Instructional ICT tools are available to Geography teachers?
- ii) What is the preparedness level of Geography teachers for integrating ICT into teaching and learning?
- iii) How frequently do Geography teachers use ICT resources in teaching and learning?

1.6 Theoretical framework

This study was guided by the Technology Acceptance Model (TAM). The Technology Acceptance Model (TAM) was introduced by Devis in 1989. The model attempts to describe the conditions for accepting technology in different practices, such as for teachers. It consists of five components namely: external variables, perceived ease of use, perceived usefulness, and attitude towards using and behavioral intention. According to (Davis, 1989), **perceived usefulness** is the extent to which a person (teacher) believes that utilizing a particular method or technique would enhance his or her job performance or routine responsibilities. **Perceived ease-of-use**, on the other hand, entails the extent to which an individual (teachers) considers that using a specific system would be effortless and hassle-free; in other words, ease of use means freedom from complexity and trouble. These variables are related to the current study in that they helped the understanding and description of aspects related to integration of ICT in the instruction of Geography.

Figure 1: Technological Acceptance Model

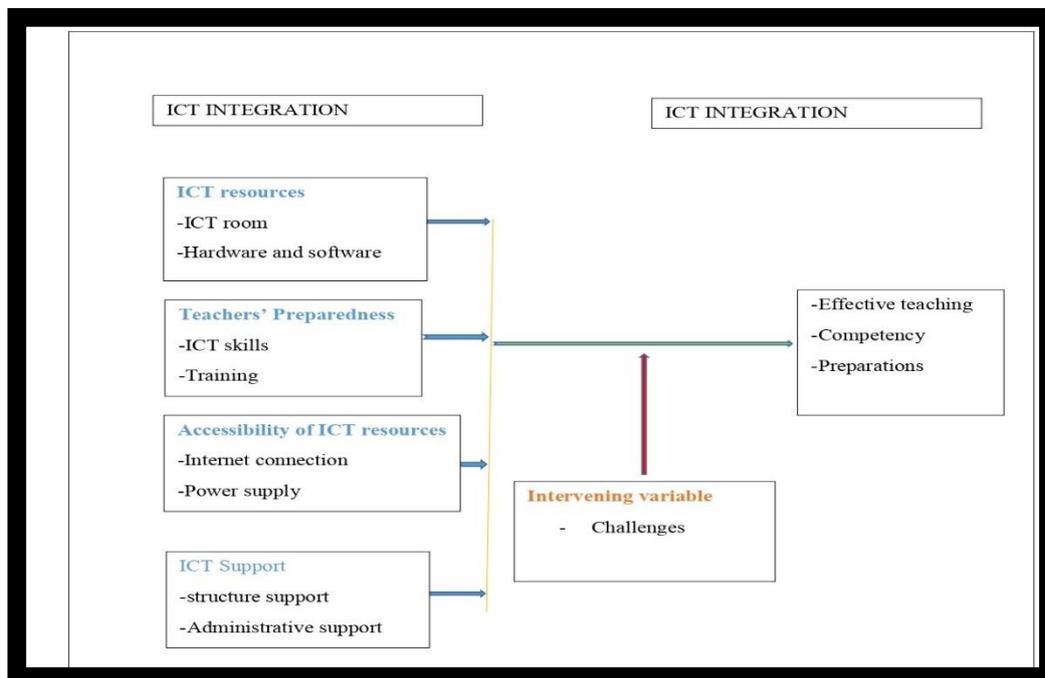


Source : Davis et al. (1989) cited by (Luhmya et al., 2017)

1.7 Conceptual framework

The study conceptual framework illustrates the relationship and interaction between the study independent, dependent variables and the intervening variables as shown in figure 2.

Figure 2: Conceptual framework



Source: Researcher (2022)

2.0 Literature review

Education worldwide is experiencing major paradigm shifts in educational practices of teaching and learning under the umbrella of an ICT-enabled learning environment (Majumdar, 2015). It is a globally expanded network that is considered a suitable medium for building a global public sphere whereby everyone is allowed to express any opinion; hence the principle of universalization is practically realized.

In East Africa, particularly Kenya, the Ministry of Education and Technology (MOEST) discusses how the integration of ICT in education can be leveraged to support and improve quality education for all Kenyans (Ministry of Information & Technology, 2016). It further says the Government's main priority towards attaining Kenya Vision 2030 development goals and objectives for wealth and job creation is the achievement of an industrialized information society and knowledge economy. Likewise, Swarts & Wachira, (2010) asserted that *"Tanzania cannot afford to overlook the importance of ICT for improved access, equity, quality and relevance of education as it takes advantage of the full range of ICTs, from radio and mobile telephony to computers and the Internet, and further to build the foundation for a well-educated and learning knowledge society"*.

Ncube, (2018) asserted that ICT in teaching and learning Geography is essential as it contributes in interpreting abstract phenomena and concepts. Most importantly, the abstract nature of geographical concepts such as longitudes and latitudes needs the support of ICT resources like visual materials to facilitate learning. Similarly, Samuel Antwi, (2018) noted that ICT resources like the internet and webcam take the opportunity of illustrating various geographic examples and exercises for learners during teaching and learning activities. Garyfallidou & Ioannidis (2014) revealed that Geography teaching had been graced with many ICT tools such tools as Google earth, a selection of configurable and specialized search engines, software allowing the creation of crosswords, and even further, a magazine (either internet-based or in paper form) with references to different countries and places, and many more.

Rogers (2016), as cited by Soomro et al, (2020), argue that adequate skills in digital technologies could be influential for teachers and students to improve their teaching and learning performance in their schools. It has been noted that the preparedness levels of teachers toward the use of ICT have a great impact on its integration into teaching and learning. Ghavifekr et al, (2014) argue that although teachers appear to acknowledge the value of ICT in schools, they continue encountering obstacles during the process of adopting these technologies into classroom teaching and learning.

Moyo, (2018) argued that if teachers are fully aware and adequately knowledgeable about ICT, they will guide their learners toward a bright future. In addition, the use of ICT in Teaching and learning helps improve the teaching and learning activities of the teachers and students if the entire necessary ICT infrastructure for implementation is in place (Ngeze, 2017a). Moreover, the teachers reported that they have no in-service training related to ICTs in teaching and learning.

3.0 Materials and methods

3.1 Research design

The study employed a concurrent triangulation mixed method design which is based on a pragmatic worldview in which the researcher merges qualitative and quantitative data to provide a comprehensive analysis of the research problem. This is due to the fact that collecting diverse data types best provides a complete understanding of the research problem than quantitative or qualitative data alone (Creswell, 2014).

3.2 Study area

The study was conducted in selected public secondary schools in Manyoni district in Singida. According to the 2022 Tanzania National Census, the population of Manyoni District was 279,069; it seats between 05°45'S 34°50'E. The main economic activity in the Manyoni district is farming and livestock keeping (Nicol et al, 2015).

3.3 Sampling methods and sample size

Manyoni district had 16 public secondary schools up to 2022, so it was not easy to include them all in the study. The purposive sampling technique was used to select nine (9) public secondary schools to be involved in the study. This method of sampling was preferred by the researcher because it excluded schools that were unsuitable for the study such as schools without electricity. The simple random sampling technique was used to select 185 (20%) from a target population of 918 from the 9 schools. The use of Simple random sampling ensured that all the form three students from the sampled public secondary schools had an equal chance of being chosen for the sample study.

The purposive sampling technique was used to sample 30 Geography teachers from sampled public secondary schools to participate in the study. The researcher purposively sampled Geography teachers to seek in-depth knowledge on the integration of ICT in teaching and learning. In each school that was sample for the study, all the Geography teachers in the school were purposively sampled. This gave a sample of 30 teachers from the 9 public schools. Headteachers were included in the study because they had mandatory school administrative responsibilities on the Government's behalf. Thus 9 Head teachers were purposively selected from public secondary schools to participate in the study to answer administrative questions.

3.4 Research instruments

The data collection instruments for this study included the questionnaire, document analysis, interview and observation Schedules. The researcher used questionnaires that comprised statements that sought Geography teachers' and students' views, perceptions, opinions, and attitudes on ICT integration in the teaching and learning of Geography. The questions were clear and precise to help minimize subjectivity and make it possible to use quantitative analysis. The interview schedule was conducted with head teachers in the targeted public secondary schools to obtain in-depth data on school administrative practices that support the integration of ICT in teaching and learning. In this

study, the researcher attended three Geography lessons in sampled public secondary schools to observe how the Geography teachers integrated ICT into their teaching methods.

3.5 Data analysis

Quantitative data were analyzed using the inferential statistical technique, while qualitative data were analyzed thematically. For quantitative data, the researcher coded and entered it into the SPSS computer software and analyzed it. On the other hand, for qualitative data, the researcher transcribed the information that had been recorded by writing it down. After that, a comparison was made to confirm that all the written information had been captured and that none was missed. In the production of the research report, the researcher narrated by giving an interpretation of the data provided and gave meaning to the phrases uttered by the participants in a manner that made sense. The participants' voices were quoted directly.

3.6 Ethical considerations

The researcher sought for official permission to carry out the research from concerned authorities. Informed consent was sought during the actual administration of the research instruments according to guidelines in research ethics. The researcher explained the aims and objectives of the study in order to remove doubt hence avoid any misconception and poor attitude among respondents. It was also prudent to assure the respondents of total confidentiality of information sought. In this case the names of the respondents remained anonymous.

4.0 Results and discussion

4.1 Response rate

Regarding the response rate, the researcher administered 30 questionnaires to Geography teachers and 185 questionnaires to form three students in Manyoni District. The researcher further aimed at interviewing nine headteachers from sampled public secondary schools. Out of 215 questionnaires distributed to Geography teachers (30) and students (185), all 215 questionnaires were correctly filled and returned. These gave a response rate of 215(100%). The researcher was able to interview 9 headteachers giving a response rate of 100%. This is consistent with Mugenda & Mugenda's (2003) recommendation that a response rate of 50% is sufficient for analysis and reporting, 60% is acceptable, and 70% and above is good.

4.2 Availability of ICT resources in secondary public schools

The study sought to establish ICT resources available for teaching and learning Geography in public secondary schools. The questionnaire was answered by the Geography teachers and form three students. Interviews were done with headteachers of sampled public secondary schools. The study variables were measured using a Likert scale ranging from Agree, Disagree (1), strongly disagree (2), Neutral (3), Agree (4), and strongly agree (5). The results are indicated in table 1.

Table 1: Availability of ICT resources for teaching and learning Geography

Statement/topic	Responses					Mean	SD
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
My school has adequate ICT resources for teaching and learning Geography	19(63.3%)	5(16.7%)	0(0%)	6(20.0%)	0(0%)	1.77	1.194
The network and internet infrastructure are good in my school	16(53.3%)	2(6.7%)	2(6.7%)	7(23.3%)	3(10.0%)	2.3	1.557
The software and other computer applications for Geography are readily Available	17(56.7%)	7(23.3%)	2(6.7%)	3(10.0%)	1(3.3%)	2	1.965
My school has a projector, Digital cameras, printer, etc., for teaching and learning Geography	16(53.3%)	6(20.0%)	1(3.3%)	7(23.3%)	0(0%)	1.97	1.245
My school has a sufficient number of interactive whiteboards	19(63.3%)	7(23.3%)	3(10.0%)	1(3.3%)	0(0%)	1.53	0.817
Structure of the earth	19(63.3%)	3(10.0%)	1(3.3%)	7(23.3%)	0(0%)	1.87	1.279
Forces that affect the earth	19(63.3%)	3(10.0%)	0(0%)	8(26.7%)	0(0%)	1.9	1.322
Soil	19(63.3%)	3(10.0%)	1(3.3%)	7(23.3%)	0(0%)	1.87	1.278
Elementary survey and map	18(60%)	4(13.3%)	0(0%)	9(30.0%)	0(0%)	2.03	1.351
Map reading and map interpretation	17(56.7%)	4(13.3%)	0(0%)	9(30.0%)	0(0%)	2.03	1.351
Photographs reading and interpretation	17(56.7%)	4(13.3%)	0(0%)	7(23.3%)	1(3.3%)	1.97	1.377
Application of statistics	18(60%)	3(10.0%)	0(0%)	7(23.3%)	1(3.3%)	1.97	1.377
Overall						1.933	1.033
Valid N	30						

Source: Survey data 2022

This study finding in Table 1 shows that 24 (80%) of the respondents disagreed that public secondary schools had adequate ICT resources for integrating teaching and learning, whereas 6(20%) said ICT resources were available in schools. Respondents strongly disagreed that secondary schools have adequate ICT resources for teaching and learning Geography (Mean = 1.770, SD =1.194). This implies that, much as the government is putting priorities on the use of ICT in teaching and learning (MoEVT, 2007), more tools should be supplied to schools. The findings concur with (Ngeze, 2017a), who noted that most schools do not have ICT infrastructure in place.

Secondly, the majority of respondents, 18(80%), disagreed that schools had good internet and network structures (Mean = 2.30, SD 1.557). These findings concur with Malekani, (2018), who reported that secondary schools in Tanzania experience low bandwidth resulting in poor internet connectivity or slow speed.

Thirdly, 24(80%) of respondents (strongly disagreed and disagreed) with the statement that the software and other computer application for Geography are readily available in schools (Mean = 2.00, SD = 1.965). These findings are in line with the study by Manyengo (2021) on Digitalization in teaching and education in the context of COVID-19, who found that lack of access to digital facilities and technology in secondary schools in Tanzania which has impacted both teachers and students.

Fourthly, 22(73.3%) of respondents disagreed with the statement that my school has projectors, digital cameras, printers and other digital tools for teaching and learning Geography (Mean = 1.97, SD = 1.245). The findings concur with the study by (Guo et al., 2020), who suggested that when using various multimedia combinations, the unique nature of social sciences can be addressed effectively yet most schools lack this equipment.

Lastly, a further inquiry through interviews on the availability of ICT resources in teaching and learning Geography by headteachers shows some of the following selected individual responses from headteachers:

“Here, we only have a few tools donated by the National microfinance bank (NMB) like one printer, one television, five working desktop computers, and one satellite dish (Interview, headmaster school B, line 12(2022-03-07)).

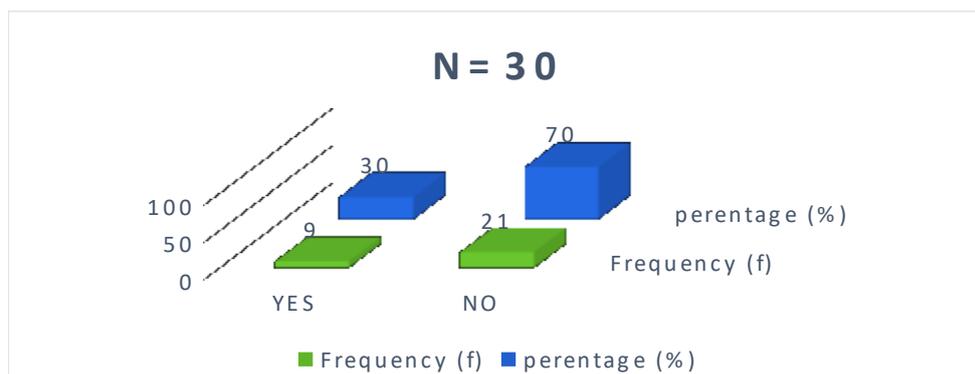
“My school has one ICT room, nineteen desktop computers, two laptops, two printers, one photocopier machine, one data projector, and one satellite dish for the internet. All these were donated by the Tanzania development trust (TDT) (Geography teacher participant school E, serial number 2.

It is shown that findings from qualitative data concurred with findings from the quantitative data that public secondary schools had insufficient ICT resources for teaching and learning Geography. The findings concur with the study by (Kayombo & Mlyakado, 2015); (Ngeze, 2017b), who found that few public secondary schools have ICT resources, and the government's efforts to give schools access to them seem to be relatively limited.

4.3 ICT preparedness level among Geography teachers in public secondary schools

The study used three research instruments to generate data. The questionnaire was answered by the Geography teachers, interviews were done with the headteachers and a class observation schedule for Geography teachers was done. The results are indicated in Figure 2.

Figure 2: ICT training for Geography teachers



Source: Survey data, 2022

Figure 2 shows that 9(30%) of the respondents indicated that they had attended ICT training, while the majority of the respondents indicated that they had no special training on the integration of ICT in teaching and learning of Geography. This implies that effective integration of ICT in teaching and learning Geography needs training. These findings were in agreement with the technology acceptance model by Fred Davis (1985), which demonstrates that individuals (Geography teachers, students) are said to be affected by external factors that include training, computer experience and quality of the system, which collectively determine the actual usage (integration) of ICT in teaching and learning. In response to an item about preparedness level to the integration of ICT in teaching and learning based on the 3-Likert scale, whereby highly prepared had a value of 1, fairly prepared had a value of 2, and not prepared had a value of 3. The mean responses of Geography teachers are presented in Table 3.

Table 3: ICT Level of preparedness among Geography teachers (N=30)

ICT area/Skills	Highly prepared	Fairly prepared	Not prepared	Mean	SD
				2.60	0.675
Use of basic computer hardware	3(10%)	6(20%)	21(70%)		
Identify appropriate technology (where, when, and how) to be used in teaching and learning Geography	1(3.30%)	8(26.70%)	21(70%)	2.67	0.547
Support learner-centered approach using ICT tools and digital content in teaching and learning Geography	3(10%)	7(23.30%)	20(66.70%)	2.57	0.679
Select and use a variety of Geography-specific ICT tools and digital resources	3(10%)	7(23.30%)	20(66.70%)	2.57	0.679
Skills to use ICT tools and digital resources to support own professional development	3(10%)	8(26.70%)	19(63.30%)	2.53	0.681
Use basic ICT technology in various Geography classes situation	5(16.70%)	6(20%)	19(63.30%)	2.47	0.776
Valid	30				

Source: Survey data, 2022

From the study findings in Table 3, 21(70%) of the respondents indicated that they are not prepared well enough to use basic computer hardware used in teaching and learning Geography. At the same time, a few respondents, 9(30), indicated that they are fairly and highly prepared for the use of basic computer hardware in teaching and learning Geography (Mean=2.60, SD=.675). This agrees with (Manyengo, 2021) who states that teachers in secondary schools are digitally literate at different levels; the challenge, however, is how to integrate digital competencies into teaching and learning. The study further demonstrated that pre-service teacher education programmes related to digital technologies are not sufficient to prepare teachers to be effective users of digital technologies in the classroom. 9(30%) of respondents indicated that they are highly and fairly prepared to identify appropriate ICT resources (Where, When, and How) to be used in teaching and learning Geography, while the majority of respondents 21(70%) indicated that they are not well prepared on the aspect. (Mean=2.67, SD=.6750).The findings agree with Malekani (2018), who noted that teachers had limited in-service training related to ICTs in teaching and learning.

A majority, 20(66.7%) of respondents, indicated that they are not well prepared to support a learner-centered approach using ICT tools and digital content in teaching and learning Geography (Mean = 2.57, SD = 0.679), while 10(33.3%) of respondents indicated that they are prepared and fairly prepared to support learner centered approach using available ICT resources. The results concur with Kihiza, et al., (2016), who noted that the majority of secondary school teachers are poorly prepared in ICT use and could fail to mix digital and non-digital technologies. The findings also concur with the Technological Acceptance Model by Davis (1989), who noted that if users (teachers) find technology useful and easy to use, then they develop a positive attitude toward using this technology. However, these findings contradict (Mazana et al., 2019), who noted that teachers and students have devices and skills and are well prepared to integrate ICT into the teaching and learning process.

20 (66.7%) of respondents agreed that they are not well prepared regarding the selection and use of a variety of Geography-specific ICT tools and digital resources (Mean = 2.57, SD = 0.679). On the other hand, it was found that 10(33.7%) respondents have the skills and abilities to select and use a variety of Geography-specific ICT tools and digital resources. The findings concur with (Kihiza et al., 2016; Manyengo, 2021), who found that some of the challenges to integrating technology for teaching and learning include: inadequate teacher training for digital skills development, lack of access to digital facilities and technology in schools and at home; and low internet and power connectivity in some schools and regions.

Direct observation in the classroom was done to get a better understanding of how well Geography teachers are prepared to integrate ICT in teaching and learning Geography. The observation schedule was based on four criteria, namely preparation (ability to set of appropriate ICT resources to be used in teaching and learning Geography), presentation (ability to use basic hardware and software (multimedia, software, office application, web browser and presentation software) for Geography lesson, lesson development (the mastery of ICT integration skills for Geography lesson), classroom Management (the flexibility of learning environment that integrate ICT for learning Geography) and lastly the effective use of Geography ICT resources like audio-visual materials etc. This study revealed that most Geography teachers in public secondary schools had limited skills to implement the integration of ICT based. This was observed in some schools with ICT resources where only a few Geography teachers fairly had the skills to do the integration using the available resources. The results concur with (Kihiza et al., 2020; Sumari et al., 2017), who noted that teachers had limited competencies in pedagogical ICTs applications in the classroom.

The researcher propped the headteachers further through an interview schedule if public secondary schools are organizing any capacity development programs concerning ICT integration in teaching and learning Geography; this is what the headteachers' had to say through excerpts;

“.... We have so far not offered any capacity-building programmes to teachers regarding using ICT in teaching and learning. In the financial year 2022/2023, the government promised that it would supply ICT resources and build a good ICT room; I think teachers, even geographers, will be trained to well to integrate ICT in their teaching”. (Interview, headmaster school A, line 4 (2022-03-07).

“.....My school sent two teachers to seminars on integrating ICT in teaching and learning, and I encouraged them to share knowledge with other teachers, including Geography teachers. This training was given by NGO, not the school. Generally, more training is needed for all teachers on ICT integration in teaching and learning”. (Interview, headmaster school B, line 12(2022-03-07).

The study findings from the above excerpt show that few public secondary schools are organizing any capacity development programs concerning ICT integration in teaching and learning Geography. In the majority of schools, no in-service training was being offered to teachers to effectively integrate ICT in teaching and learning Geography. This study's findings agree with those of researchers such as (Manyengo, 2021) and (Kihiza et al., 2016), who noted that some of the challenges to integrating technology for teaching and learning include: inadequate teacher training for digital skills development, lack of access to digital facilities and technology in schools and at home.

4.4 The frequency and use of ICT resources in teaching and learning Geography in public secondary schools

The study used three research instruments to generate data for the benefit of the objective. The questionnaire was answered by the Geography teachers. Interviews were done with the headmaster while documents on the teacher's lesson plan, scheme of work and the form three Geography syllabus of 2010 were analyzed. The teachers were to respond in terms of **Never (1), Rarely (2), Sometimes (3), Often (4)** and **All the time (5)**. The Geography teachers' results are indicated in table 3. Table 3: The extent of ICT use in Geography topics (N = 30)

Topic	Responses					Mean	SD
	Never	Rarely	Sometimes	Often	the All time		
The earth's crust, the mantle, and the core	18(60%)	7(23.3%)	3(10%)	0(0%)	2(6.7%)	1.700	1.119
Types of rocks of the earth's crust	19(63.3%)	5(16.7%)	4(13.3%)	2(6.7%)	0(0%)	1.630	1.165
Forces causing earth's movements	17(56.7%)	8(26.7%)	2(6.7%)	1(3.3%)	2(6.7%)	1.770	1.165
Elementary survey and map-making	18(60%)	8(26.7%)	2(6.7%)	2(6.7%)	0(0%)	1.600	0.814
Map reading and interpretation	18(60%)	6(20%)	6(20%)	0(0%)	0(0%)	1.600	0.814

Photograph reading and interpretation	16(53.3%)	8(26.7%)	3(10%)	3(10%)	0(0%)	1.770	1.006
Application of statistics	16(53.3%)	8(26.7%)	3(10%)	3(10%)	0(0%)	1.770	1.006
Valid	30						

Source: Survey data, 2022

Table 3 shows that 7(23.3%) of the respondents rarely used ICT, 3(10%) sometimes used it, and 2(6.7%) used ICT all the time for the topic “Structure of the earth”. The majority of the respondents, 18(60%), indicated that they never integrated ICT into the teaching and learning for the topic “Structure of the earth” (Mean = 1.700, SD = 1.119). This implies that most secondary public secondary schools do not integrate ICT into the teaching and learning “*structure of the earth*”; as a result, students are missing the benefits that ICT could offer, as noted by (Haleem et al., 2022) that when integrating ICT in teaching and learning Geography topics such as accessing digital learning resources allow access to a wide range of multimedia resources about the world in which we live and interact. These help students visualize places through pictures, animations and sounds. Further, the respondents indicated the same to other topics such as “*Types of rocks of the earth's crust*” 19(63.3%) indicated never, while 11(36.7%) rarely- (Mean = 1.63, SD = 1.165), for “*Forces causing earth movements*” 17(56.7%) of respondents never used ICT while 13(43.3%) rarely used (Mean = 1.77, SD = 1.165). 18(60%) of respondents never used while 12(40%) rarely used ICT in teaching and learning “*Elementary survey and map-making and Map reading and interpretation*” - (Mean = 1.60, SD = 0.814). 16(53.3%) of respondents never used while 14(47.3%) of respondents rarely integrated ICT in teaching and learning “*Photograph reading and application of statistics*” - (Mean = 1.770, SD = 1.006). These findings were similar to those by (M. Chirwa, 2018) in a study about access and use of ICT resources in teaching and learning in Tanzania, where the study noted that teachers infrequently used ICT in teaching and learning.

Moreover, the study sought to find out what headteachers' opinions on how frequently Geography teachers use ICT resources if available in their schools. This is what headteachers, through interview exhort, had to say;

“.... Not at all. No teacher here uses ICT in teaching and learning (Interview, headmaster school I, line 86 (2022-03-07); (Interview, headmaster school I, line 66 (2022-03-18); (Interview, headmaster school I, line 56(2022-03-15).”

“.....Here they rarely use the few available ICT resources in teaching and learning (Interview, headmaster school E, line 46 (2022-03-07).”

The finding in these exhort implies that the majority of Geography teachers in secondary schools never use ICT in teaching and learning Geography topics, while a small percent of them rarely use ICT in teaching and learning Geography content. This is supported by (Kweka & Ndibalema, 2018); who note that most secondary school teachers have minimal skills in integrating ICT into the teaching and learning process.

5.0 Conclusions and recommendations

In light of the study findings, the following conclusions were made; interaction of factors has negatively influenced and slowed the integration of Information and Communication Technologies (ICT) in the teaching and learning of Geography in public secondary schools. There was lack of appropriate ICT infrastructure; insufficient in-service training for teachers, restrictive administrative

practices such as limited budgetary allocations and lack of proper ICT policies in the public secondary schools. As a result, ICTs were rarely used in instructional activities.

Based on the empirical evidence in the study, the researcher made the following recommendations:

- i) The secondary school Geography syllabus was not clear on using ICT in instruction of Geography. The study recommended a review of the ordinary-level Geography syllabus of 2010 to reflect more activities on the use of Information and Communication Technology.
- ii) The study recommended that government provides an enabling environment for the application of ICT in public secondary schools, and teachers should avail themselves for training opportunities.
- iii) The school administrators should familiarize themselves with the national ICT policy for education. This will assist them develop a school ICT policy that would enable teachers to integrate ICTs in teaching and learning Geography in the classroom.

References

- Chirwa, M. (2018). Access and use of internet in teaching and learning at two selected teachers' colleges in Tanzania. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)* (Vol. 14, Issue 2). <http://ijedict.dec.uwi.edu>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339. <https://doi.org/10.2307/249008>
- Ghavifekr, S., Razak, A., Ghani, M., Ran, N., Meixi, Y., & Tengyue, Z. (2014). ICT Integration in Education: Incorporation for Teaching & Learning Improvement. *Malaysian Online Journal of Educational Technology*, 2(2), 24–45. <http://www.mojet.net/>
- Guo, F., Meadows, M. E., Duan, Y., & Gao, C. (2020). Geography pre-service teachers' perspectives on multimedia technology and environmental education. *Sustainability (Switzerland)*, 12(17), 1–16. <https://doi.org/10.3390/SU12176903>
- Haleem, A., Javaid, M., Asim, M., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3(May), 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Kayombo, J. J., & Mlyakado, P. B. (2015). The paradox of ICT integration in secondary education in Tanzania: Assessment of teachers' ICT knowledge and skills in Tanga and Mwanza regions. *International Journal of Research Studies in Educational Technology*, 5(1). <https://doi.org/10.5861/ijrset.2015.1299>
- Kihoza, P. D., Zlotnikova, I., Bada, J. K., & Kalegele, K. (2020). An Assessment of Teachers' Abilities to Support Blended Learning Implementation in Tanzanian Secondary Schools. *Contemporary Educational Technology*, 7(1), 60–84. <https://doi.org/10.30935/cedtech/6163>
- Kihoza, P., Zlotnikova, I., Bada, J., & Kalegele, K. (2016). Classroom ICT integration in Tanzania: Opportunities and challenges from the perspectives of TPACK and SAMR models. *International Journal of Education and Development Using Information and Communication Technology*, 12(1), 107–128. <http://ijedict.dec.uwi.edu>

- Kweka, K. H., & Ndibalema, P. (2018). Constraints Hindering Adoption of ICT in Government Secondary Schools in Tanzania: The Case of Hanang District. *International Journal of Educational Technology and Learning*, 4(2), 46–57. <https://doi.org/10.20448/2003.42.46.57>
- Luhanya, A., Bakkabulindi, F. E. K., & Muyinda, P. B. (2017). Integration of ICT in teaching and learning: a review of theories. *Makerere Journal of Higher Education*, 9(1), 21. <https://doi.org/10.4314/majohe.v9i1.2>
- Majumdar, S. (2015). Emerging Trends in ICT for Education & Training. *Director General Asia & Pacific Region IVETA*, 1–13. <https://www.semanticscholar.org/>
- Malekani, A. A. (2018). Access to, use and challenges of ICTs in secondary schools in Tanzania: A study of selected secondary schools in Morogoro Municipality. *Information Impact: Journal of Information and Knowledge Management*, 9(2), 44–57. <https://doi.org/10.4314/ijikm.v9i2.4>
- Manyengo, P. R. (2021). *Digitalization in teaching and education in the context of COVID-19: United Republic of Tanzania*. <https://www.ilo.org/>
- Mazana, M. Y., Montero, C. S., & Oyelere, S. S. (2019). Information and Communication Technology in Mathematics Education & Integration Readiness in Tanzania Higher Education Institutions. *IFIP Advances in Information and Communication Technology*, 552, 409–420. https://doi.org/10.1007/978-3-030-19115-3_34
- Ministry of Information, Communication & Technology, Kenya (2016). *Ministry of Information Communications and Technology National Information & Communications Technology (Ict) Policy*. June, 1–50. Nairobi: Government printer
- Mishra, M. & Mahapatra, B. C. (2021). *Trends in ICT Enabled Education*. India: Aradhana Brothers Kanpur. <https://www.researchgate.net/>
- Ministry Of Education and Vocational Training MoEVT (2007). *Information & Communication Technology (ICT) Policy for Basic Education: ICT for Improved Education, Dar es Salaam*. <http://www.moe.go.tz>.
- Morgan, J., & Tidmarsh, C. (2004). Reconceptualising ICT in Geography teaching. *Education, Communication & Information*, 4(1), 177–192. <https://doi.org/10.1080/1463631042000210935>
- Moyo, N. (2018). Bindura University of Science Education. *Department of Business Studies, June*, 1–62. <https://www.buse.ac.zw/>
- Ncube, N. (2018). ICT Integration in the Teaching of FET Geography in Johannesburg East. *A research report presented to the Faculty of Humanities. Education Ethics number: 2017ECE001M. February*. <https://wiredspace.wits.ac.za/>
- Ngeze, L. V. (2017a). ICT Integration in Teaching and Learning in Secondary Schools in Tanzania: Readiness and Way Forward. *International Journal of Information and Education Technology*, 7(6), 424–427. <https://doi.org/10.18178/ijiet.2017.7.6.905>
- Ngeze, L. V. (2017b). ICT Integration in Teaching and Learning in Secondary Schools in Tanzania: Readiness and Way Forward. *International Journal of Information and Education Technology*, 7(6), 424–427. <https://doi.org/10.18178/ijiet.2017.7.6.905>
- Nyakito, C., Amimo, C., & B. Allida, V. (2021). Challenges of Integrating Information and Communication Technology in Teaching among National Teachers' Colleges in Uganda. *East African Journal of Education and Social Sciences*, 2(Issue 3), 157–171. <https://doi.org/10.46606/eajess2021v02i03.0114>
- Samuel Antwi, A. K. B. (2018). *Ghana*. 6(1), 16–38.
- Selemani, M., Ndume, V. A., & Kisanga, D. H. (2021). *Integrating ICT in Tanzania Secondary Schools: Experience of Tanzania as it Grows to Second World Economy Integrating ICT in Tanzania Secondary Schools: Experience of Tanzania as it Grows to Second World Economy. December*. <https://doi.org/10.47310/iajel.2021.v02i05.010>

- Soomro, K. A., Kale, U., Curtis, R., Akcaoglu, M., & Bernstein, M. (2020). Digital divide among higher education faculty. *International Journal of Educational Technology in Higher Education*, 17(1). <https://doi.org/10.1186/s41239-020-00191-5>
- Sumari, N. S., Shao, Z., & Kira. (2017). Challenges and Opportunities for the Advancement of GIS Education in Tanzania. *Journal of Education and Practice*, 8(28). <https://www.iiste.org/>.
- Swarts, P., & Wachira, M. E. (2010). Tanzania: ICT in education situational analysis. *Global E-Schools and Communities Initiative*, July, 1–67. <https://www.gesci.org/>.
- Telore, N., Shripatrao, R., Mahavidyalaya, B., Satara, A., & Region, D. T. (2021). *ICTs in Geography*. <https://www.researchgate.net>.

Acknowledgement

The authors acknowledge the respondents that took part in the study.

Conflict of interest

The authors declare that they have no financial or personal relationship (s) that may have inappropriately influenced them in writing this article.

About the authors

Mwaluko Frank Zakaria is a secondary school teacher at Makuru Secondary School in the Manyoni District, Tanzania and a post graduate student at Moi University. He holds a Bachelor of Education in Psychology from the University of Dodoma, Tanzania. His academic interests are teacher education and technology education.

Dr. Musamas Josephine Kemboi is a senior lecturer in the School of Education, department of Curriculum, Instruction and Education Media at Moi University, Kenya. She holds a PhD and a Masters degree in Educational Communication and Technology and a Bachelor of Education (Arts) degree in Religious Education and Geography. Her academic interests are teacher education, Social Studies pedagogy and character development. She has authored several journal articles and book chapters in education.

Tarmo Albert Paulo a senior lecturer in the School of Education, department of Educational Psychology and Curriculum Studies at University of Dar es Salaam, Tanzania. He holds a PhD from University of Sussex, Master of Education in Science Education program and Bachelor of Education in Science both from The University of Dar es Salaam, Tanzania. His academic interests are science education and technology education. He has authored several journal articles and book chapters in education.