

**ADOPTION OF INFORMATION AND COMMUNICATION  
TECHNOLOGY AS A PEDAGOGICAL TOOL IN COMMUNITY  
SECONDARY SCHOOLS:  
A CASE OF SERENGETI DISTRICT IN TANZANIA**

**By**

**Mwema M. Warioba**

**A Dissertation Submitted in Partial Fulfilment of the Requirement for the Degree  
of Master of Arts in Education (MA-EDU) of Mzumbe University**

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## CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a dissertation entitled; "**Adoption of ICT as a Pedagogical Tool in Community Secondary Schools: A Case of Serengeti District in Tanzania**" in partial fulfilment of the requirements for award of Master of Arts in Education (MA-EDU) of Mzumbe University.

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## **DEDICATION**

To the most high God for his love, care and protection that have led me this far. I will praise and uplift his name always undoubtedly.

To my beloved parents Mr & Mrs Michael Mwema Machage and friends whom we suffer together in making our better tomorrow, we are one another's support. I dedicate this entire work to you trusting that my future is holding the pearl of great price.

## **LIST OF ABBREVIATION**

CD	ROM Compact Disc – Read Only Memory
CD	Compact Disc
CK	Content Knowledge
CSSs	Community Secondary Schools
DVD	Digital Video Discs
ETP	Education and Training Policy
ICT	Information and Communication Technology
MoEST	Ministry of Education, Science and Technology
MRALG	Ministry of Regional Administration and Local Government
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
SDA	Secondary Data analysis
SPSS	Statistical Product and Service Solutions
TCK	Pedagogical Content Knowledge
TPACK	Technological and Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge
UCSAF	University Communications Services Access Fund
WWW	World Wide Web

## **ABSTRACT**

Although the integration of Information and Communication Technologies (ICTs) has revealed positive changes in teaching and learning, it is still poorly practised in Tanzania. Despite various efforts to improve it, little has been done on students' and teachers' experiences of ICT adoption in community schools. This study was guided by constructivism theory and technological pedagogical content knowledge (TPCK) framework, explored students' and teachers' experiences on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district, Tanzania. This study employed a descriptive research design with 210 respondents from five community secondary schools in Serengeti district using simple random sampling and purposive sampling techniques. Questionnaires, semi structured interview, and observation checklist were used to collect data. Frequencies and percentage were computed from quantitative data through Statistical Product and Service Solutions (SPSS) version 25, while qualitative data were thematically analysed. The findings revealed that teachers have varied experiences and basic skills on ICT use, while students have inadequate experiences and basic skills on ICT use. Similarly, the findings indicated that few schools have potentials and opportunities for ICT adoption. However, lack of TPCK, ICT devices, technical support and regular power cut off, were the constraints against effective accessibility and integration of ICT in teaching and learning. Moreover, ICT use facilitate teaching and learning process, enhance students' academic performance, develop health problems such as eyestrain and improved teachers' TPCK. Conclusively, ICT use is inevitable in addressing inadequate learning resources due to students' mass enrolments. The study findings have implications to policy makers to consider both students and teachers in counterbalancing the discrepancies on the use of ICT as pedagogical tool and implementation of ICT policy for basic education of 2007.

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# **CHAPTER ONE**

## **PROBLEM SETTING**

### **1.1 Introduction**

This chapter covers background to the study, statement of the problem, purpose of the study, and the significance of the study. Others include research objectives and questions, definition of the operational key terms, scope and delimitation of the study.

### **1.2 Background of the Study**

For years now, Information and Communication Technology (ICT) has to been an important aspect in our regular life and has brought about many economic and educational transformations. ICT provides access to information, including the use of computers, telephones, and other technical devices to support and enhance information delivery across the world (Bindu, 2016). In economic and business sector, the advancement of science and technology incorporates various modern ways of processing, storing, and divulging business information to maximize production and increase competition among business partners (Karanja, 2018). The advancement of science and technology has also brought a major revolution in education. Integration of ICT in teaching and learning process has changed the way knowledge is delivered in all levels of education. For instance, the use of ICT in education is said to have developed teaching and learning practices, enhanced curriculum development, and improved educational management in most of the education institutions worldwide.

The advancement of science and technology has led to fundamental changes globally. Recently, ICT has become an important aspect in education system around the globe. It has been used to teach students suitable skills and knowledge, in the technological world. Realizing the influence of ICT on the workplace and everyday life, today's educational institutions are streamlining their educational curricula and classroom facilities, in order to blend the prevailing technology gap in teaching and learning. The new technological skills help teachers to provide specific subject knowledge that would

promote ICT education (Adegbenro, Gumbo, & Olugbara, 2019). The study conducted by Luhanya, Bakkabulindi, Muyinda and Mpoza (2017) about examining the integration of ICT in teaching and learning among educators in public teacher training colleges in Tanzania revealed that, ICT integration in education especially in universities, colleges, and organisations helps both teachers and students to interact easily and participate in teaching and learning process. The study concludes that ICT has changed the way materials are delivered in classroom and the way teachers teach.

Different studies have been conducted in many African countries on how ICT is perceived and implemented especially in economics and education. ICT is positively perceived because of its importance in Eco business growth and education advancement. It is clear that, in education sector, students and teachers' interaction with other education stakeholders in the world helps them to acquire new skills and knowledge from large arrays of resources (Zlotnikova, Bada & Kategele, 2016). How ICT is used in teaching and learning today has raised concern in Africa. The study conducted by Ifinedo, Rikala and Hamalainen (2020) in Nigeria about factors influencing technology integration among Nigerian educators considering characteristics, knowledge constructs, ICT practices, and beliefs reveals that ICT is used as a tool of identifying various applications used in teaching different subjects' contents in the classrooms. Similarly, Mwunda' (2014) study in Kenya revealed that, ICT integration in teaching uses various ICT pedagogical support systems to enable curriculum change and enable learners to fit in a changing environment.

It is well known that in order to meet the Tanzania Developmental Vision (TDV) of 2025, education has a vital role to play. TDV of 2025 is the national development vision, which considers a nation being endowed with five features: stability, peace and unity, good governance, quality livelihood, a well-educated and learned society as well as strong and competitive economy. The vision of 2025 recognises the role of education as a strategic change agent of the national economy. The vision explicitly included ICT as a new opportunity opened up to attain the goals and targets of the vision (URT, 2003). The Ministry of Education, Science, Technology and Vocational Training (MESTVT)

identifies the potential of ICT as a tool for enlightening education provision and address most of the educational and developmental challenges in Tanzania.

Subsequently, the National ICT policy of 2003 recognises the importance of ICT in education. In its implementation, the policy was used to guide the provision of ICT curriculum in secondary schools (Kafyulilo & Keegwe, 2013; Machumu, Anathe & Almasi, 2018; URT, 2003). Currently, the 2007 ICT policy for basic education allows the integration of ICT in secondary schools where it has changed the teaching and learning processes (URT, 2007). ICT integration in education has brought about remarkable education changes, especially in private secondary schools that have better ICT infrastructure compared to community secondary schools.

Regarding ICT as pedagogical tool, in a study by Ngeze (2017), the finding shows that ICT has successfully facilitated the shift from the teacher-centred to student-centred learning approach where learners participate in the learning process and teachers remain as facilitators. Teachers guide and provide instructions, which enable students to learn interactively. ICT as a pedagogical tool is defined as a tool that enables teachers and students to access information in solving educational challenges in teaching and learning. Similarly, Ndongfack (2015) argues that the role of ICT is to enhance and support content delivery and pedagogical knowledge of the teacher for effective practices in the classroom. That is to say, using ICT as a pedagogical tool means that learners and teachers are actively involved in constructing knowledge and skills using the available ICT devices (Machumu, Anathe & Almasi, 2018).

Recently, the adoption of ICT as a pedagogical approach has intensified in the education sphere in teaching and learning. Various studies have widely discussed teachers' perceptions, competence, problems, and expertise on ICTs use. Tedla (2012) and Hennessey, Harrison and Wamakote (2010) are among the scholars who believe that the successful use of ICT as a pedagogical approach largely depends on teacher's capability, attitudes, and readiness of using ICT in education. However, the questions of what basic skills should both teachers and students possess in order to adopt ICT effectively as a

pedagogical tool, enabling factors for ICT use, constraints that demise ICT use and its impacts on pedagogical processes are still extensively uncovered especially in rural peripheral secondary schools.

### **1.3 Statement of the Problem**

Introduction and integration of ICT in secondary education in Tanzania has shown encouraging results such as a shift from teacher centred to students centred approaches, simplification of teaching and learning activities, easy accessibility of teaching and learning resources, promotion of collaborative teaching and learning activities, and facilitation of knowledge delivery (Machumu, Anathe & Almasi, 2018; Ndongfack, 2015). The Government of Tanzania has made efforts on enhancing integration of ICT in teaching and learning through development agendas and the introduction of National ICT policy in 2003 and ICT policy for basic education in 2007.

Despite impetus development of ICT in education its use as pedagogical tool is practically limited in Tanzania secondary schools especially in community secondary schools. The problem is tense in most rural peripheral schools which are hardly equipped with ICT facilities. In enhancing effective adoption of ICT as a pedagogical tool, teachers and students are important players in ICT use in teaching and learning. However, teachers are not encouraging students' participation; hence, this trend increases the digital divide between teachers and students. The question of students and teachers experiences on ICT use if not systematically addressed, the disparity along digital divide between these two players would increase and hence compromise effectiveness of ICT as a pedagogical tool. There are various studies (i.e. Bindu (2016), Machumu *et.al*, 2018; Ndibalema, 2014; Ngeze, 2017) that mainly addressed ICT focusing on exploring teachers' conceptions, perceptions, attitudes and skills, and readiness on ICT use as a pedagogical tool in the classroom context hardly focusing on students' experience. Similarly, little is known about teachers and students' experiences on the use of ICT as a pedagogical tool in community secondary schools in Tanzania.

Therefore, this descriptive study sought to bridge the knowledge gap through exploring teachers and students' experience on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district. The study would be beneficial to educational leaders and stakeholders such as students, teachers, policy makers, and educational planners in taking initiatives required for the introduction and adoption of ICT as a pedagogical tool in secondary schools in Tanzania. The study has multiplier effects on enforcing the practicability of ICT policy for basic education for both students and teachers.

## **1.4 Objectives of the Study**

### **1.4.1 Main Objective**

The study explores students' and teachers' experience on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti District, Tanzania.

### **1.4.2 Specific Objectives**

- i. To determine students and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti District.
- ii. To explore possibilities and constraints of adopting ICT as a pedagogical tool among teachers and students in community secondary schools in Serengeti District.
- iii. To determine the impacts of ICT adoption on pedagogical processes in community secondary schools in Serengeti District.

## **1.5 Research Questions**

- i. What are the basic ICT skills that teachers and students should have in order to adopt ICT as a pedagogical tool in community secondary schools in Serengeti district?
- ii. What are the possibilities and constraints of adopting ICT as a pedagogical tool among teachers and students in community secondary school in Serengeti District?

- iii. What are the impacts of ICT adoption on pedagogical processes in community secondary school in Serengeti District?

### **1.6 Significance of the Study**

The findings of the study would contribute useful information to the body of knowledge about different basic skills that teachers and students need to possess when using ICT as a pedagogical tool. The study would also increase awareness among teachers and students about the significance of integrating ICT in education for their smooth teaching and learning performance.

Moreover, the study would be beneficial, as it would provide useful information on challenging areas of ICT adoption. This would guide educational officers and ICT experts to design training on career development programmes for teachers for effective adoption of ICT. Through this endeavour, the study will be beneficial in building the knowledge base of both teachers and students on ICT adoption to facilitate teaching and learning. The knowledge would serve as a guide of overcoming constraints both teachers and students face when using ICT.

Furthermore, the findings are significant to educational key players including policymakers, educational planners, curriculum developers, and decision-makers on better ways of launching ICT policy for basic education in participatory approach. The findings are expected to address the confusion caused by the nexus between ICT 2003 and 2007 policies regarding the Educational Act number 5 of 1978 on ICT gadget possession, rules, and regulations for secondary schools' students. Thus, the study would suggest suitable policy guidelines to the government towards improving integration of ICT in our education system.

### **1.7 Scope and Delimitation of the Study**

The study focused on finding out the rate of available ICT devices, skills, possibilities, constrains, and the influence of ICT as a pedagogical tool. The current study was conducted in Serengeti district, Tanzania. The study included teachers and students from

five community secondary schools whose teachers are dedicated to ICT use in teaching and learning processes within Serengeti district. The sample of 210 respondents was involved in survey questionnaires and interviews. The study was limited to time framework in which the data were collected for two weeks. Data collected saturated the need for this study as they provided robust insights about teachers' and students' experience on the use ICT as pedagogical tool; thus, the research objectives were met. Indeed, the study did not cover the actual classroom implementation that could define the teacher's real skills toward using ICT in teaching and learning rather experience on use. Furthermore, the study did not cover all schools and teachers in Serengeti district as the selected sample helped the researcher to reach the expected outcomes. However, the findings in large area in the country should be done in acute and sharp research eye.

## **1.8 Definition of Key Terms**

### **Information Communication Technology (ICT)**

The term information communication technology refers to the use of new technologies such as computers, telephone lines and audio-visuals to enable users to access, store and convey information (Bahrini & Qaffas, 2019). For this study, ICT covers a wide range of various communication and technological devices, including computer, cellular phones, bandwidth, network, World Wide Web (www), projector, radio, television, and the associated applications such as audio recording, video conferencing, emailing and online distance learning (URT, 2016). Regarding ICT policy context, ICT is used differently to support teaching and learning processes as well as other related educational activities.

### **Pedagogy**

Giroux (2020) defines pedagogy as the identified teaching methods, styles, practices, theory, feedback, and assessment in teaching. Pedagogy of teaching involves how teachers plan for a lesson and deliver the content of the curriculum to learners in an effective way. Additionally, pedagogy is used to shape teachers' actions, understanding and different teaching strategies in consideration of students' background, needs, and interest.

### **Pedagogical Approach**

The pedagogical approach in this study refers to the proper choice and use of teaching and learning tools, selecting an appropriate theory that guides learning activities, and determining suitable methodology of interlinking subject content knowledge, technological skills and pedagogical knowledge in enhancing teaching and learning in the classroom. The pedagogical approach helps teachers and students to interact and collaborate effectively in teaching and learning processes (Cassim, 2010).

### **Technological Knowledge (TK)**

Müller, Kudic, and Vermeulen (2020) define technological knowledge as knowledge, skills, and understanding of various digital technologies such as computers, internet, overhead projectors, interactive whiteboards, and computer software programs. In education context, technological knowledge express ICT literacy used to enhance efficient use of technological tools in teaching and learning and other administrative purposes.

### **Technological Pedagogical Knowledge**

Technological Pedagogical Knowledge (TPK) is defined as the knowledge and skills of how various technological tools can be used in selecting appropriate theory and method in teaching a particular content and change how materials are delivered in classroom (Machumu et al., 2018). Teachers are guided by the selected technologies and theory to choose properly the best teaching style to enhance teaching and learning activities.

### **Technological Content Knowledge**

Technological content knowledge (TCK) refers to the knowledge of how various technologies can be used to construct and understand the subject content. As the mutual relationship between technology and content, TCK suggest that teachers must be well informed on subject content and change how learners practise and understand concepts in specific content areas (Koehler et al., 2008; Machumu et al., 2018).

## **Technological Pedagogical Content Knowledge**

Koehler and Mishra (2006) define Technological Pedagogical Content Knowledge (TPACK) as the knowledge needed by teachers to integrate technology effectively in teaching any content area. TPACK comprise three knowledge types namely Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK). TPACK emphasize that teaching of content should be symmetrical to pedagogical methods and technology.

### **1.9 Organization of the Study**

The study was organized into six chapters. Chapter one is concerned with the problem, which informed the study and its context. This chapter focuses on the background and statement of the problem, the purpose of the study, research questions, and significance of the study, scope. Others include delimitation of the study, definition of the operational key terms together with the organisation of the study. Chapter two presents theoretical and empirical review of literature relevant to the study, knowledge gap, and identification of the conceptual framework. Chapter three focuses on the methodology of the study and ethical considerations. Chapter four presents the findings reflecting the objectives of the study. Chapter five discusses the obtained findings in accordance to the study objectives. Lastly, chapter six focuses on the study summary, conclusion, policy implications, recommendations, and areas for further studies.

### **1.10 Chapter Conclusion**

This chapter presented introduction and background of the study and then addressed the problem to be researched. The chapter revealed the aim of the study which is to explore students and teachers' experience on adoption of ICT as a pedagogical tool in community secondary schools followed by study objectives and questions on basic ICT skills, possibilities and constraints and the effects of ICT on pedagogical processes. Significance of the study to various stakeholders, scope and delimitation of the study, definitions of key terms used in the entire study together with the organisation of the study have been presented.

### **Community Secondary Schools**

According to Machumu (2011), community secondary schools (CSSs) are public and parent-oriented school established to lessen the cost of education. In this study, CSSs means all ward schools that were established by the community mobilisation in Tanzania particularly in 2007 to extend secondary schools to make it accessible many local community children. They are famously known as shule za kata in Tanzania.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews relevant literature on the adoption of information communication technology as a pedagogical tool in secondary schools. The aim of the review was to gain insight from different scholars who had conducted studies on similar aspects. The chapter is sub-divided into sub-headings: Theoretical framework, empirical literature review, synthesis of the reviewed literature and conceptual framework. The chapter concludes with chapter summary.

#### **2.2 Theoretical Review**

This section focuses on the conceptualization of the concept of ICT and theoretical framework of the study.

##### **2.2.1 The Concept of Information Communication Technology**

ICT refers to the technological form of which electrically creates, processes, stores, displays, transmits and share information globally (Gupta & Gupta, 2014). The technological aspect of ICT broadly includes televisions, Digital Video Discs (DVDs), Compact Discs (CDs), radio, telephones (mobile and landlines), satellite system, hardware and software networks, computers and emails (Avidov-Ungar & Iluz, 2014). It covers media and broadcasting, online libraries and various documentations, network-based information services and online digital platforms. As Bindu (2016) emphasises, ICT integration in education enables the smooth and effective provision of education in schools, colleges, and universities. Gibson et al. (2014) observe further that, ICT is an electronic means by which information is collected, processed, stored, and disseminated from one person, part, or section to the other.

Understanding ICT and mastering of basic skills and concepts of ICT are regarded as the core components of education. The application of ICT should be valued in education and in the work areas (Dogan, 2010). According to the United Nations (1999) report ICT

encompasses telecommunication (its equipment and services), internet services, the media and broadcasting services, libraries and documentation centres, business and commercial information providers, network services and supplementary associated information and communication activities. In the education provision, emails, videotapes, audio tapes and recorders, projectors, telephones, video and audio teleconferencing, computers, and Compact Disc -Read-Only Memory (CD ROMs) are broadly used.

### **2.2.2 Theoretical Framework**

This study adopted constructivism theory by Bruner (1961) and Technological Pedagogical Content Knowledge (TPACK) model by Mishra and Koehler (2006).

#### **Constructivism Theory**

Constructivism is the learning approach based on the premise that learning is active and a social construction. Constructivist conception is historically grounded in Dewey (1929), Bruner (1961), Vygotsky (1962), and Piaget (1980) works who believe that learners are actively involved in the construction and acquisition of new knowledge from their experience and prior-knowledge (Bada, 2015). Constructivist maintains that, individuals create new knowledge from their experience, prior knowledge and their interaction with the environment (Vygotsky, 1978). In this regard, learners are the central part in learning operations and active participants in creating their knowledge and meaning in their learning environment. In constructivist principles knowledge is constructed, learning is an active process, knowledge exists in the mind, and increases learner's ability to invent and discover new knowledge, skills and understanding (Omari, 2011). Interactive and collaborative learning, problem-solving learning, and student-centred learning approaches focus on learner's prior knowledge and all these define constructivism learning context where learners grow logically and conceptually (Zlotnikova et al., 2016).

In teaching and learning, constructivism reinforces student centred teaching methods and techniques where students become active participants in their own learning. Similarly, teachers are primarily treated as facilitators of learning activities in a classroom context (Bada, 2015). Constructivists guide learners to interact effectively with their companions as well as learning materials using modern technologies (i.e., projectors, radio, television, and white electronic boards). This enables effective interaction and assists learners to use their skills to acquire knowledge in the learning contexts (Schank, 2012). Vygotsky (1978) reveal that learners construct knowledge based on interaction with their social, cultural, and technological environment. The constructivist pedagogical approach focuses on the student-centred approach, critical thinking and problem-solving, learning, group learning and online web learning as the ways of learning (Amineh & Asl, 2015). In this regard, the use of ICT tools in learning enables both teachers and students to utilize effectively the said ways of learning.

Constructivism theory was found relevance in this study due to its nature of its focus on individual needs, collaboration, problem solving, and active sharing. Constructivist approach was applied because it involves structuring learning experiences and allows active involvement of learners in the learning practices. ICT as a pedagogical tool is grounded on teacher and students' interaction in learning, problem-based learning and student-focused approaches. These approaches are integrated into instruction and learning (Machumu & Chung, 2018). Kihzoza (2016) and premised on the assumption that when constructivist principles are employed in the instruction and learning process, new ways of teaching with computers would bring a change from instructor-centred to learner-focused approach. In the constructivist approach, prior knowledge and skills of teachers and students are well explored when adopting ICT as a pedagogical approach. ICT enables students to internalize their insights, and allow them to construct their meanings based on the available feedback.

The use of ICT in classroom is premised on the assumptions that, teachers play a role of facilitator and students are actively participants in a classroom. In constructivist classroom, student try to find the solution of the learning tasks by learning in a group

where they are assigned to do their learning tasks themselves and find solutions. Teacher's role is just to facilitate the student (Paudel, 2015). This encourages more teachers to use technology in order to enjoy these abundant benefits, which are the bases of the current study.

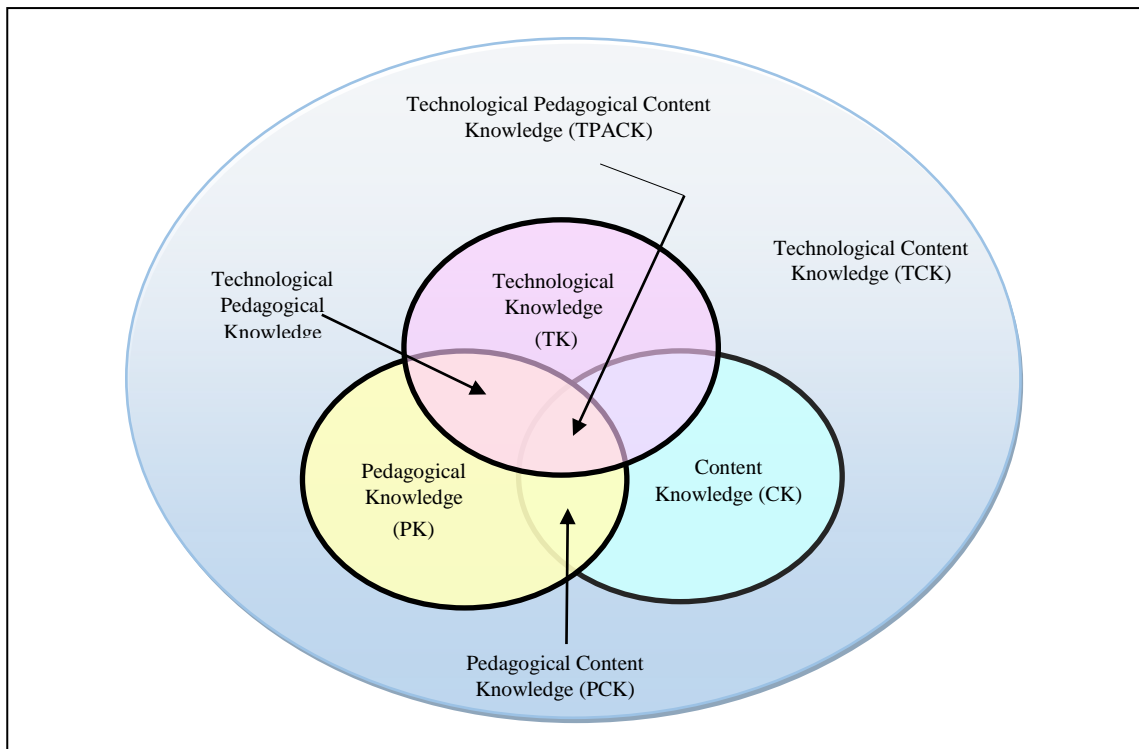
As emphasised by Agyei and Voogt (2010), constructive integration and the use of ICT in teaching and learning transformed theoretical learning in the classroom to practical learning where critical thinking, group exercises, and efficient collaboration among students and teachers are enhanced. The interview, which was carried out after closed questionnaire, granted more freedom to both teachers and students. Such freedom-generated insights about the nature and the kinds of ICT skills which were needed to enhance its adoption in teaching and learning. Therefore, data collected were actual, contextual, and natural from the respondents' perspectives.

The analysis of the findings considered the opinions, views, perceptions, and attitudes of both teachers and students. It was found worthwhile to interpret the findings in the respondents' perspective. Data were presented in quotations to reveal the fresh voice of the respondents. Under such circumstances, the teachers and students' experiences were highly considered; hence, authentication of the findings was highly maintained. In this respect, it was considered advantageous to adopt the constructivists' views as the best way of addressing the quest of teachers and students' experience in the use of ICT as a pedagogical tool in secondary school.

### **Technological Pedagogical Content Knowledge (TPACK) Model**

The study also adopted Technological Pedagogical Content Knowledge (TPACK) model by Mishra and Koehler (2006). As a theoretical model, TPCK was introduced primarily to examine and explore teachers' knowledge, which is needed for effective adoption of technology in teaching. The model shows the interplay between all three important components of knowledge: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK), which are needed by teachers during the adoption of ICT as a pedagogical tool (Koehler & Mishra, 2008). Content Knowledge (CK) is the

knowledge of the subject topics, concepts, and facts taught in the class. CK examine how teachers are well informed in the subject content area; Pedagogical Knowledge (PK) refers to the ability and skills demonstrated by teachers in selecting appropriate theory and teaching methods for subject delivery in the classroom. Technological Knowledge (TK) refers to the skills, knowledge, and the ability on the use of technology in the classroom instruction. TK is the knowledge of ICT tools such as multimedia, interactive whiteboards and other technologies such as internet, digital audio and videos as well as installation of various computer peripheral and software programs (Ozudogru & Ozudogru, 2019; Rueda, 2020).



**Figure 2.1: Technological Pedagogical Content Knowledge (TPACK) Model**

Source: Adopted from Koehler et al., 2008; Machumu et al., 2018; Mishra & Koehler, 2006

TPACK model in Figure 2.1 shows other components as the results of the blended knowledge, that is, Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Pedagogical Content Knowledge (PCK). TCK refers to the knowledge of how various ICT tools can be used to enhance the delivery of

specific subject content to students. The integration of technology into content helps teachers to choose the most suitable technologies, which can change the way students understand and perceive the concepts of a particular content. On the other hand, PCK is the interlink between content and pedagogy that means the knowledge of how teachers understand better methods and teaching practices which are compatible with the particular subject content. Therefore, it is the knowledge of what is used to deliver subject content. Lastly, TPK is the knowledge required by teachers to understand how ICT tools can be integrated in teaching activities and change the modality, methods, and style of teaching. In this respect, TPK advocates for the use various technologies such as computers, videos, audio tapes, internet, overhead projectors, and interactive whiteboards to enhance teaching. This is in view of the fact that the use of technology may lead to a change of teaching modality, style and presentation of material in a classroom (Kartal & Cinar, 2018; Kihoza, Zlotnikova, Bada & Kalegele, 2016; Machumu et al., 2018; Rueda, 2020).

The TPACK model by Mishra and Koehler (2006) was found relevant and was included in this study due to its role on the adoption of ICT as a pedagogical tool in CSSs. The TPACK model examined important components, which are needed for pedagogical use of ICT. In the adoption of ICT as a pedagogical tool, teachers are required to possess adequate pedagogical skills such as understanding various methods and teaching practices, subject content mastery, and the ability to select carefully appropriate technical tools for teaching (Machumu et al., 2018). This study focused on ICT skills, which are needed by both teachers and students to adopt ICT effectively as a pedagogical tool. The skills such as TK, PK, and CK are clearly shown in the TPACK model. The study sought to find out further the possibilities for ICT use and constraints against the adoption of ICT as a pedagogical tool in community secondary schools and its impact in pedagogical processes. As Kartal and Cinar (2018) observe, TPACK model is used to analyse the impacts of ICT tools and applications in teaching and learning activities. Understanding different knowledge and skills would enable the smooth adoption of ICT as a pedagogical tool. The TPACK model was used to assess various

ICT tools and digital application and to identify the impacts of ICT adoption in teaching activities.

Whereas Machumu et al., (2018) and Rueda (2020) acknowledge Mishra and Koehlers' TPACK model because its adoption on ICT use as a pedagogical tool enhances mastery of subject content and understanding of the concepts, knowing pedagogical approaches in relation to technological devices available in the context of teaching and learning. Therefore, the TPACK model would guide teachers and students to share their experiences on the adoption of ICT as a pedagogical tool. It is from these premises that, the study sought to determine students and teachers' skills on the adoption of ICT as a pedagogical tool, explore possibilities and constraints and determine the impacts of ICT adoption on pedagogical processes in community secondary schools.

### **2.3 Empirical Literature Review**

This section presents the reviewed literature based on adoption of ICT as a pedagogical tool focusing on the key study objectives namely; basic ICT skills and pedagogical knowledge, possibilities and constraints for ICT adoption and impacts of ICT adoption on pedagogical processes.

#### **2.3.1 Basic ICT Skills and Pedagogical Knowledge**

Innovation and advancement of technology has influenced our lives in many ways. In education, teachers and students often perform their tasks manually. The use of digital technology such as computers, mobile phones, projectors, and multimedia help both teachers and students to accomplish their tasks easily and efficiently. It is obvious that in order to effectively adopt ICT as a tool for teaching and learning, teachers require adequate technological knowledge and skills (Kihoza, 2016; Machumu et al., 2018). Much research has been on teachers' ability, but little is known on both teachers' and students' basic knowledge of integrating ICT skills in the classroom interaction. This study was influenced by this knowledge gap.

Ndibalema (2014) conducted a study on teachers' attitudes towards the use of information and communication technology as a pedagogical tool in secondary schools in Tanzania, it was revealed that, teachers have positive attitudes towards the use of ICT as a pedagogical tool but they have inadequate skills to integrate it effectively in education. Nevertheless, Kihoza (2016) found that teachers failed to integrate ICT as pedagogical tool due to the existing internal and external limitation including accessibility to devices and skills. These study findings imply that, although teachers are enthusiastic in using ICT in teaching and learning, their efforts are hampered by inadequacy of ICTs skills. However, Kafyulilo, Fisser, Pieters, and Voogt (2015) adopted Technological and Pedagogical Content Knowledge (TPCK) as a framework for describing the knowledge and skills that pre-service teachers need to develop in order to integrate effectively technology in science and mathematics teaching. Through collaboration design, the study recommended that teachers' readiness to integrate ICTs in teaching and learning process should be symmetrical with pre-service teachers' preparation in teaching colleges. Thus, the current study focused on gaining in-depth understanding on the kind of ICTs skills required by teachers and students for effective adoption of ICT in teaching and learning process.

Mwunda (2014) found that the use of ICT in Machakos Sub-county secondary in Kenya is still low. Similarly, Mwangi and Khatete (2017) revealed that, teachers' competence, attitudes, and motivation have some influence on their ICTs use in education. They maintain that competence among teachers, ICTs infrastructure, and technical support were not the determinants rather, lack of appropriate skills in TPCK was a factor. These factors have motivated teachers to use computer for searching teaching materials while embarking on their tradition teacher centred approach. Elsewhere, While Ngeze (2017) revealed that 77.0 percent of teachers possess either laptop computers or smart phones as an indicator of the implementation of ICT in basic education in Tanzania. The question of interest here, is to what extent teachers are able to integrate their devices regarding TPACK? Therefore, the current study seeks to explore the ability of teachers of integrating technological skills in their classrooms.

According to Machumu et al. (2018), ICT as a teaching and learning tool encompasses teachers' ability in using technology in teaching and in professional development. In the 21<sup>st</sup> Century, ICT has changed the way teaching and learning process occurs in schools. As observed by Kafyulilo et al. (2015), the use of ICT, as a pedagogical tool has changed the way the curriculum is delivered. As a pedagogical tool, ICT has facilitated the shift from a teacher-centred approach where teachers were the only sources of knowledge to learners' centred approach where learning is a construction of knowledge among students with the minimal assistance of a teacher who remains as the facilitator. Mwangi and Khatete (2017) observe further that, teachers should possess ICT skills and knowledge of what, why, and how to teach a particular subject content. In this respect, both teachers and students should possess basic ICT literacy such as how to use Microsoft word, PowerPoint, how to save and store files, how to social network s, how to send emails, browse the internet, present using gadgets, digital camera, and ICT devices for multimedia presentation. The current study explores such basic ICT skills in helping teachers and students integrate these technologies to make classrooms more active and participatory.

### **2.3.2 Possibilities for ICT Adoption as a Pedagogical Tool**

Effective use of ICT in education require favourite environment with clear potentials that would determine significant factors for its adoption (Simin & Sani, 2015). Recently, few studies focused on identifying various factors that determine the use of ICT in education. The outlined factors if well established, maintained, and managed would create favourable environment for the use of technology in classroom teaching and learning activities in secondary schools.

#### **Accessibility and Availability of ICT Devices**

Bindu (2017) identified accessibility of ICT gadgets such as computers, projectors, and software resources as factors of effective adoption of ICT in schools. The availability of ICT gadgets and software at school, provides teachers and students with the opportunity of accessing the devices easily and take them in their teaching and learning activities. It is further argued that teachers are enthusiastic in supporting ICT integration in teaching

and learning as long as the gadgets are available at school (Tairo, 2017). Similarly, Ndongfack (2015) insisted that availability of computers at school creates supportive environment for teachers to access various teaching materials. The situation is worse in community secondary schools in Tanzania where there is uneven distribution of such ICT gadgets, keeping in mind that, the current curricular emphasises on the use of technologies in classrooms. However, there are few ICT devices available; the question of inquiry is to what extent teachers are eager to adopt ICT as a pedagogical tool.

### **Positive Attitude Towards ICT Use in Education**

Attitude towards ICT use is another strong element, which bears on the adoption of ICT in education. Different studies have demonstrated the ability of positive attitude towards technology use in teaching and learning. A study conducted by Ghavifekr, Kunjappan, Ramasamy, and Anthony (2016) in teaching and learning with ICT tools: issues and challenges from teachers' perceptions revealed that, positive attitude towards the use of technology in education have a significant influence on ICT use among teachers. Positive attitude on the use of technology in education encourages teachers with limited technological abilities to learn supplementary basic skills, which are needed for effective adoption of ICT as a pedagogical tool in teaching and learning activities (Prasojo, Mukminin, Habibi, Hendra & Iqroni, 2019). Furthermore, as Naidu and Laxman (2019) observe, teachers' positive attitude towards ICT use is influenced by teachers' experiences with ICT devices. Thus, if teachers want to use technology successfully and effectively in their classes, they ought to have positive attitude on deployment of technology in teaching activities. It should be noticed that, positive attitude has intrinsic motivation towards accomplishment of targeted goals. Thus, if teachers and students have positive attitude towards the modern technologies, they are likely to respond willingly and comfortably to the technological usage regardless with the limited resources and facilities invested on ICT in secondary schools.

### **Availability of Trained and Qualified Personnel**

It is clear that, though many teachers in schools lack ICT trainings, few of them possess sound skills and knowledge of technology use (Adegbenro, Gumbo & Olugbara, 2019).

The study conducted by Prasojo, et al. (2019) on building quality education through integrating ICT in schools: teachers' attitudes, perception, and barriers reveal that, teachers overwhelmingly expressed the demand for ICT trainings. The study indicated further that the demand for trainings was not limited for teachers who teach ICT studies only rather to all teachers who are interested in the use of ICT in teaching and learning. On the other hand, Naidu and Laxman (2019) established that, shortage of qualified ICT personnel in community secondary schools does not affect students' learning only but also it discourages the adoption of ICT as a pedagogical tool in classrooms. The experience in Tanzanian community secondary schools shows that most teachers get basic ICT training during their teaching courses in colleges for the fulfilment of coursework requirement for passing examinations. Therefore, the in-service capacity-building workshop, trainings and seminar should include large population of teachers rather than favouring few teachers.

### **ICT Competence**

A study carried out by Simin and Sani (2015) on the effectiveness of ICT integration recommended that in order to provide quality education to students and improve their academic performance in secondary schools, teachers should be well equipped with ICT competencies and positive beliefs. According to Ndongfack (2015) in most of the schools, teachers demonstrate the ability of using ICT in an integrated learning environment. Similarly, Bordbar (2010) observed that, competence is one of the major indicators of ICT integration in teaching and learning process. Therefore, teachers' competence on ICT makes teachers develop confidence in its integration in teaching and learning process. However, most teachers are incompetent in ICT use. It is high time now that educational leaders prepared teachers who are competent in the subject to be able to integrate content knowledge and ICT in classrooms.

### **Availability of Technical Support**

Scholars (e.g. Mahdum, Hadriana & Safriyanti, 2019; Ndimbalema, 2014) are of the view that, lack of technical support in schools cause technical problems; poor ICT infrastructure cause regular technical breakdowns. It is clear that ICT infrastructures

breakdown causes technical interruptions. Therefore, absence of technical support for repairing and maintenance would result to students and teachers' failure in integrating ICT in teaching and learning (Marelo, Ismail & Manyilizu, 2015). Similarly, Talip and Tiop (2020) conducted a study on the effect of educational organizational commitment as a moderator towards principal technology leadership in curriculum management and teachers' self-efficacy. the finding reveals that, the presence of technical support in schools encourage both teachers to use ICT gadgets confidently in teaching, management, and curriculum evaluation without the fear of destruction. Generally, many secondary schools lack technical support, as technical personnel are few as well. As a result, teachers and students are unable to integrate technologies in their classroom interaction because when breakdowns and software failure occur, they cannot fix them. In this regard, the current study considered the influence of the presence of technical support for fitting, installation, and maintenance of ICT gadgets.

### **Presence of Electricity Power Supply**

Chambers (2019) conducted a study on barriers affecting teacher integration of technology in classrooms; the findings revealed that electricity was the determinant of ICT adoption in education. Similarly, the findings from Mwunda (2014) and Ngeze (2017) revealed that power is the major factor for smooth adoption of ICT in Kenyan's sub counts and Tanzanian's districts which have no access to national grid electricity. The findings imply that, in order to promote ICTs in secondary schools, the number of associated factors should be considered. Investment on infrastructure, facilities, resources, and personnel should be considered. However, currently the government is striving to supply the electricity in rural areas; some areas are still outreached, something that increases the digital divide among students and teachers in urban centres and rural peripheral.

### **2.3.3 Constraints Against Adoption of ICT as a Pedagogical Tool**

The introduction and integration of ICT in teaching and learning encounter various constraints. Numerous studies have identified a range of factors constraining teachers and students against using technology in learning in developing countries, Tanzania in

particular. However, the following constraints are identified in this study; inadequate ICT knowledge and skills, lack of supportive ICT infrastructure and resources, lack of technical support, teachers' attitude towards technology use in learning, lack of access to ICT, and lack of professional development.

### **Inadequate ICT Knowledge and Skills**

Effective integration of technology in education requires one to possess adequate knowledge and technical skills. Successful educational innovations depend mostly on the knowledge and skills teachers and students possess. Belay, Khatete and Mugo (2020) in their study on teachers' skills for ICT integration in teaching and learning Biology in secondary schools reveals that, though they have attended computer training, teachers have insufficient ICT skill. Similarly, Naidu and Laxman (2019) cited lack of ICT skills as the inhibitor of teachers' use of ICT in teaching. It was further revealed that limited knowledge and skills impede the application of ICT in teaching in developing countries (Muyengabe, Yiyi, Hiyan & Hitimana, 2017). The current study intended to explore the constraints that face both teachers and students regarding ICT basic skills and knowledge.

### **Lack of ICT Supported Infrastructure and Resources.**

According to Tairo (2017), teachers' positive attitude towards ICT use in education is hampered by lack of suitable ICT infrastructure in secondary schools. Likely, lack of well-established computer laboratories in schools deters innovative attitudes among teachers and students (Prasojo et al., 2019). Teachers and students fail to adopt ICT in teaching and learning because most of the schools lack well-constructed ICT infrastructures, software resources, and the presence of outdated hardware resources (Ifinedo, Rikala & Hämäläinen, 2020). Muyengabe et al. (2017) reveal further that inadequate budget and language problems, for example, online content and software are in English language that limits effective integration of ICT in education. In Tanzania, for instance, most of the ICT studies are carried out regardless of the target of the government, as by 2015 ICT was to become a subject in secondary schools. There was a small move in providing ICT devices and creating conducive infrastructure in secondary

schools. The operational use of ICT in teaching and learning process requires the accessibility of ICT gadgets and their proper maintenance. Hence, the need for well-equipped ICT infrastructure is inevitable.

### **Lack of Access to ICT**

Lack of accessibility to ICT has been identified by various scholars as the main blockade that hinders both teachers and students from using technology in education. Sedoyeka and Gafufen (2016) cited absence of computers; alternative sources of energy and internet connectivity as denying teachers' access to ICT in schools. On the other hand, Ghavifekr et al. (2016) and Mustapha, Mohammed, Egigogo, Kutiriko, and Dokoro (2020) observe that limited accessibility is a significant challenge that limits teachers from using ICT tools in teaching. Different schools in Tanzania are furnished with ICT packages; and the investment is based on devices while disregard other factors such as network, expertise, and ICT skills and knowledge. The victims of the situation are the rural peripheral schools where even network accessibility is a problem.

### **Lack of Technical Support**

Technical issues such as internet connectivity, peripheral gadgets connection, and printers' services, require trained technical personnel. Studies show that lack of technical support in schools is among the major constraints that hinder both students and teachers from using ICT in teaching and learning (Ghavifekr et al. 2016; Tairo 2017). Most of the teachers fail to connect different gadgets such as computers and projectors for lesson presentation and fail to troubleshoot network failure problems. Similarly, Chambers (2019) revealed that technical barriers such as network failure, and the failure of fixing software updates and gadgets such as printer jams as deficiencies that accelerate the lag behind the adoption of ICT in secondary schools. It is believed that when you lack technical skills in a specific career there is likelihood of developing anxiety, phobia, and stress that limit the acquisition of new technologies in the teaching and learning process.

### **Lack of Effective Training**

Effective use of ICT as a pedagogical tool requires effective training among teachers and students. A study by Ghavifekr and Rosdy (2015) on teaching and learning with technology: effectiveness of ICT integration in schools reveal that many teachers lack knowledge on how to integrate technology in teaching. Similarly, Belay et al. (2020) reveal that secondary schools' teachers lack in-service training for the implementation of new technology in teaching science subjects. As Manyama (2017) argues, though teachers agree that ICT knowledge makes them more creative in their careers, lack of training on how to integrate technology in education and in Teacher Professional Development (TPD) is a hindrance.

Teachers have basics knowledge on ICT use from teaching colleges; however, they need in-service technical pieces of training to integrate new technology properly in teaching. Training would enhance teachers' positive attitude towards technology use, skills, knowledge, and awareness, as they are kept updated on their profession (Karanja, 2018). The in-service training provided in Tanzania is limited to only few teachers and clusters. They do not consider the practical impacts of promoting TPD, as there is no critical follow-up. The current study also aimed to give insight regarding the School-Based Professional Development (SB-PD) that would be the remedial to centralised model, which is constrained with time framework, budget allocation. Furthermore, recent studies focused on training to teachers only, leaving the question of students unanswered. Lack of training on pedagogical skills and new digital literacy are the obstacles in using new technology in teaching and learning.

### **Students' and Teachers' Attitude towards ICT Use**

Successful integration of ICT in teaching and learning depends strongly on students and teachers' attitudes towards the use of technology in education. In this respect, scholars (e.g. Adegbenro & Olugbara, 2019; Chambers, 2019) observe that teachers are important players whose beliefs, attitudes, and perceptions towards technological usage influence effective integration of ICT in teaching and learning in the classroom. Moreover, a study by Almasi, Machumu, and Zhu (2017) on the Internet use among secondary schools'

students and its effects on their learning reveal that students have a negative attitude towards ICT use as most of them use the internet for social interactions, watching movies, and listening to music.

Similarly, Marelo et al. (2015) carried a comparative study on the ICT usage and readiness for private and public secondary schools in Dodoma- Tanzania. The study findings revealed that readiness and usage of ICT in private schools in Dodoma Municipality are better compared to public secondary schools. Public school teachers had negative attitudes towards ICT use in teaching and learning. The findings imply that the adoption of ICT as a pedagogical tool does not rely only on furnished infrastructure, resources, and facilities but also on teachers and students' interest, positive mind and attitudes.

#### **2.3.4 Impacts of ICT Adoption on Pedagogical Processes**

In education, ICT is a vibrant tool used to improve instruction and learning processes. Different studies have focused on the impacts of ICT in the pedagogical process in different perspectives. Hereunder are some of the outlined effects.

##### **ICT Improves Subject Content and Pedagogical Knowledge**

The pedagogical purpose of ICT has helped teachers to improve their subject contents and the pedagogic knowledge from former traditional delivery to more transformational approaches (Manyama, 2017). Similarly, Kihoza (2016) and Ngeze (2017) revealed that ICT had enhanced the implementation of learner-centred approach. The teacher's role has changed from that of the instructor to that of a coach. The availability of materials on a particular subject and good delivery methods are possible through ICTs. Therefore, teachers have improved their teaching strategies while students have materials in their fingerprints (Ngeze, 2017). Moreover, improvement of teachers' pedagogical content knowledge through digital devices has a significant impact on students' academic performances.

### **Facilitates Teaching and Learning Processes**

The adoption of ICT has significantly changed teaching and learning processes. For a long time, textbooks and lecture method have been used to enhance learning in the classroom (Angadi, 2014; Bindu, 2016). Currently, technology plays a significant role in making education inclusive as ICT has enabled a change in learning approach from teacher-centred to student-centred approach. Similarly, Ghavifekr and Rosdy (2015) observed further that, ICT integration assists teachers in substituting traditional teaching methods with a technology-based teaching and learning where teachers guide students to develop their own knowledge and understanding. Furthermore, the use of ICT in education has made easy availability of teaching and learning materials, enhanced collaboration and sharing of materials which in turn reduces teachers and students burdens over scarce materials in schools (Ghavifekr & Rosdy, 2015). The use of various ICT devices such as computers, multimedia, projectors, and other digital applications has assisted learners to actively think, share, and express their knowledge in learning.

### **Enhancement of Participatory and Collaborative Learning**

As Ndongfack (2015) observes, ICT use in pedagogy increased teachers' ability to diversify activities in the classroom, enabling students in project-based learning and involves classroom follow-up. The pedagogical role of ICT gave enough room for both teachers and students to interact actively and collaboratively in learning processes compared to a traditional teaching method. As Machumu et al., (2018) assert, technological and pedagogical content knowledge (TPCK) framework enables teachers to generate ideas using ICT tools and enable students to participate in learning. Technical innovation in teaching and learning have changed teachers cantered approach and gave more opportunity to learners who participate in finding out new subject content knowledge collaboratively and achieve the goals of a certain given task (Ghavifekr & Rosdy, 2015). Therefore, ICT is a trusted used resource that grants maximum freedom and opportunity to students in participating in a learning task in effective and collaborative ways. Today, various ICT software applications such as E-class, Google Classroom, Team Viewer and other online services such as email and Google Services,

are used as a platform for augment collaborative learning practices in and outside the classroom context.

### **ICT Facilitates Academic Performance**

Researchers have shown that ICT is a vital tool in teaching and learning and has brought positive impacts on students' academic performance. Study conducted by Bindu (2016) revealed that, the role of technology in learning has improved students' performance and enhanced students-teachers interaction. As indicated by Simin and Sani (2015), teachers should be well prepared in terms of ICT competencies to enable students acquire technical skills that would improve their academic performance. As reported by scholars (e.g. Holzmann, Schwarz, & Audretsch, 2020; & Machumu et al., 2018), among the effects associated with internet use among secondary school students are wastage of time, delay on schoolwork submission, poor academic results and school dodging. The findings imply that, if not well managed ICT use might result to negative impacts to learners. Forthrightly, the ICT has positive impact in teaching and learning when is meaningfully used.

### **2.4 Synthesis and Research Gap in the Reviewed Literature**

The introduction of ICT policy for basic education in 2007 aimed at launching ICT studies in secondary by 2015 throughout the nation. The rationale behind was to ensure that the Tanzania society is not left behind in modern technologies. The policy therefore focused on introducing and integrating ICT as a pedagogical tool in teaching and learning activities. Teachers and students are identified as important ICT stakeholders in teaching and learning processes. The reviewed studies focused on ICT basic skills, possibilities, constraints and impacts of ICT on pedagogical processes. The reviewed literature revealed that, the investment of ICT as a subject and as a pedagogical tool is still limited to few schools in urban centres. The rural peripheral schools are marginalised and ignored on the use of ICT. Under such circumstances, the study aimed at bridging the knowledge gap that exists in rural schools residing in the centres.

Most studies focused on exploring ICT skills, perceptions, challenges and their impact on education by referring to teachers only. The studies did not pay attention to students who are the important players in teaching and learning processes. Similarly, Cassim (2010) focused on the teacher's pedagogical use of ICT in teaching and learning mathematics in urban school and found that, ICT enabled only teachers to access computer systems to improve their skills, communicate, and interact with other teaching colleagues globally. Machumu et al. (2018) revealed further that, ICT has a vital role in helping the country to reach its vision and mission; the study emphasised on teachers' TPCK. Both Cassim (2010) and Machumu et al. (2018) did not establish students' role in ICT integration including the required basic skills, constraints, and the impacts of ICT on pedagogical process. This also constitutes the knowledge gap in the current study.

The 2007 ICT policy on basic education stipulates that both teachers and students are significant stakeholders in ICT integration in teaching and learning. However, there is a mismatch between the policy guidelines and Education Act 25 of 1978, which prohibits students from possessing ICT gadgets such as mobile phones and computers. Such discrepancies also motivated the current study.

Thus, the current study aims at complementing the gaps in other studies that have been reviewed by exploring students and teachers' experience on the adoption of ICT as a pedagogical tool in community secondary schools in Tanzania. The study intended to determine students' and teachers' basic ICT skills, possibilities, and constraints on the adoption of ICT as a pedagogical tool among teachers and students and the impacts of ICT adoption on pedagogical processes.

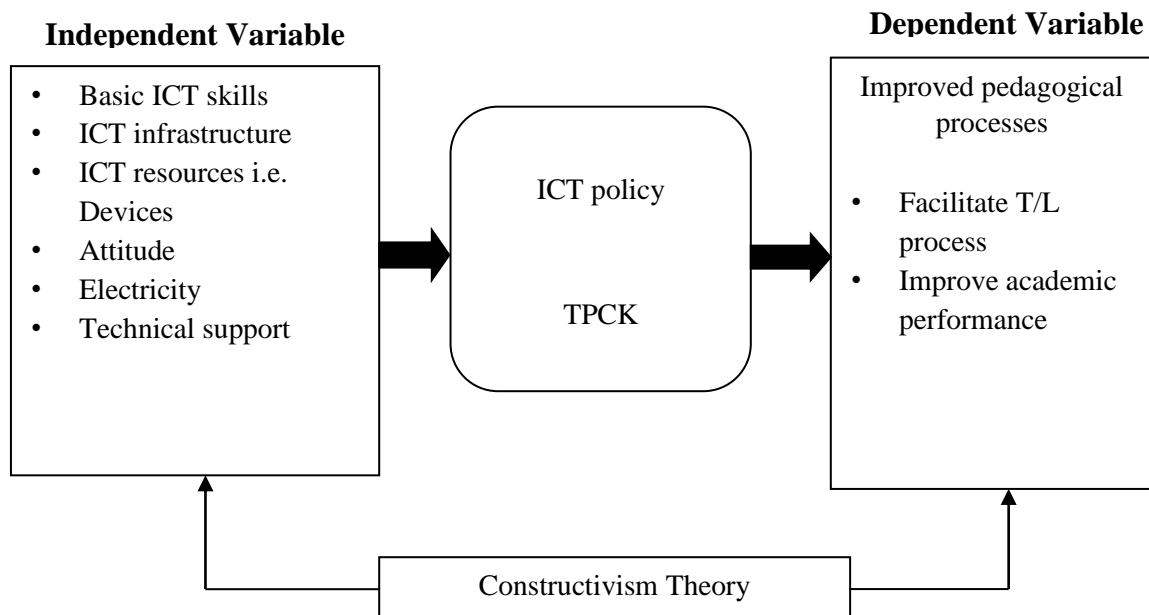
## **2.5 Conceptual Framework**

The adoption of ICT as pedagogical tool in Tanzania is constrained by various factors. The barriers identified included inadequate skills, limited infrastructure, and inadequate resources including devices, negative attitudes, unreliable electricity, and inadequate technical support. These barriers are associated with low government's response to allocate enough fiscal resources in ICT due to budget deficit. Therefore, students and

teachers hardly developed interest due to such barriers. The identified barriers were also regarded as enabling factors. if alleviated they can enhance a smooth adoption of ICT in teaching and learning; thus, these were referred to as independent variable in the current study.

The adoption of ICT as revealed in the reviewed literature depends not only on the available ICT policy guidelines rather than on the appropriate TPCK that teachers' need in order to select appropriate devices, content, and methods for knowledge deliverance. At this point, the appropriate use of TPCK and ICT policy for basic education would have positive impacts on the use of ICT in pedagogical processes. Hence, these were regarded as control variables. This is because, clarity of the ICT policy would help teachers, and students to choose appropriate TPCK along the requirement of constructivism theory that guided the inquiry. Constructivism helped the gathering of information from the natural setting through multiple methods. In this respect, these control variables were kept constant due to the study being carried out in the same geographical location; hence, the findings were not affected.

Meanwhile the control variable helped the inquiry to establish the effects of independent variable and dependent (outcome) variables. The collected data along the natural setting provided a wide insight about the sorting of basic ICT skills and other enabling factors for the adoption of ICT as a pedagogical tool. Positive impacts of ICT adoption on pedagogical process were regarded as outcome variables. These included facilitation of teaching and learning process and improvement of students' academic performance. The conceptual framework is diagrammatically presented in figure 2.2.



**Figure 2.2: Conceptual Framework**

Source: Researcher’s own construction (2020)

## 2.6 Chapter Conclusion

In this chapter, theoretical and empirical knowledge of various concepts have been reviewed from different literature. Aspects such as the concept of ICT, basic ICT skills, and pedagogical knowledge have been revealed from various readings. Also, literatures show that lack of adequate knowledge and accomplishments, lack of ICT supported infrastructure and resources, lack of access to ICT, lack of expert support, lack of effective trainings, lack of time, inadequacy of ICT infrastructure and students’ and teachers’ attitudes towards ICT use are the barriers that impede students and teachers against effectively adoption of ICT in teaching.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter presents the research approach, design, area of the study, target population, sample size, and sampling techniques. It also identifies methods of data collection and tools, reliability and validity issues, data processing and analysis plan as well as how ethical issues.

#### **3.2 Research Approach**

The study used mixed-methods research approach to explore students' and teachers' experience on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti District, Tanzania. Creswell and Creswell (2017) explain that, mixed methods research involves both collecting and analyzing quantitative and qualitative data. Quantitative data includes closed-ended information such as that found on attitude, behavior, or performance instruments. In contrast, qualitative data consists of open-ended information that the researcher gathers through interviews with participants. The general, open-ended questions asked during these interviews allow the participants to supply answers in their own words. However, Creswell added that, the combination of quantitative and qualitative approaches provides a better understanding of research problem. On top of that, mixed methods research provides strengths that offset the weaknesses of both quantitative and qualitative research (Creswell, 2014)

#### **3.3 Research Design**

Research design is a plan on how a study will be carried out. It is a structured outline which guide different strategies of inquiry, which decides what to consider, where to meditate, how to study and what tools to be used in order to answer the study questions and to attain the predetermined objectives of the study (Creswell & Creswell, 2017; Singleton & Straits, 2016). The current study employed descriptive survey design where qualitative and quantitative data were gathered. The descriptive survey design provides a complimentary opportunity for the respondents to share their opinions,

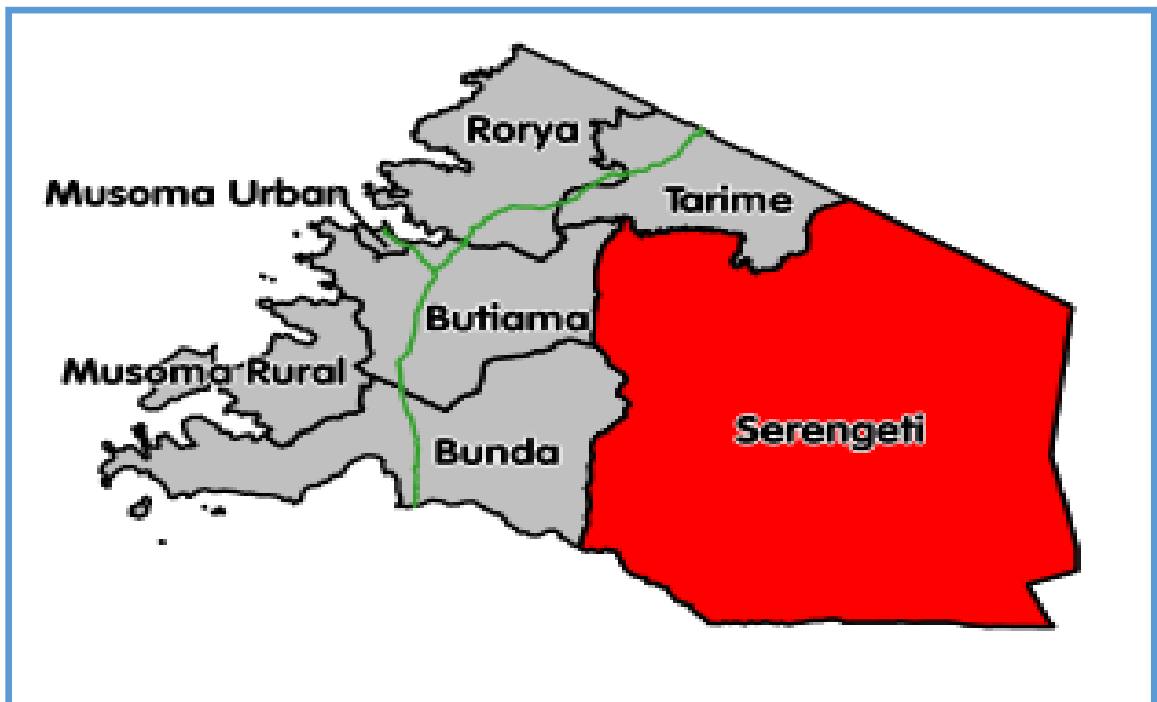
attitudes, perceptions, and experiences of certain issues (Singleton & Straits, 2016). The descriptive design was employed in order to explore comprehensive and precise data on ICT adoption through questionnaires and interview.

Moreover, the descriptive design was chosen because of its trustworthiness in providing detailed information about perceptions, opinions, attitudes, and experiences of teachers and students towards application of ICT in teaching and learning. Likewise, the design offers the opportunity of combining both qualitative and quantitative data and assessing the opinions and tendencies from the specified set of people in order to extrapolate the population sample results in triangulated manner (Theodore, 2020). Similarly, the ability of descriptive survey design to administer questionnaires to a large sample of the population, gives extra credit for its usage.

### **3.4 Area of the Study**

The study was conducted to five (5) among thirty-one (31) community secondary schools in Serengeti District in Mara region (DSEO's office data, 2019). Serengeti District is one among the seven districts in Mara region in Tanzania. However, the district is located in rural peripheral, two schools: Kisangura and Ngoreme secondary teach ICT as a subject and three schools, that is, Natta, Serengeti, and Nagusi secondary use ICT for teaching and administration roles. Meanwhile, through literature review, there were limited studies, which were conducted on ICT in teaching and learning in the study area. This reason motivated this study to be set in Serengeti District. Similarly, the district has relatively reasonable number of teachers who have attended various ICT training and workshops rendered by Universal Communications Service Access Fund (UCSAF) under Tanzania Ministry of Regional Administration and Local Government (MRALG) (DSEO's Office data, 2019). The district has the Serengeti National Park, Grumet Reserves and other tourist companies who in fact have engineered for the facilitation of those training, seminars, and workshop for teachers and donated some ICT gadgets to some schools. It was assumed that, teachers and students have gained some experience and interest in the ICT use as pedagogical tools in the study area. Such commitments from both the government and private partnership motivated this study in

on examining teachers and students lived experience in ICT use. The findings would significant to both parties: government and private partnership on the ICT use in secondary schools in Serengeti District. Reasons such as familiarity and participants' willingness and working experience of the researcher provided addition reasons for the selection of the location. It was therefore, assumed that, regardless of the efforts undertaken for integrating ICT, the adoption and use of ICT as pedagogical tool is still a bit challenging in secondary schools, Serengeti district has no exception. Therefore, the insights, experience, and perceptions were contingent to teachers who are ICT literate in selected five secondary schools.



**Figure 3.1: The Map of Serengeti District**

Source: Google Map (2019)

### **3.5 Target Population**

Creswell (2014) considers the term target population as people or units that have criterion to be the study group whose representative sample is engaged in thorough investigation. The target population in this study included teachers and students from

five community secondary schools as stakeholders in the use ICT as a pedagogical tool in teaching and learning processes. One hundred eighty (180) students and thirty (30) from five schools with access to ICT in Serengeti District were targeted because; it was assumed that they had some experience in the use of ICT as pedagogical tool as opposed to other schools in the study area. This population was targeted purposively basing on the robust data, hence, they had richness of information to the research problem and study objectives.

### 3.6 Sample Size and Sampling Techniques

#### 3.6.1 Sample Size

The study recruited 210 respondents as follows: One hundred eighty (180) students 101 females and 79 males thirty (30) teachers 19 females and 11 males. The respondents were drawn from five schools. The sample size is summarised and presented in Table 3.1.

**Table 3.1 : Categories of Respondents in Community Secondary Schools (N=210)**

School	Teachers	Students	Grand Total
Community school 1 (Cs1)	6	36	42
Community school 2 (Cs2)	6	36	42
Community school 3 (Cs3)	6	36	42
Community school 4 (Cs4)	6	36	42
Community school 5 (Cs5)	6	36	42
<b>Sub Total</b>	<b>30</b>	<b>180</b>	<b>210</b>

Source: Field data (2020)

#### 3.6.2 Sampling Technique

This study employed mainly two sampling techniques; purposive sampling simple and random sampling procedures.

### **Purposive Sampling**

Schools and five (05) teachers among 30 were convenient-purposely selected and results would be used for generalisation from which the schools and teachers were selected. The school was selected based on its geographical proximity and accessibility due to the scattered nature of the Serengeti District. Five teachers were selected from five schools that use ICT in teaching. However, the two schools have computer rooms as laboratory in which it was assumed that, the teachers and students use ICT as pedagogy. Five (05) teachers one from each school who were selected attended different workshops and training offered by UCSAF and MRALG. Thus, the readiness, unique and reach information of value to the study influenced the use of the techniques for saturated sample. Moreover, purposive sampling technique was applied to distinguish and select the respondents who are experts in their field of interest, and those who are willing to participate and share their experience and sentiments on the design of the study (Elikan, Musa & Alkassim, 2016). Thus, teachers with ICT basic skills and those who attended different ICT workshops in the regional, district, and national level in the district were purposefully selected.

### **Simple Random Sampling**

Simple random sampling was used to select 180 students. Simple random sampling was employed bearing in mind that, it was difficult to include all students in the selected schools. In this study, 36 students were selected from each five school. Lottery method was used to get the required sample. This was done through numbering each student in the class and writing numbers on separate pieces of papers and folded. The folded papers were tossed in the box. Lastly, students were given the opportunity of selecting a number by chance from the box by choosing folded pieces of papers randomly. The students were informed of the numbers that were to be selected (for example 3, 5, 7, 9 etc were selected). However, the method was time consuming and expensive, it was inevitable due to large population of students in the selected schools. Furthermore, the technique was used in order to enable each student to have a chance of being included in providing opinions and perceptions on the adoption of ICT as a pedagogical tool in secondary schools. Similarly, twenty-five (25) teachers were selected using simple

random sampling. The inclusion of teachers was essential to this study in order to achieve objectives that require their information about skills, experiences, and perceptions towards the adoption of ICT as a pedagogical tool in community based secondary schools.

### **3.7 Data Collection Methods**

Data collection methods in the current study included questionnaires and interview

#### **3.7.1 Questionnaires**

Questionnaires are the research instruments using questions to gather both quantitative and qualitative data of the study from the respondents. Questionnaires are Simple, flexible, and fast tools that the researcher would use in organizing questions and receiving responses without necessarily talking to the respondents (Theodore, 2020). Questionnaires are used to gather information from a large sample of respondents easily and rapidly (Maxwell, 2012). However, the instrument is limited with respondents' voices and risk of reduced returned questionnaire; this study used relatively large sample 150 students and 40 teachers. The technique helped to ensure that required sample is reached while triangulation helped to offset its weakness by employing interview from selected sample who responded interview for verification. Both open and closed-ended questions were used to explore students' and teachers' experience on the use of ICT as a pedagogical approach.

#### **3.7.2 Interview**

The interview offers a direct face to face conversation between the researcher and the interviewee to elicit facts (Creswell & Creswell, 2017). Semi-structured interview was conducted to gather information from teachers and students. The interview guide was used to collect detail information about ICT as a pedagogical tool in secondary schools. The method was suitable to this study because it contextualises data in real practice in the field (Boyce & Neale, 2006). Five teachers were purposely selected for an interview to provide their opinions, experiences, and perception regarding the basic skills, possibilities, constraints, and impact of ICT integration in the classroom. The collected

information assisted the researcher to paint the real picture of what is happening between the theory and practices toward ICT as a pedagogical tool. Similarly, five students were randomly selected to provide their experiences on ICT use in their learning process. Thus, the method helped the researcher to triangulate the data. Thus, method enabled the researcher to modify, explain, and clarify ambiguous and difficult terms or questions in order to collect in depth information.

### **3.8 Validity and Reliability of the Research Instruments**

#### **Validity**

The validity of an instrument involves the extent to which the research instrument measures what it is expected to measure. Validity helps the researcher to find out whether the instruments utilized in the research are appropriate, accurate, reliable, and useful for the study (Ary, Jacobs, & Sorensen, 2010). To test the validity of the instruments in this study, the data collection instruments were reviewed by researcher's colleagues and sent to the researcher's supervisor to examine whether the instruments measures the study objectives. Similarly, the researcher carried out a pilot study in one community secondary school in Serengeti District for testing the questionnaires and interview guidelines before the main study was undertaken with duration of one week with a cross section of respondents. It should be noted that the respondents used in the piloting stage were excluded from the main research to avoid influencing the results due to the prior experience of interview questions. The purpose of pilot study was to test the interview questions and make any necessary improvements (Maxwel, 2013). Thus, peer reviews or appraisal and pilot study were conducted to check for the appropriateness and accuracy of the tools before the actual data collection process as a means of ensuring validity of research instruments.

#### **Reliability**

Reliability refers to the consistency of the finding that an instrument will give after been repeatedly used in the investigation of the study (Fraenkel, Wallen, & Hyun, 2012). Multiple methods such as, interviews, questionnaires and observation were used to collect other aspects under the study and phenomenon as a means of triangulation for

ensuring more credibility rather than relying on a single method. This criterion helped to offset one's method strengths and limitation for gaining in depth information about different aspects of the phenomenon under study (Maxwell, 2012).

Indeed, transparency and consent added the quality of the study findings. The researcher clarified the objectives of the study to the participants; methods were used to obtain data and allowed participants to use Kiswahili language to convey their opinions. As well, the recorded field notes and transcripts were referred to provide the reader an assessment of the findings of this study. The researcher kept data that were collected, interpreted, and analysed. Furthermore, the researcher cross-checked and confirmed the findings from the respondents.

### **3.9 Data Analysis Plan**

After exploration, information, which was gathered through various methods were synced and coordinated according to objectives and coded accordingly on paper. Through Statistical Product and Service Solutions (SPSS) version 25, the descriptive data from questionnaires and observation checklist were analysed through frequency and percentage and presented in tabular forms. The qualitative data from the interviews were analysed using content analysis technique using quotations and inference within the context of the research as per researcher interpretation in respect to categories, themes, concepts, and relationship of words in relation to the context of the study.

### **3.10 Ethical Considerations**

Ethical issues are the significant aspects in research, which should be considered by researchers. In academic arena and research actions, the respondents' rights to privacy, physical and mental security are worth to be taken during the cognitive operation of carrying out a research (Bliss, 2016). In consideration of the importance of being ethical, the researcher therefore adhered to the following: Prior to the field for data collection; initially the researcher will submit a proposal as essential for the researcher to seek for research clearance letter from the Directorate of Postgraduate Studies of the Mzumbe University. The clearance letter helped a researcher to be introduced to other authorities

such as Mara Regional Administrative Secretary (RAS). The letter helped the researcher to be introduced to Serengeti District Executive Director (DED). Then, through DED, District Secondary Education Officer (DSEO) granted research permission letter to specific heads of schools where the study was conducted. The researcher gained participants' consent by explaining to them the objectives of the study and the possible risk of the study. Further, the researcher adhered to ethics by maintaining participants' anonymity, confidentiality and privacy. Indeed, the researcher ensured the participants that the information given is for research purposes and will be kept confidential (Flick, 2013; Fouka & Mantzorou, 2011). The respondents' consent was important for the researcher; therefore, seeking for respondents' consent helped to create good rapport during data collection.

Equally, the researcher kept secret by not identifying the ethnic or cultural background of respondents, used of anonymous name as the means of unrevealing any other sensitive information while reports the findings in proper citation.

### **3.11 Chapter Conclusion**

In this chapter, descriptive survey has been adopted and the reasons for its use were provided. With the supporting motives, Serengeti District was selected as the study area. The chapter identified different measures used for choosing sample size. Questionnaires, interview guide, and observational checklist were used as the official instruments in data collection. Additionally, validity and reliability of the research instruments were discussed in this chapter. Data analysis plan and ethical considerations of the study are also presented in this chapter.

## CHAPTER FOUR

### PRESENTATION OF FINDINGS

#### 4.1 Introduction

This chapter presents the findings of the study with respect to the study objectives. The purpose of this study was to explore students and teachers' experience on the adoption of ICT as a pedagogical tool in the community secondary schools specifically in Serengeti District, Tanzania. Categorically, the study findings were presented in three major parts in this chapter. The parts include demographic characteristics of the respondents, availability, and skills of ICT use as well as possibilities, constraints and impacts of ICT use in pedagogical processes.

#### 4.2 Demographic Characteristics of the Respondents

In Chapter Three, it was stated that the unit of analysis for this study is community secondary schools whereby data were collected from teachers and students who are directly involved in using ICT as a pedagogical tool in teaching and learning processes. The demographic characteristics of the respondents were crucial as they have some influence on ICT adoption in teaching and learning activities. However, the features were not used for statistical analysis in relation to the study variables. The respondents' characteristics involved gender and working experience. The findings in this part are presented in table 4.1 in three categories; teachers, students, and working experience.

**Table 4. 1: Demographic Characteristics of Respondents**

Category	Sub-Category	Frequency	Percent (%)
Teachers' Sex	Male	19	63.3
	Female	11	36.7
	<b>Total 1</b>	<b>30</b>	<b>100</b>
Students' Sex	Male	79	43.9
	Female	101	56.1
	<b>Total 2</b>	<b>180</b>	<b>100</b>
Working Experience	1-3 Years	3	10
	4-7 Years	13	43.3
	8 Years and above	14	46.7
<b>Grand Total</b>		<b>210</b>	<b>100</b>

Source: Field Data (2020)

#### **4.2.1 Demographic Characteristics of Teachers**

Demographic characteristics of teachers focused on two sub-categories namely sex of the respondents and working experience.

##### **Sex of the Respondents**

Sex of the teachers was considered important by the researcher because it presented different perceptions and experience on ICT use in teaching and learning activities. The findings in table 4.1 show that thirty (30) respondents were involved in this study. 19 (63.3%) were males while 11 (36.7%) were females. This implies that the majority of the respondents were males.

##### **Working Experience of the Respondents**

Table 4.1 indicates that 14 (46.7%) out of 30 respondents had 8 years and above of working experience, followed by 13 (43.3%) who had 4-7 years of working experience, and 3 (10%) the respondents had 1-3 years of working experience. The study findings establish that majority (90.0%) of the respondents who participated in this study had 4-8 years and above of the working experience. Henceforth, they were perceived as well informed on the use of ICT in teaching and learning and thus they could provide adequate information.

#### **4.2.2 Demographic Characteristics of Students**

Demographic characteristics of students focused on the sex of the respondents only.

##### **Sex of the Respondents**

The researcher considered sex of the respondents as important in t this current study since their opinion and experiences varied between males and females. Their differing information had an impact on this study. Therefore, the respondents were asked to indicate that their sex. The findings in table 4.1 show that 180 of the respondents' 101 were females, 79 were males who comprised 56.1% and 43.9% respectively. The findings showed that majority of the students participated in this study were females. It

could be established that the data provided had balanced ideas on ICT adoption as a pedagogical tool in community secondary schools in Serengeti.

### 4.3 Availability of ICT Devices

The presence of ICT devices such as computers, interactive whiteboards, overhead projectors, internet, and other digital devices create a favourite environment for ICT use in schools. The observational checklist and questionnaires were used to gather data from respondents to determine if ICT devices were available in all the five schools. The findings on the availability of ICT devices are presented in two categories, which are students' responses and teachers' response. In this respect, both teachers and students were asked to fill the questionnaires.

#### Students' Responses

With the aid of observational checklist, researcher asked respondents to identify the ICT device, which were available in their schools by ticking against the items provided in the questionnaires. The findings are presented in table 4.2

**Table 4. 2: Availability of ICT Devices (N=180)**

<b>School Code</b>	<b>Desktop Computer</b>	<b>Laptop Computer</b>	<b>Smartphone</b>	<b>TV</b>	<b>LCD Projector</b>	<b>Radio</b>	<b>Internet Services</b>	<b>Total</b>
Cs1	6	10	5	6	4	3	2	36
Cs2	9	6	7	4	1	5	4	36
Cs3	13	6	5	3	2	3	4	36
Cs4	12	7	6	2	2	4	3	36
Cs5	11	8	4	3	5	1	4	36
<b>Frequency</b>	<b>51</b>	<b>37</b>	<b>27</b>	<b>18</b>	<b>14</b>	<b>16</b>	<b>17</b>	<b>180</b>
<b>Percentage</b>	<b>28.3</b>	<b>20.6</b>	<b>15</b>	<b>10</b>	<b>7.8</b>	<b>8.9</b>	<b>9.4</b>	<b>100</b>

Source: Field data (2020)

Key: Cs1-Community school one, Cs2-Community school two, Cs3- Community school three, Cs4- Community school four, Cs5- Community school five

The findings in table 4.2 shows the availability of ICT devices in all five community secondary schools whereby out of 180 respondents, 51 (28.3%) respondents cited desktop computers, 37 (20.6%) cited laptops, 27 (15%) cited smart phones, and 18

(10%) cited televisions as the available devices in their schools. Moreover, 14 (7.8%) respondents cited LCD projector, 16 (8.5%) cited radio and 17 (9.4%) cited internet service as the available facilities in their schools. The findings indicated unequal availability and insufficiency of ICT devices in community secondary schools. Desktop computers and laptop computers were at least identified by 28.3 and 20.6 percent of the respondents respectively. It indicates that desktops and laptop computers were available in community schools as opposed to other devices such as smart phones, television, LCD projector, radios, and internet services, which each were reported by few respondents.

Similarly, the interview results from three among five students in all schools revealed similar results as shown in table 4.2 that there were inadequate ICT devices in community secondary schools. The first student at Cs1 revealed;

*There is computer laboratory at our school. However, very few devices are in there. You will find only six desktops, which cannot sustain all students. In addition, laptops and smart phones belong to individual teachers. Therefore, there is no students' access to ICT devices at school. Teachers are only who can use them (Student 1 at Cs1, 21<sup>st</sup> January, 2020)*

Another student at Cs4 said that;

*The school has very few computers and there is no internet service. Teachers use internet from their phones to access different materials and to share various information. But the laptops and smart phones belong to individual teachers and we are prohibited to use them (Student 2, 24<sup>th</sup> January 2020)*

Similarly, other students reported availability of scarce ICT devices in their schools.

Student 3 revealed;

*At our school, we do not have enough ICT devices. You can only find few desktops in computer room and in the headmaster's office. Few teachers have their laptops and mobile phones. We are not encouraged to use them rather we are warned not to damage the computer when we get into computer room (Student 3 at Cs2, 23<sup>rd</sup> January 2020)*

The students' responses imply that, there are few ICT devices available at community secondary schools in Serengeti district. Similarly, devices such as smart phones and laptops belong to individual teachers not to the school as a whole. In addition, students

have no access to ICT devices neither are they allowed to possess or bring ICT gadgets to school.

### Teachers' Responses

The researcher also asked the respondents to identify the ICT device which were widely available in their school and the results are as presented in table 4.3

**Table 4.3: Availability of Available ICT Devices**

<b>Category</b>	<b>Frequency</b>	<b>Percent</b>
Laptop Computer	9	30
Desktop Computer	7	23.3
LCD Projector	3	10
Smartphone	5	16.7
iPad/Tablet	2	6.7
Radio	2	6.7
Television	1	3.3
DSP Player	1	3.3
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.3 indicate the availability of ICT devices. Out of 30 respondents, 9 (30%) respondents cited laptop computers, 7 (23.3%) cited desktop computers, and 5 (16.7%) cited smart phones as the available devices in their schools. About 3 (10%) respondents cited LCD projector, 2 (6.7%) cited iPad/Tablets and radios as and 3.3% respondents cited television and DSP Players as available devices in their community secondary schools. The findings indicate that there were inadequate ICT devices available at community secondary schools. Only desktops, laptops, and smartphones were identified by 30, 23.3, and 16.7 percent of the respondents out of 30 (100%) total respondents.

Consistently, the findings from the interview between the researcher and 5 teachers who were interested in ICT use in teaching and those who attended various seminars and ICT workshop revealed similar findings that ICT devices were insufficient and not supportive in teaching and learning. when asked about the availability of ICT devices in

his school one teacher replied, “*One cannot understand why government officials keep on insisting the use of ICT in teaching and learning while ICT devices are not made available at school, even the few available devices are old and dysfunctional*” (Teacher1 at Cs1, 24<sup>th</sup> January 2020). The respondent cited the presence of few desktops at his school and said that, few laptops and mobile phones available at school were privately owned. Teacher3 at Cs3 said,

*ICT policy for basic education requires teaching and learning process be integrated with ICT. The policy is ineffectively implemented regardless of laying down sound strategies. There is no physical facilities and infrastructure that are supportive in our school. There are no ICT gadgets such as computers, LCD projectors* (Teacher 3 at Cs3, 24<sup>th</sup> January 2020).

Another teacher at Cs5 said,

*We need to adopt ICT in teaching, the challenges include inadequate devices. As you can see in the office here, there is a TV, few desktops and a single radio. The laptops mostly belong to teachers. There are no supporting efforts from the government to bring the school with devices like LCD projector, internet services, and printers. We need to transform from traditional doing to modern* (Teacher 2 at Cs5, 28<sup>th</sup> January 2020)

Another respondent at Cs2 on the availability of ICT devices revealed how ICT adoption in teaching is impossible. She said,

*Integrating ICT in teaching in community-based secondary schools is a nightmare. The available infrastructures do not favour the inception of ICT devices. Nevertheless, a teacher wants to use his/her own laptops there is no projectors, some classes have no electric power, also there are contradictions between policy documents and practices. I think the government should put more emphasis establishing ICT infrastructures in its schools* (Teacher 4 at Cs2, 23<sup>rd</sup> January 2020)

Furthermore, teacher 5 reported on the impossibility of ICT adoption in community secondary schools due to unavailability of ICT devices. She revealed,

*How can one use ICT in teaching and learning in these schools of ours? Most of the community schools in our district you can only find rooms called computer labs but no adequate devices in there. Like here at our school, only few desktops can be found in the computer room. Other supportive devices like laptops, overhead projector, and interactive whiteboard are not available* (Teacher 5 at Cs4, 24<sup>th</sup> January 2020)

Generally, the findings showed that community secondary schools have inadequate ICT devices such as LCD projectors and computers, which are commonly used in interactive teaching and learning activities. Similarly, the findings revealed that laptops and smart phones available at schools mainly belong to individual teachers and not to the school. Moreover, since ICT devices need electric power in order to run internet bundle to surf materials, the findings showed that community schools found at the peripheral had no electric power supply, or even network accessibility.

#### **4.4 Basic ICT Skills and Knowledge**

The first objective of the study was to determine students and teachers' basic ICT skills needed for the adoption of ICT as a pedagogical tool. This objective was steered by the research question, "What are the basic ICT skills that teachers and students have in order to adopt ICT as a pedagogical tool in community secondary schools in Serengeti District?" The use of ICT in education requires technical knowledge and skills that would enable teachers and students to e adopt effectively ICT in teaching and learning. Questionnaire and interview methods were used by the researcher to collect related information from both students and teachers. In attainment of this objective, the survey questions with various statements and interview questions were administered to the respondents. The data were collected and presented in two categories namely students' responses and teachers' responses.

##### **4.4.1 Students' Responses**

The researcher requested the respondents to identify the basic ICT skills they possess that help them to use ICT tools in learning. The findings were quantified and presented in table 4.4.

**Table 4.4: Basic Skills on Using ICT**

<b>Ability/Skill</b>	<b>Frequency</b>	<b>Percent</b>
Ability to browse learning material on internet	40	22.2
Ability to use computer in learning	30	16.7
Ability to use TV and Mobile phones in communication at school	34	18.9
Ability to send emails	20	11.1
Ability to use MS Office like word, PowerPoint etc. in learning	18	10
Ability to save files	19	10.6
Ability to use Social Networks like WhatsApp, Facebook, blogs in learning	19	10.6
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field Data (2020)

The findings in table 4.4 showed the basic ICT skills that students possess whereby out of 180 respondents, 40 (22.2%) respondents had the ability to browse learning materials on the internet, and 34 (18.9%) respondents had skills on the use of television and mobile phones in communication at school. Moreover, the findings indicate that 19 (10.6%) of the sample had skills on how to save different files in ICT devices and skills on how to use social networks such as WhatsApp, Facebook and Blogs in learning activities. Furthermore, 30 (16.7%) respondents had the ability of using the computer in learning, 20 (11.1%) were able to send electronic mails and only 18 (10%) respondents had skills on using Microsoft office application such as Microsoft word, and Microsoft PowerPoint in learning.

The findings indicate that students in the community secondary schools lack adequate basic ICT skills for ICT adoption as a pedagogical tool. Few students (22.2, 18.9, and 16.7 out of 100 percent had some ICT skills on browsing different learning materials from the internet, using mobile phones and television for communication at school and using computer in learning respectively. Therefore, the findings imply that majority of the students did not have the needed ICT skills, which enabled them to use ICT tools in learning. Similarly, the findings from four out of five interviewed students support the above observation. Student 1 at Cs1 said,

*I know a little on how to search for learning materials on the internet because I learnt ICT in my former private school. At our former school, we had a very good ICT room; we were allowed at least once a week to learn few things. I found it were simple to type a question on Google and get learning materials.*

*However, I can efficiently use smartphone for social networking (Student 1 at Cs1, 21<sup>st</sup> January 2020)*

Another respondent at Cs2 revealed that;

*I can use a smartphone only for social networking and not for searching learning materials. Here at school we are not taught how to use ICT tools effectively for learning, most of us knew at least from our peers at home. I like to type different documents in computer and save them but unfortunately, I cannot since I do not have those skills. In addition, here at school we are not allowed to possess or use phones here (Student 3 at Cs2, 23<sup>rd</sup> January 2020)*

Moreover, the respondent at Cs4 commented,

*I don't know how to use computer. We are discouraged to use computer here at school and even at home. We use internet in our smart phones mostly in social networks like WhatsApp and Facebook secretly and not in learning. Most of students here at school don't have skills on how to use ICT in learning, even teachers only few of them uses computers and projector when teaching in our class, but most of them don't (Student 2 at Cs4, 24<sup>th</sup> January, 2020)*

Another respondent in Cs5 added that;

*We are sometimes eagerly to use ICT devices in learning, especially when we are given class activities. We encounter the challenges of basic skills, and no expert can volunteer to teach us. We search for our own knowledge as the results we find difficulties in accessing authorised material (Student 5 at Cs5, 28<sup>th</sup> January 2020)*

The findings revealed that majority of the respondents had inadequate ICT skills and only few were able to socialize in social networks. The findings also shown that, the respondents with little ICT skills were located in private schools where they studied ordinary level studies as student1 at Cs1 revealed. Regardless of the significance of ICT integration in education, the findings showed that students had limited basic ICT skills for ICT use in learning. The results also showed that only few students could at least use smartphones to search for learning materials and communicate at school. The results revealed further that no efforts were made on ICT investment in terms of experts, infrastructure, and facilities for promoting active and participatory learning in community secondary schools.

#### 4.4.2 Teachers' Responses

Closed questionnaires and interview guide were administered to 30 and 5 teachers correspondingly on determining teachers' basic ICT skills to support integration of technology in their classroom. Questionnaires helped to obtain descriptive data on teacher's pedagogical ICT practices in teaching and learning process. The study outlined seven statements to assert ICT skills needed by teachers for effective adoption of ICT as a pedagogical tool in CSSs. Four items were used to collect data of the study; well skilled, moderate skilled, poorly skilled, and not skilled at all. The findings are summarised and presented in table 4.5 as follows:

**Table 4.5: Teachers' Basic ICT Skills**

ICT Skills/Ability		Not Skilled at All	Poorly Skilled	Moderate Skilled	Well Skilled	Total
Ability to create multimedia presentations by using scanners, digital cameras and LCD Projectors	Freq.	3	10	12	5	30
	Perct.	10%	33.3%	40.0%	16.7%	100
Ability to use computers/Tablets for Accessing online resources and communicating	Freq.	1	7	10	12	30
	Perct.	3.4%	23.3%	33.3%	40%	100
Ability to use computer office applications to prepare lesson plans, schemes, results and students' reports	Freq.	6	13	6	5	30
	Perct.	20%	43.3%	20%	16.7%	100
Ability to enhance instruction through the use of computers, interactive media, audio/video conferencing	Freq.	6	17	15	2	30
	Perct.	20%	56.7%	16.7%	6.7%	100
Ability to use technology in varied ways to assess students' learning	Freq.	13	5	7	5	30
	Perct.	43.3%	16.7%	23.3%	16.7%	100
Ability to choose Information technologies that enhance the teaching approaches for a lesson and what students learn	Freq.	2	9	13	6	30
	Perct.	6.7%	30%	43.3%	20%	100
Ability in technological content knowledge, pedagogical content knowledge and technological pedagogical knowledge	Freq.	4	13	11	2	30
	Perct.	13.3%	43.3%	37.7%	6.7%	100

Source: Field Data (2020)

Key: Freq. =Frequency; Perct=Percent

Table 4.5 shows that out 30 respondents, three (10%) respondents were not skilled at all, 10 (33.3%) were poorly skilled, 12 (40%) were moderately skilled, and 5 (16.7%) respondents were well skilled on creating multimedia presentations using scanners, digital cameras, LCD Projector. Thus, the findings indicate that 56.7 percent of the respondents were moderate and well skilled in creating multimedia presentation using scanners, digital cameras, and LCD projector, whilst 43.3 percent were either poorly skilled or not skilled at all. The study findings imply that majority of teachers had skills on creating multimedia presentations using various ICT devices such as scanners, digital cameras, and LCD projectors. This situation generated positive attitude towards ICT use and created a sense of self-confidence among teachers on the adoption of ICT as a pedagogical tool in community secondary schools.

The study findings in table 4.5 shows that out of 30 respondents, 12 (40%) respondents were well-skilled, (10) 33.3 percent were moderately skilled, whilst 23.3 and 3.4 percent of the respondents were poorly and not skilled at all respectively in using computers/tablets for accessing online resources and for communication. These findings imply that majority (73.3%) of the respondents had the ability of using computers or tablets for accessing different online resources and for communication, while 26.7 percent of teachers were poor and not skilled at all. The findings imply that many teachers were skilled in using computers and tablets for accessing online sources, which enabled them to communicate different types of information on teaching and learning among themselves and between them and their students.

The findings in table 4.5 indicate that, 5 (16.7%) respondents were well skilled, 6 (20%) were moderately skills, 13 (43.3%) and 6 (20%) respondents were poorly and not skilled at all respectively on using computer applications to prepare lesson plans, schemes, results, and students' reports. The findings indicate further that 36.7 percent of the total respondents were skilled whilst 63.3 percent were not skilled on using computer office application to prepare lesson plans, schemes, results and students reports. Thus, the findings imply that majority of the respondents were not skilled in using computer office

applications such as microsoft word, microsoft powerpoint, publisher and excel to prepare lesson plans, schemes, academic results and students' reports.

Moreover, table 4.5 indicate that 6 (20%) respondents out of 30 were not skilled at all and 17 (56.7%) were poorly skilled, whilst only 5 (16.7%) and 2 (6.7%) respondents were moderately and well skilled respectively on the use of computers, interactive media, audio or video conferencing to enhance instruction. These findings show that (76.7%) majority of the respondents had no skills and only 23.4 percent of the respondents had skills. The findings signify that majority of the respondents in community secondary schools in Serengeti had limited skills in using computers, interactive media, and audio or video conferencing to enhance instruction.

The findings in table 4.5 indicates that out of 30 respondents, 13 (43.3%) respondents were not skilled and 5 (16.7%) were poorly skilled in using technology in varied ways to assess students' learning. Whereas 7 (23.3%) were moderately skilled and only 5 (16.7%) respondents were well skilled. This implies that majority (60%) of the respondents were not skilled on using technology in varied ways in assessing students' learning, whilst few (40%) of them about had skills. The findings imply that majority of the respondents in lack skills of using technology to assess students' learning.

The study findings in table 4.5 indicate that 13 (43.3%) out of 30 respondents were moderately skilled, 6 (20.0%) respondents were well skilled, while 2 (6.7%) and 9 (30%) respondents were not skilled at all and poorly skilled respectively on choosing information technologies that enhance teaching approaches in enhancing what their students learning These findings imply that about 63.3 percent of the respondents had adequate skills in choosing information technologies that enhance teaching approaches and what students learn whilst 36.7 percent lacked skills on choosing information technologies that enhance teaching approaches in enhancing what their students learning.

Furthermore, the findings in table 4.5 shows that out of 30 respondents, 13 (43.3%) respondents were poorly skilled and 4 (13.3%) were not skilled at all. However, 11 (36.7%) and 2 (6.7%) respondents were moderately skilled and well skilled respectively in technological content knowledge, pedagogical content knowledge and technological pedagogical knowledge. The findings revealed that 43.4 percent of the respondents were skilled in TCK, PCK, and TPK, while 59.6 percent of the respondents were not skilled. The study findings signify that majority of the respondents are not skilled in TCK, PCK, and TPK hence the adoption of ICT as a pedagogical tool in community secondary schools is still hampered by such limited skills.

Similarly, five teachers were purposively interviewed regarding their involvement in ICT trainings and seminars provided by the government under UCSAF. It was assumed that all 5 (100%) teachers had basic skills and knowledge in using ICT as pedagogical tools. Having basic skills confirms effective adoption of ICT as a pedagogical tool in community secondary schools. However, limited skills among respondents seemed to prevail. Four among five teachers who were interviewed had the following responses,

*Few teachers here at our school know how to operate the devices like computer and projector when they deliver in the classrooms. They can power on/off the devices and connecting them with their peripherals. I also use my computer along with the school projector when I'm teaching in a class. I can use power point to project my lessons in classroom though I have attended ICT training I don't have enough technological content skills (Teacher 1 at Cs1, 24<sup>th</sup> January 2020).*

Another teacher at Cs3 on pedagogical knowledge revealed,

*Teaching in the classroom with ICT needs one to possess pedagogic knowledge and be competent in using technological devices. Most of us lack TPK and only few teachers here can use ICT devices in teaching and learning effectively. I can prepare my lesson notes, tests and exams and even students' results because I have skills on how use Ms Office tools like word and excel (Teacher 3 at Cs3, 24<sup>th</sup> January 2020).*

When the researcher asked the interviewee to mention the skills which they possess, teacher2 at Cs5 said,

*I attended various computer courses and seminars; I have both hardware skills and software skills. On hardware skills I know different computer parts like*

*screen, keyboard, CPU and I can connect them with other peripherals such as scanners. I can type using keyboard and use 2<sup>nd</sup> function keys such as @ and shortcuts. On software skills, I have file management skills like creating, copying and sharing different files, using Ms Office tools like word, spreadsheet, access and power point (Teacher 2 at Cs5, 28<sup>th</sup> January 2020).*

Similarly, on the skills possessed by teachers for easy adoption of ICT as a pedagogical tool, teacher 4 said,

*I have attended ICT training under UCSAF and at least I can integrate ICT into my teaching practices. Surely, most of teachers do not show any efforts in adopting ICT in their classrooms. They only use internet for searching teaching materials. However, the challenge may be due to lack of TPK as only few teachers attended ICT training. We need more ICT trainings to be held at working station since many of us lack needed skills for ICT adoption in education (Teacher 4 at Cs2, 23<sup>rd</sup> January 2020).*

Generally, the findings reveal that few teachers who attended ICT trainings had basic ICT skills on how to use technology in teaching and learning. However, most of the respondents lacked technological content skills on how to choose an appropriate device for appropriate subject content and TPK as well. Moreover, majority of the students had inadequate ICT skills for their learning purposes. Only few of them can browse different learning materials from the internet and communicate with their teachers and fellow students in and out of their schools. The findings suggest that both teachers and students in community secondary schools had minimal ICT skills needed for effective adoption of ICT as a pedagogical tool.

#### **4.5 Possibilities and Constraints for Adopting ICT as a Pedagogical Tool in Community Secondary Schools**

This study objective aimed at exploring the possibilities and constraints for adopting ICT as a pedagogical tool among teachers and students in community secondary schools in Serengeti District. The objective was guided by the question, “What are the possibilities and constraints for ICT adoption as a pedagogical tool in community secondary schools in Serengeti District?” In order to achieve this study objective, 30 teachers, and 180 students were involved to provide worthwhile data of the study

through questionnaires and interview. The findings were presented in tables and narrations in two main categories namely possibilities and constraints.

#### 4.5.1 Possibilities for Adopting ICT as a Pedagogical Tool

##### Students' Responses

Firstly, the respondents were asked to state if there were possibilities, which enabled ICT adoption as a pedagogical tool in their schools. The responses were as shown in table 4.6

**Table 4. 6: Presence of the Possibilities for ICT Adoption**

Category	Frequency	Percentage
Yes	91	50.6
No	89	49.4
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.12 reveal that 91 (50.6%) out of 180 respondents said yes and 89 (49.4%) said no. The findings imply that there were uneven possibilities for ICT adoption as a pedagogical tool in community secondary schools as the responses were nearly the same.

Secondly, in order to explore possibilities for ICT adoption as a pedagogical tool, respondents were asked to give their responses by identifying the possibilities among the given four statements, which enable ICT adoption in their schools. Their responses were as presented in table 4.7

**Table 4. 7: Possibilities for Adopting ICT as a Pedagogical Tool**

Possibilities	Frequency	Percent
Availability of ICT device	63	35
Positive attitudes towards ICT use	27	15
Presence of technical support	20	11.1
Presence of electricity	70	38.9
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.7 reveal that, 70 (38.9%) respondents out of 180 respondents cited availability of electricity as the possible factor for adopting ICT as a pedagogical tool in community secondary schools, followed by 63 (35%) who cited availability of ICT devices. Moreover, 27 (15%) respondents cited positive attitudes towards ICT use and 20 (11.1%) respondents identified availability of technical support as the environment that made it possible for the use of ICT in their community secondary schools. The study findings indicated that at least few respondents cited availability of electricity and ICT devices by 38.9 and 35 percent respectively out of 100 percent of the total respondents. The findings inform that there were uneven possibilities for ICT adoption in community secondary schools in Serengeti district since there were minimal possibilities for ICT adoption in schools.

### Teachers' Response

The respondents were firstly asked to state if there were possibilities that enable them to adopt ICT as a pedagogical tool in their schools. The findings were as shown in table 4.8

**Table 4. 8: Possibilities for ICT Adoption**

Category	Frequency	Percentage
Yes	14	46.7
No	16	53.3
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.7 shows that out of 30 respondents, 14 (46.7%) respondents said yes and 16 (53.3%) said no. The findings imply that there were limited possibilities for ICT adoption as a pedagogical tool in community secondary schools as majority (53.3%) of the respondents said no. However, other respondents who said no were equally many.

Secondly, respondents were asked to identify the possibilities for ICT adoption as a pedagogical tool in their schools from among five of the following statements. Responses were as shown in table 4.9

**Table 4. 9: Possibilities for Adopting ICT as a Pedagogical Tool**

<b>Possibilities</b>	<b>Frequency</b>	<b>Percent</b>
Availability of stable power i.e. electricity	7	23.3
Presence of technological devices like computers, projectors	6	20
Availability of technical support	3	10
Competence in ICT use	4	13.3
Positive attitudes, perceptions towards ICT use in education	10	33.4
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Field Data (2020)

The findings in table 4.9 indicate that out of 30 respondents, 10 (33.4%) respondents identified positive attitude towards ICT use in education as a possibility for adopting ICT, followed by 7 (23%) respondents who identified availability of stable electricity. Moreover, 6 (20.0%) respondents cited availability of technological devices such as computers and projectors, 4 (13.3%) respondents cited competence in ICT use, and 3 (10%) respondents cited availability of technical support as the possibilities for adopting ICT as a pedagogical tool. The study findings revealed uneven possibilities for ICT adoption as a pedagogical tool. Only few respondents identified positive attitudes and perceptions towards ICT use in education at least by 33.4 percent of the total respondents. This implies that there were minimal possibilities and ICT was hardly adopted as a pedagogical tool in community schools.

Similarly, the interview was carried out to collect the respondents' views about the possibilities for ICT use in community secondary schools. The interview results depict that, there is a minimal possibility for ICT adoption as a pedagogical tool as there were no enabling environment for effective adoption of ICT. Teacher1 said,

*As you can see here at our school, it is possible to use ICT as a tool for teaching and learning because there is stable electric power from the National grid. However, it is challenging since we do not have other facilities such as enough ICT gadgets, internet service, and ICT expert. The school have the computer laboratory with devices in it even if they are not enough when you compare to the number of the students present today (Teacher 1 at Cs1, 24<sup>th</sup> January 2020)*

In supporting, another teacher at Cs4 added,

*Yes, we can hardly use ICT in teaching and learning. First, here at our school, teachers are eager to use digital devices in teaching activities and for searching teaching materials, I can say we are positive minded on ICT use in education. In addition, we have one projector here, we do not use desktops though, and we often use laptops and smartphones however, most of them belong to teachers. Therefore, I can see possibilities are many (Teacher 3 at Cs4, 24<sup>th</sup> January 2020)*

However, 3 (60%) respondents commented that available devices are old and out of date. They added that there is no regular maintenance; furthermore, regular power cuts lead to wastage of instructional time. Teacher 4 had the following to say,

*Most of the devices, which are available here at our school, are old and lack regular maintenance. For instance, you can take a laptop computer, but it can take you five to ten minutes just to start it ready for use. Sometimes, you find that a laptop computer and a projector are not compatible...this creates negative attitude among teachers towards these kinds of devices. I often waste a lot of time trying to fix them instead of teaching (Teacher 4 at Cs 2, 23<sup>rd</sup> January 2020)*

Another respondent cemented,

*We have damaged and corrupted computers here at our school. No person can repair our computers. Likewise, there is no maintenance, updating, and repair. We have no IT expert responsible for maintenance and repair of our computers. The computers are slow and full of virus. You cannot share anything like Trans cards; otherwise, your device will create shortcut links and will be difficult to be read on other devices (Teacher 5 at Cs 4, 24<sup>th</sup> January 2020)*

Similarly, teacher3 said;

*We have the devices yes! Even if they are inadequate, how can we use them effectively in teaching if there are regular power cuts? In our area, electricity can go off at any time without notice. In addition, unfortunately, our school doesn't have any kind of backup power, be it generator or solar panel! It is challenging to use ICT here (Teacher 2 at Cs 5, 28<sup>th</sup> January 2020)*

The study findings revealed that ICT is hardly adopted as a pedagogical tool in community secondary schools. This is because of limited possibilities for its adoption. Inadequate devices, competence, presence of scrap devices and regular power cuts have made the adoption of ICT in teaching and learning ineffective especially in rural peripheral community secondary schools in Serengeti district.

#### 4.5.2 Constraints for Adopting ICT as a Pedagogical Tool

This section presents the findings on challenges experienced by both students and teachers on the use of ICT as a pedagogical tool in community secondary schools in Serengeti district. The findings from students' and teachers' questionnaires were presented together with the detailed responses from teachers' interviews.

##### Students' Responses

Respondents were first asked to state if there were constraints that prevented them from adopting ICT as a pedagogical tool in their schools. The results were as presented in table 4.10

**Table 4. 10: Presence of Constraints for Adopting ICT in Community Secondary Schools**

Category	Frequency	Percentage
Yes	176	97.8
No	4	2.2
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field data (2020)

Table 4.10 reveals that, 176 (97.8%) respondents agreed with the statement that, there were constraints that prevented them from adopting ICT as a pedagogical tool in their schools while 4 (2.2%) disagreed. Therefore, the findings imply that there were constraints that that prevented them from adopting ICT as a pedagogical tool in their schools.

Secondly, the researcher requested the respondents to identify the constraints against adopting ICT in community secondary schools from among six statements outlined in table 4.11. The findings were as tabulated in table 4.11

**Table 4. 11: Constraints for Adopting ICT as a Pedagogical Tool**

<b>Constraints/Challenges</b>	<b>Frequency</b>	<b>Percent</b>
Inadequate of ICT Skills	27	15
Lack of technological devices	30	16.7
Lack of technical support	24	13.3
Negative attitude towards technology use	20	11.1
Poor ICT infrastructure	56	31.1
Lack of internet connectivity	23	12.8
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.11 show the constraints for adopting ICT as a pedagogical tool. Out of 180 respondents, 56 (31.1%) identified poor ICT infrastructure as a constraint for ICT adoption, 30 (16.7%) cited lack of technological devices, 27 (15%) identified inadequacy of ICT skills, and 24 (13.3%) respondents reported lack of technical support. Others include lack of internet connectivity cited by 23 (12.8%) respondents, and cited and negative attitude towards technology use identified by 20 (11.1%) respondents. The study findings imply that the adoption of ICT as a pedagogical tool in community secondary schools was limited by various constraints since all the constraints were almost identified without much variation in the number of respondents. However, poor ICT infrastructure and lack of technical devices were at least identified by the majority compared to other constraints against the adoption of ICT as a pedagogical tool in community secondary school.

### **Teachers Responses**

First, the respondents were asked to state if there were constraints preventing them from adopting ICT as a pedagogical tool in their respective community secondary schools. The responses were as shown in table 4.12

**Table 4. 12: Presence of Constraints for Adopting ICT in Community Schools**

<b>Category</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	24	80
No	6	20
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Field data (2020)

The findings in table 4.18 reveal that out of 30 respondents, 24 (80%) agreed with the statement that there were constraints preventing them from adopting ICT as a pedagogical tool in their respective community secondary schools and only 6 (20%) respondents disagreed. Since, the majority (80%) agreed, the findings imply that there were constraints that prevented the respondents from adopting ICT as a pedagogical tool in community secondary schools.

Moreover, five statements were developed that defined the constraints against the adoption of ICT to enable respondents identify the constraints for ICT adoption in community secondary schools. The findings are as shown in table 4.13

**Table 4. 13: Constraints for ICT adoption (Teachers response)**

<b>Constraints/Challenges</b>	<b>Frequency</b>	<b>Percent</b>
Absence of well-equipped computer laboratory	3	10
Lack of Technical support	8	26.7
Inadequate of ICT devices	12	40
Lack of ICT knowledge and skills	5	16.7
Regular power cut off	2	6.7
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Field Data (2020)

The results in table 4.13 indicate that, 12 (40%) out of 30 respondents identified inadequacy of ICT devices. This was followed by lack of technical support which was identified by 8 (26.7%) respondents, 5 (16.7%) respondents identified lack of ICT knowledge and skills, 3 (10%) identified lack of well-equipped computer laboratories; and 2 (6.7%) cited regular power cuts as a constraints against the ICT adoption in community secondary schools. The results revealed that all the items were identified as constraints against ICT adoption with variation. However, inadequacy of ICT devices and lack of technical support were at least identified by majority of the respondents as compared to other constraints. The results imply that, however there were many constraints that prevent ICT adoption, inadequacy of ICT devices and lack of technical support seemed to be more challenging in community secondary schools in the district.

Furthermore, the researcher conducted interviews with five teachers as a means of triangulating the findings. All 5 (100%) respondents confirmed that there were many challenges that prevent teachers from effectively using ICT in education. three solid responses were presented. One respondent at Cs 2 had this to say,

*The adoption of ICT in education is limited by inadequate devices. We are almost 25 teachers here at school, eleven teachers are interested in using ICT in teaching, but we only have 5 laptop computers and a single projector! How do we all use? I think you can see what I mean! The devices are not adequate. Most of these community schools lack enough ICT devices such as computers, projectors, and access to internet services. About 20 schools in our district, only two have internet access. Here at our school, most of the devices are scrappers; they need major maintenance (Teacher 4 at Cs 2, 23<sup>rd</sup> January 2020)*

These findings imply that, community schools had inadequate ICT devices; and, operating ICT devices need technical skills and knowledge. Most teachers have basic knowledge on communication skills where computer education is meagrely provided during their teaching courses in colleges and universities.

Another respondent at Cs 4 made the following comment,

*Lack of computer literacy experienced by many teachers is a major problem. During my schooling at university, I gained limited skills on computer use for complementing my tasks. I am not competent enough to integrate ICT in the classroom. I do not have any professional training on the use of ICT as a tool for teaching. Only one teacher attended the course, but we do not get anything in return! And this is a common habit of teachers when they attend seminars or trainings; their feedback in most cases is not taken into consideration at all (Teacher 5 at Cs 4, 24<sup>th</sup> January 2020)*

Another female respondent at Cs1 cited policy statements, school rules, and regulations as constraints against ICT usage especially to students. She had this to say,

*The government also is confusing us, just see the 2007 ICT policy for basic education for instance, it allows the use of ICT in teaching and learning but our school rules and regulations prohibit students to either possess or use any ICT device especially mobile phones and computers at school. Adoption of ICT as pedagogical tool is inevitable for interactive and participatory classroom. Unfortunately, in secondary school it is in prints only not into practice. How will you make your students to be aware about information sharing, searching materials through internet while there are no clear guidelines that allow them to possess the ICT devices (Teacher 1 at Cs 1, 24<sup>th</sup> January 2020)*

The findings as revealed above established that there is a contradiction between the ICT policy and the actual practices in the field. It is a fact that, the adoption of ICT as pedagogical tools is not actually practised. The schools do not have the enabling infrastructure, attitudes, and facilities including technical personnel. The trend tends to sustain teachers' traditional teaching as opposed to learner centred approach.

#### **4.6 Impacts of ICT Adoption on Pedagogical Processes in Community Secondary Schools**

This study objective focused on the impacts of ICT use in pedagogical processes in community secondary schools. The study objective was guided by the research question, "What are the impacts of ICT adoption in pedagogical processes in community secondary schools in Serengeti District?" To achieve this objective, data were obtained through closed questionnaire from 180 students, and through questionnaires and interview from five teachers who were purposively selected among thirty teachers. The findings from questionnaires were presented in strap lines through frequency tables regarding students and teachers' responses respectively.

##### **4.6.1 Students' Response on the Impacts of ICT Adoption on Pedagogical Processes**

Firstly, the respondents were asked to state if the adoption of ICT had any impacts on pedagogical processes. The findings were as revealed in table 4.14

**Table 4. 14: Presence of Impacts of ICT Adoption on Pedagogical Processes**

<b>Category</b>	<b>Frequency</b>	<b>Percent</b>
Yes	141	78.3
No	39	21.7
<b>Total</b>	<b>180</b>	<b>100</b>

**Source:** Field Data (2020)

The findings in table 4.14 show that out of 180 respondents, 141 (78.3%) respondents agreed that, the adoption of ICT had some impacts on pedagogical processes whilst 39 (21.7%) disagreed that there were no impacts of ICT adoption in teaching and learning

processes. The findings imply that, ICT adoption as a pedagogical tool had some impacts on pedagogical processes in community secondary schools.

Furthermore, the respondents were required to identify the impacts of ICT adoption from six outlined statements; the findings are presented in table 4.15 as follows.

**Table 4. 15: Impacts of ICT Adoption on Pedagogical Processes**

<b>Impact</b>	<b>Frequency</b>	<b>Percent</b>
Improves students' academic performance	35	19.4
Increase desire to learn ICT	11	6.1
Provide access to variety of learning materials easily	54	30
ICT saves time and enhance learning activities	49	27.2
It creates laziness and dependency to ICT	11	6.1
ICT simplify collaboration and increase interaction in learning	20	11.1
<b>Total</b>	<b>180</b>	<b>100</b>

Source: Field Data (2020)

The findings in table 4.15 indicates that out of 180 respondents, 54 (30%) respondents cited ICT as providing access to a variety of learning materials easily, 49 (27.2%) cited ICT saves time and enhance learning activities while 35 (19.4%) respondents stated that ICT improves students' academic performance. Correspondingly, 20 TI (11.1%) respondents reported that, ICT simplifies communication and increase interaction in learning while 11(6.1%) respondents revealed that ICT creates laziness and dependency on ICT, which is a negative impact of ICT adoption in pedagogical processes in community secondary schools in the district. The findings depict that ICT had various impacts. However, at least majority of the respondents agreed that, ICT, provide access to a variety of learning materials easily, enhance learning activities and improves students' academic performance.

#### **4.6.2 Teachers' Response on the Impacts of ICT Adoption on Pedagogical Processes**

The closed questionnaires were administered to thirty (30) teachers and interviews were administered to 5 teachers to indicate the impacts of integrating ICT on pedagogical processes in their classrooms. Eighty (8) statements were developed to allow

respondents to reveal and easily rate the impacts. The findings were rated in four scales namely; strongly disagree, disagree, agree, and strongly agree. The study findings are presented in table 4.16 as follows:

**Table 4.16: Impact of ICT on Pedagogical Process: Teachers' Responses**

ICT Skills/Ability		Strongly disagree	Disagree	Agree	Strongly agree	Total
Saves time and enhance teaching and learning process	Freq.	2	4	9	15	30
	Perct.	6.7%	13.3%	30%	50%	100
Simplify Implementation of Competence Based Curriculum	Freq.	3	3	9	15	30
	Perct.	10%	10%	30%	50%	100
Accomplishment of subject syllabus on time	Freq.	6	13	7	4	30
	Perct.	20%	43.3%	23.3%	13.3%	100
Provides teachers with Easy Access to Instructional Materials	Freq.	2	4	6	18	30
	Perct.	6.7%	13.3%	20%	60%	100
Simplifies Preparation of Lesson Plans and Enhance Records Keeping	Freq.	3	3	10	15	30
	Perct.	10%	10%	33.3%	50%	100
Facilitates Academic Performance	Freq.	0	2	8	6	30
	Perct.	0%	6.7%	26.6%	20%	100
Developing Health Problems Such as Stress and Eyes Strain	Freq.	1	2	11	16	30
	Perct.	3.3%	6.7%	36.7%	53.3%	100
Creating Mental Laziness as Dependency on Technology Increases	Freq.	1	4	9	16	30
	Perct.	3.3%	13.3%	30%	53.3%	100

Source: Field Data (2020)

Key: Freq. = Frequency; Perct = Percent

Table 4.16 shows that 15 (50%) of the sample strongly agreed that ICT saves time and enhance teaching and learning process while 9 (30%) respondents agreed. About 2 (6.7%) and 4 (13.3%) respondents disagreed and strongly disagreed ICT saves time and enhance teaching and learning process as indicated in Table 4.20. The findings reveal that majority (80%) of the respondents agreed whilst 20% disagreed. These findings imply that ICT adoption had some impact on pedagogical processes as it saves time and enhance teaching and learning processes.

The findings in table 4.16 indicates that out of 30 respondents, 15 (50%) respondents strongly agreed and 9 (30%) respondents agreed that ICT simplifies implementation of

competence-based curriculum. However, 3 (10%) respondents disagreed and strongly disagreed respectively. The findings showed that majority (80%) of the respondents agreed that ICT has positive impacts on teaching and learning process, while few of them (20%) disagreed. The findings signify that the adoption of ICT as a pedagogical tool had some impact on the implementation of CBC in community secondary schools.

The findings as indicated in table 4.16 show that out of 30 respondents, 13 (43.3%) respondents disagreed and 6 (20.0%) respondents strongly disagreed while 4 (13.3%) respondents agreed and other 7 (23.3%) respondents agreed that ICT helps them to accomplish subjects' syllabuses in time. The results show that majority (about 63.3% of the respondents) disagreed. These findings imply that ICT does not help teachers to accomplish their subjects' syllabuses in time.

Table 4.16 indicates that, 18 (60%) out of 30 respondents strongly agreed and 6 (20%) respondents agreed that ICT provides teachers with easy access to instructional materials. However, 4 (13.3%) respondents and 2 (6.7%) respondents disagreed and strongly disagreed respectively with the statement. The findings show that 80% of the respondents agreed, therefore the findings imply that ICT has a positive impact and provided teachers with easy access to instructional materials.

The findings in table 4.16 indicates that out of 30 respondents, 15 (50%) respondents strongly agreed and 10 (33.3%) agreed that ICT simplified preparation of lesson plans and enhanced record keeping while 3 (10%) respondents strongly disagreed and 2 (6.7%) respondents disagreed with the statement. The findings revealed that majority of the respondents (83.3%) agreed and only 16% of them disagreed. The study findings imply that ICT adoption has helped respondents to simplify preparation of lesson plans and simplified record keeping in community secondary schools in Serengeti district.

Moreover, table 4.16 show that 20 (66.6%) out of 30 respondents strongly agreed and 2 (6.8%) agreed that ICT adoption facilitated academic performance. However, 2 (6.8%) respondents disagreed. Findings in table 4.16 revealed that majority (93.2%) of the

teachers agreed whilst only 6.8 disagreed with the statement. The findings had implication that ICT adoption facilitated academic performance in community secondary schools in the district.

Table 4.16 indicates that, 16 (53.3%) out of 30 respondents strongly agreed and 11 (36.7%) agreed that ICT develops problems such as stress and eyes strain while 1 (3.3%) respondent strongly disagreed and only 2 (6.7%) respondents disagreed with the statement. The findings revealed that about 90 percent of the respondents who are the majority agreed and only 10% disagreed with the statement. The findings imply that ICT adoption had negative impacts to human health as can cause stress when users are incompetent and could develop eyes strain when used for a long time.

Table 4.16 indicates that, out of 30 respondents, 16 (53.3%) respondents strongly agreed and 10 (30%) respondents agreed that ICT creates mental laziness as dependency on technology increases. However, 1 (3.3%) respondent strongly disagreed and 4 (13.3%) respondents disagreed with the statement. The findings revealed that majority (83.3%) of the respondents agreed with the statement. These findings imply that ICT adoption had negative impact since it creates mental laziness as dependency on the technology increases.

Similarly, findings of the interview between the researcher and five purposively selected teachers revealed that, the use of ICT as a pedagogical tool had both positive and negative impacts on pedagogical processes. However, the negative ones had no contributions on pedagogical process rather than compromising human health.

One respondent at Cs3 had this to say,

*For sure, ICT saves a lot of time during teaching and learning activities. You know before content delivery in classroom, you have to prepare lesson plan, then notes and after that, you can now deliver your content. It takes a lot of time to prepare those...but with the aid of ICT the work is simplified and takes you hardly 30 minutes instead of 45 minutes to present your content in classroom (Teacher 3 at Cs3, 24<sup>th</sup> January 2020)*

Another respondent at Cs5 had this to report,

*We are now implementing the competence-based curriculum; the use of ICT helps teachers to be more instructors than being content deliverers. Now, with the aid of computers students can also surf different materials, lesson notes, various examinations and past papers. In addition, ICT as a pedagogical tool has enhanced effective, active, and participatory teaching and learning (Teacher 2 at Cs5, 28<sup>th</sup> January, 2020).*

Furthermore, another respondent at Cs1 added,

*ICT as pedagogical tool helps teachers to cover the syllabus on time only if the teacher is competent enough in ICT use. The uses of projector with power point presentations help us to cover the syllabus so fast and we get extra time for revisions. Slides cover few instructions, which are also taught in time. In addition, I do not wonder to see that, today students are more interactive and eagerly to learn new things every day in my class. It is easy to share teaching and learning materials between teachers and students in sophisticated manner. However, for those who lack ICT skills perceive that ICT use waste their instructional time. (Teacher 1 at Cs1, 24<sup>th</sup> January 2020)*

However, the findings from other respondents revealed negative impacts of using ICT as a pedagogical tool in a technological integrated environment. One respondent at Cs2 said,

*If ICT use is not well monitored and managed, its adoption may lead to moral decay mostly to our students. You can find them watching pornography or visiting restricted sites online. It affects their discipline at school. ICT needs close supervision and discipline for better results however negative attitudes towards ICT use in teaching and learning among teachers hinders its effective supervision in our school (Teacher 4 at Cs2, 23<sup>rd</sup> January 2020)*

Another respondent at Cs4 added that;

*Most of teachers, who are addicted to computer and projector use, have spectacles on their eyes. It is because too much use of ICT devices for long time cause them eye problems. Myself always when I use computer even projector during teaching, I must have severe headache. Everything has its advantage and disadvantage (Teacher 5 at Cs4, 24<sup>th</sup> January 2020)*

Generally, the findings from questionnaires and interview on the impacts of ICT adoption as a pedagogical tool on pedagogical processes were observed to be positive and negative. The finding revealed that, both teachers and students had acknowledged the use ICT in classrooms. It facilitates teaching and learning process for students'

academic performance. The CBC becomes more implementable and manageable in a sharing, collaborative, active, and participatory manner. However, negative impacts such as eyes strain and mental laziness were revealed.

#### **4.7 Chapter Conclusion**

This chapter presented the findings of the study. It focused on the presentation of findings based on availability of ICT devices in community secondary schools in Serengeti district. This was followed by the findings based on study objectives namely; students' and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool, possibilities and constraints of adopting ICT as a pedagogical tool among teachers and students, and the impacts of ICT adopting on pedagogical processes in community secondary schools.

## **CHAPTER FIVE**

### **DISCUSSION OF FINDINGS**

#### **5.1 Introduction**

This chapter discusses the findings presented in chapter four. The main purpose of the study was to explore students and teachers' experience in the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district, Tanzania. The discussion in this chapter comprises three parts, which address the three specific objectives of the study namely, to determine students and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district. The other objective is to explore possibilities and constraints of adopting ICT as a pedagogical tool among teachers and students in community secondary schools in Serengeti district and to reveal the impacts of ICT adopting on pedagogical processes in community secondary schools in Serengeti district. Thus, discussion of the findings in this chapter based on three objectives beginning with the first objective.

#### **5.2 Basic ICT Skills on Adoption of ICT as a Pedagogical Tool**

The study sought to determine students and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district. Both teachers and students were found to have different ICT knowledge and skills on ICT adoption in education.

The findings presented in table 4.5 show that, basic ICT skills are needed by students for easy adoption of ICT in learning. The findings reveal that, only few students who makes 22.2, 18.9 and 16.7 percent of the total respondents had at least ICT skills on browsing different learning materials from the internet, using mobile phones for communication at school and using the computer respectively in learning. Therefore, the findings mean that majority of students in community secondary schools have inadequate basic ICT skills, which enable them to integrate ICT in education. Only few students can at least use smartphones to search learning materials and communicate in school.

The study findings are in line with the findings of Machumu et al. (2018) and Kafyulilo et al. (2015) who assert that using ICT in education need students to be taught various skills on how to use digital devices to enhance their learning activities. It is obvious that in their studies students lack basic skills for ICT use in education. The findings are consistent with the truth that in implementing Competence Based Curriculum (CBM), which is emphasized students, should be well informed on the skills of interacting with different online learning materials by themselves. However, Lack of basic ICT skills compromise its effective application. Notwithstanding the significance of integrating ICT in education, this study revealed that little basic ICT skills were limited to students in private school. Here they studied computer as revealed by one student, *“I know how to search for learning materials on the internet because we learnt ICT in my former private school (Student 1 at Cs1, 21st January 2020)”*.

Furthermore, the findings of this study differ from the findings by Ngeze (2017) who found that majority of students had adequate skills on the use of mobile phones for socialization in social platforms such as Facebook and WhatsApp and browsing learning materials when they were at home. Contrarily, the findings of the current study revealed that only few students had little skills on using mobile phones for socialization in social platforms. The difference might be due to the reason that, the current study was done in rural peripheral schools where most of the students did not have access to mobile phones as compared to urban schools. It is likely that most of the students in rural schools do not possess ICT gadgets such as mobile phones as compared to those in town and urban schools. However, to students are not permitted to possess mobile phones or computer in schools. The findings depict that, there is no t efforts made on ICT investment in terms of experts, infrastructure, facilities, and trainings in community schools for promoting ICT use in teaching and learning. Therefore, the adoption of ICT in education should consider the need of students to have basic skills on ICT usage in order to make them active and engaging during teaching and learning activities.

Similarly, the findings from teachers' responses were to indicate whether teachers were skilled on various skills needed for effective adoption of ICT as a pedagogical tool in their schools. The finding indicates that 56.7, 73.3 and 63.3 percent of teachers were skilled on creating multimedia presentations using scanners and LCD projector, using computers for accessing online resources, and choosing information technologies respectively that enhance teaching approaches. However, 63.3, 76.7 and 60 percent of teachers were not skilled on using office application to prepare teaching and learning documents, enhancing instruction using video conferencing and using technologies in varied ways to assess students learning. The findings imply that few teachers had basic skills on using ICT in teaching, though majority had inadequate skills. The findings are similar to the findings reported by Ndibalema (2014), Kihzoza and Kafyulilo, Fisser, Pieters, and Voogt (2015) who revealed that teachers were positive, passionate, and willing to integrate ICTs in classroom integration since they possessed basic ICT skills, which were acquired from personal efforts and little from preliminary ICT course during their teaching education in colleges. Having adequate ICT skills created confidence and interest in using technology as a pedagogical tool. However, their efforts were constrained by limited skills that were endowed by teachers, which is the background of irrelevant ICT frameworks in their teacher's education preparation. In this regard, teachers need to be taught adequately how to integrate effectively ICTs in teaching and learning process.

Furthermore, the findings revealed that 59.6 percent of teachers were not skilled in TCK, PCK, and TPK. This implies that majority of teachers were not able to integrate ICTs with subject content, pedagogy with content, and technology with pedagogy. The adoption of ICT as a pedagogical tool needed one to possess adequate TCK, PCK, and TPK for its effectiveness. Lack of technological pedagogical skills among community secondary school teachers limited ICT adoption in teaching and learning. The findings are congruent with the findings of Machumu et al. (2018) who found that, there are good indicators in the use of ICTs in secondary schools. However, teachers lacked TCK, PCK, and TPK due to inadequate investments, decrease its effectiveness in education. The government is providing schools with ICT gadgets, particularly computers without

considering other infrastructures such as the internet, scanners, projectors, printers, and ICT training to teachers. This view is cemented by Ngeze (2017) who asserts that ICT has simplified the shift from traditional teacher-centred approach to learner-centred approach and ICT use help teachers to enhance the shift. Their efforts and motivation are discouraged due to unfavourable teaching and learning environments that do not support the integration of ICT for interactive learning. Thus, the findings of this study, contradict with the findings of previous studies, which recommended that, there should be indoor in-service training that can accommodate the reasonable number of teachers in the working station. One teacher highlighted, “*Most teachers do not show any efforts in adopting ICT in their classrooms, may be due to the nature of training that involves only one teacher from a few selected schools. We need such training to be held at the working station (T3 at Cs3 Response, January 2020)*” The indoor trainings will provide teachers with the sense of knowledge ownership, particularly when it is done collaboratively along the specific TPCK.

The effectiveness of ICT adoption as a pedagogical tool in education does not only depend on the basic skills and devices, but also the technological pedagogical content knowledge. The findings are compatible with the findings of a study by Li (2020) and Mwangi and Khatete (2017) who emphasize that, ICTs in classroom should be linked with the appropriate pedagogical content knowledge. In the selection of appropriate content and methods of deliverance for effective teaching and learning, teachers should possess three types of knowledge: Content Knowledge (CK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK). Indeed, Machumu et al., (2018) affirm that the use of technology and design hands-on activities have a positive implication on the implementation of learner-centred approach while developing teachers’ PCK. Generally, students and teachers demonstrate limited basic ICT skills needed for effective adoption of ICT as a pedagogical tool in community secondary schools. Therefore, in order to prepare students holistically (cognitive, affective and psychomotor), the study recommends that basic skills on ICT use in teaching and learning process should be fused to both teachers and students in appropriate guidelines rather than embracing the available contradictory policy with school rules.

### **5.3 Possibilities and Constraints for Adopting ICT as a Pedagogical Tool**

#### **5.3.1 Possibilities for Adopting ICT as a Pedagogical Tool**

The adoption of ICT in education requires an ideal environment, which will determine important factors for its effectiveness. The availability of the required environment portrays a broad picture for ICT use in community secondary schools. This section discusses the factors that influence the use of ICT in community secondary schools.

##### **5.3.1.1 Competence in ICT Use**

ICT competence is one of the major indicators of ICT integration in education. The study findings showed that, some teachers who possess some technological training demonstrated the ability of using ICT in educational activities as compared to those who lacked such training. For example, 13.3 percent of teachers from the findings identified competence as an indicator of using ICT as a pedagogical tool. Competence enhances confidence to teachers towards using ICT. The findings are in line with the findings of some of the research studies including Dogan (2010), Simin and Sani (2015), Talip and Tiop (2020) who found that technological training for teachers' professional development and experience in ICT usage promotes competence and confidence. The training rationally generates sound experience in integrating ICT in teaching and learning practices. The current study suggests that quality technical training for teachers will confiscate technophobe and develop their skills in facilitating ICT usage in teaching and learning competently.

##### **5.3.1.2 Availability and Accessibility of ICT Devices**

About 35 percent of students and 20 percent of teachers identified technological devices as a determinant for possible adoption of ICT in teaching and learning activities. These findings mean that, 65 and 80 percent of teachers and students respectively mentioned other factors. Similarly, the findings imply that the available gadgets do not suit students and teachers' ratio. Correspondingly, the findings are compatible with the findings of Bindu (2017), Ndongfack (2015) and Tairo, (2017) who found that availability and accessibility of ICT devices in schools is an essential condition for technology integration in teaching and learning. Being the case, the adoption and use of ICT in

teaching and learning keep pace with investment of ICT devices. Therefore, the basics ICT skills that teachers have would be strengthened only if the school has devices such as computers, computers, scanners, digital camera, printers, LCD projectors, interactive boards, and multimedia. The government should support its schools with technological device as a way of motivating teachers into using ICT as a pedagogical tool. Availability of a few ICT devices in community secondary schools, compromises students and teacher's opportunity to access several diverse technological devices.

### **5.3.1.3 Positive Attitude Towards ICT Use in Education**

Effective adoption of ICT in education depends on teachers and students' attitudes. The findings show that attitude towards ICT use influence how ICT is being used in teaching and learning activities. It was found that 33.3 percent of teachers and 15 percent of students identified positive attitude as the determinant towards using ICT in teaching activities. The findings are in line with the findings of a study by Naidu and Laxman (2019) and Prasojo, et al. (2019) who found those teachers' positive attitude, confidence, and experience towards ICT has created the enabling environment for successful application of ICT in teaching and learning. It is a fact that, nothing competes with attitudes and perceptions. The use of ICTs as a new technology in teaching and learning should start with teachers and students' interest toward it. Such positive attitudes are developed when teachers and students are adequately contented with technology and are versed with its usage. Otherwise, when people develop negative attitudes toward ICT use, its impact on education will be negligible (Ghavifekr et al., 2016). Therefore, the current study establishes that, the adoption of ICT as pedagogical tools should be symmetrical with changing teachers and students' mind-sets towards technology.

### **5.3.1.4 Availability of Technical Support**

Technical support provides a supportive environment for ICT usage in education as indicated by 11.1 and 10 percent of students and teachers respectively. The findings imply that, technical support has a great contribution of sustaining ICT usage in schools. However, the selected schools that use ICT, hardly access technical support. The findings are in line with the findings in a study by Marelo, et al., (2015), Mahdum, et al.

(2019) and Ndibalema (2014) who found that inadequate technical support in most schools highly risks ICT undertakings in schools. The findings revealed that there was no regular maintenance and repair of the available technological devices in secondary school due to inadequate technical personnel. It was observed that most of the devices and ICT infrastructure were old and damaged; thus, regular maintenance and repair were needed. Therefore, availability of insufficient technical support impedes the effective utilisation of ICT devices. The study has established that, teachers and students had developed a sense of fear against using damaged devices, as they were too slow to restart

### **5.3.2 Constraints Against Adopting ICT as a Pedagogical Tool in Community Secondary Schools**

The findings, as presented in chapter four, identified various constraints that limit ICT adoption as a pedagogical tool. However, four constraints will be discussed in detail.

#### **5.3.2.1 Insufficient of ICT Devices**

In this study, 40 percent of teachers and 13.3 percent of students identified insufficient ICT devices as the most alarming constraint that hinders the adoption of ICT as a pedagogical tool in community secondary schools. The adoption of ICT in secondary schools, which is encountered by inadequate electronic devices for teaching and learning. There were few ICT devices in the sampled schools where ICT was one of the subjects. The findings are congruent with the findings in a study by Ghavifekr and Wan Athirah (2015), Mustapha et al. (2020) and Muyengabe et al. (2017) who found that ICT integration in education is challenging as most of the schools in rural areas, had insufficient ICT devices, unreliable electric power and outdated devices such as computers and lacked internet services. Most rural public schools were left behind in this technology due to unfavourable environments. Such experiences motivated the current study into establishing a smooth implementation of ICT policy of 2007 for basic education in Tanzania, which is parable due to inadequate investments in infrastructure, facilities, and expertise.

### **5.3.2.2 Lack of Technical Support**

The study indicated that, 26.7 percent of teachers and 13.3 percent of students cited lack of technical support as obstacles in adopting ICT as a pedagogical tool. The schools with available few ICT devices had few experts who can ensure maintenance and repair of the devices. The schools with ICT services hardly maintain and update their devices due to limited skills possessed by teachers. This is because, teachers had basic skills in the application of software such as wording, excel and power point presentation. The findings concur with the findings of a study by Chambers (2019), Muyengabe, et al. (2017) and Tairo (2017) who found that technical problems such as failure of gadgets connection, networking failure as well as hardware and software problems limit the effective use of ICT as a pedagogical tool. Many schools had inadequate technical personnel who can help teachers in maintenance, repair hardware, and software. Contrary, to the previous studies, the current study established that, there is negligence; no one was caring about the available improvised computer laboratories. Therefore, the findings revealed that there were hardly any ICT technical personnel who were responsible for the maintenance of available devices. Teachers used them without considering their deficiencies because most of them had limited basic computer skills in few application offices. Surprisingly, teachers were sometimes were afraid of using them as they were anxious to destroy them. Thus, the adoption of ICT as a teaching tool in schools should keep pace with other conditions such as ICT technicians for its sustainability.

### **5.3.2.3 Lack of Technological Competence**

The findings revealed that 16.6 percent of teachers and 15 percent of students agreed that lack of technological skills and knowledge among them results to lack of technical competence in adopting ICT as a pedagogical tool. The reasons could be due to limited practical skills that were versed to teachers during their teacher education in their colleges. In fact, teachers considered ICT as supplementary courses that were undertaken to accomplish communication purposes, browsing materials to complete their learning tasks for coursework. Such experiences created digital divide among teachers in the use of ICT which in fact developed fears among incompetent teachers in

ICT integration and use in the classroom. The findings are comparable with the findings by Karanja (2018) and Kihiza et al. (2016) who found that however effective use of technology in education requires supplement skills, in most schools, teachers and students were not competent in technology use since they lacked technological competence. As Kohler et al., (2007) observed, the interplay between pedagogy, knowledge, and technology results in TPK entails teachers to possess TPK for successful integration of ICT as pedagogical tool. However, most schoolteachers lacked pedagogical knowledge to merge content with technology for effective delivery in the classroom. Therefore, the integration of technology into content helps teachers to choose suitable technologies that change how learners understand and perceive the concepts of particular content. Teachers enjoy using technologies in their teaching if they are competent in the use of technology. Technological competence is built by possessing technical skills, content knowledge, and pedagogical knowledge.

#### **5.3.2.4 Lack Internet Connectivity**

The findings have shown that 23 (12.8%) of teachers identified lack of internet connectivity as a barrier against ICT use in teaching and learning. Most areas in rural areas such as Serengeti are limited with internet and network coverage. Geographically, the area is scattered with limited internet services providers. In most cases, teachers used their own modems and hotspot tethering in accessing the internet. Similar findings are reported by Almasi et al (2017) and Ndimbalema (2014) that, the school with ICT services struggle to ensure reliable internet connectivity as the speed is slow. They maintain that teachers fail to use internet effectively in teaching due to individual incurred cost of subscribing internet bandwidth. The problem is severe because while the internet service providers strive to reach 4G the internet speed there are areas where even 2G is inaccessible. The situation has multifaceted impacts on teacher's attitudes and interest in the effective use of ICT in classroom situation rather in ensuring social communications.

Therefore, the discussion above ascertains that, regardless the efforts of the government and private partnership vested in integration and use of ICT as a pedagogical tool, there are still detrimental factors that constraint its sustainability. The study therefore established insufficient devices, absence of technological supports, and lack of internet connectivity as major constraints that constrain teachers and learners from using ICT in the classroom. Although the sampled schools had teachers with relatively ICT basics and in-service training, their practical inducement to other working staff has limited impact. The schools with advanced level had students who were oriented to ICT courses but the number is undefined. In order to create learning and information community, both teachers and students need to be part of the innovation. This is because, currently, there are various You Tube channels that render varied ICT skills needed for teachers' smooth integration and its use in education.

#### **5.4 Impacts of ICT Adoption in Pedagogical Processes**

In this objective, the study sought to reveal the impacts of ICT adoption on pedagogical processes in community secondary schools in Serengeti District. As a vital tool used in education, various effects of ICT adoption in pedagogical processes have been revealed in this study as presented in chapter four. From a global perspective, ICT helps people to work individually or collaboratively on different aspects (Vashisht, 2020). The findings showed that 78.3 percent of students and 100 percent of teachers showed that ICT adoption had effects on pedagogical processes. The findings ascertain that ICT adoption is very important in education and has both positive and negative impacts on pedagogical processes.

##### **5.4.1 Enhances Teaching and Learning Processes**

The findings revealed that 27.2 and 80 percent students and teachers agreed that ICT enhanced teaching and learning processes. For a long time, teaching and learning relied on traditional methods such as chalk and board and paper and pencil, teachers used a lot of time and resources in teaching and students in learning. The findings imply that ICT has substituted the traditional teaching approach to participatory learning approach. The findings are in line with the findings from Angadi (2014), Ziphorah (2014) and Bindu

(2016) who found that ICT has changed how the content is delivered from lecture method to collaborative learning. And it promotes the learners' ability to express their knowledge and performance. The inversion of technology and its integration in education has changed the way teachers deliver content in the classroom. It has made the delivery of subjects' syllabus possible within the timeframe. Ziphorah (2014) maintains that the use of ICT enhances self-problem-solving skills along learner-centred approach.

Therefore, the adoption of ICT as a pedagogical tool has changed how materials are delivered in a classroom and speeded up the rate of syllabus completion in time. This in turn, makes teachers and students get enough time to do revisions for better academic performance. Thus, the study recommends that ICT should be adopted in all community secondary schools as the means of new technology through which sharing and interacting with teaching and learning materials are made in a sophisticated manner.

#### **5.4.2 Simplifies Implementation of CBC, Collaboration and Increase Interaction in Learning**

The findings revealed that 80 percent of teachers agreed that ICT simplify the implementation of competence-based curriculum while 11.1 percent of students showed that ICT simplify collaboration and increase interaction in learning. The findings of the study suggest that adoption of ICT in education enhances collaboration and participatory learning. The findings are in line with Mishra and Koelher (2006) and Machumu et al., (2018) who found that TPCK framework enhanced teachers to integrate technology, pedagogy, content and knowledge to achieve the stated educational goals. The framework enables learners to participate in learning actively. ICT enabled teachers to create project-based works that allow learners to cooperate and participate in classroom learning and even at home. The implementation of CBC is achieved in a collaborative and participatory manner when teachers together with students are actively engaging in learning. The use of ICT helps students gain enough time to learn on their own with little assistance from teachers. In addition, the use of ICT as a pedagogical tool enhances effective, active, and participatory teaching and learning.

The findings indicate that teachers can perform multitasks in the classroom to enable learner's have the opportunity of working together through e-learning platforms actively. It is expected that learners' participation will be enhanced in community secondary schools. Moreover, as Bindu (2016) observes, the adoption of ICT as a pedagogical tool has increased teachers' ability to develop learners who express and share their knowledge in a collaborative learning environment. Therefore, the enabling environments for ICT adoption in community schools should be improved for easy and effective adoption.

#### **5.4.3 ICT Enhances the Accessibility of Learning and Instructional Materials**

The findings of the study showed that both teachers and students agreed that ICT enhances accessibility of learning and instructional materials by 80 and 30 percent respectively. Among the major hindrances of education undertakings in secondary schools is absence of adequate teaching and learning materials such as books. ICT use in education simplified the accessibility of learning and teaching materials. The findings are supported by Ghavifekr and Wan Athirah (2015), Bindu (2016), and Vashisht (2020) who found that ICT help teachers and learners to access a variety of instructional and learning resources easily from the world online library. ICT provides educational flexibility where learners can be able to access learning materials anywhere and at any time. In Tanzania, the mushrooming of community secondary schools in 2007 necessitated the accessibility of enough teaching and learning resources. The solution to the question of limited resources against increasing number of students in secondary schools can be better attained when ICT is adopted in the classroom technology. Education is a continuous process that is acquired at school and even at home. Teachers and students can use ICT gadgets like computers, printers, and mobile phones to access different learning materials such as books even at home during weekends or holidays. The cost of walking long distances to buy various texts and reference books is minimized by using ICT devices.

#### **5.4.4 ICT Facilitates Academic Performance**

The findings revealed that 93.2 and 19.4 percent of teachers and students respectively established that ICT facilitates among others academic performance. The findings indicate that majority of teachers see clearly the benefit of ICT adoption however the majority of students did not. Through different e-learning platforms such as *Shule Learning, THL, Tz shule, Tusome pamoja, shule direct* and different educational blogs have enabled students improve their academic performance. The findings are congruent with the findings in a study by Bindu (2016), Holzmann, Schwarz and Audretsch (2020), Zlotnikova et al. (2016) and Simin and Sani (2015) who observed that innovation of science and technology has a significant improvement in students' academic performance. The analysis maintains that students who practice computer-based learning perform better compared to students who learn without technological aid. The current study in Tanzania establishes that when students are well oriented to institutionalise e-learning platforms, blogs and apps, their academic performance is likely to improve. This is because there are different efforts made from primary schools where head teachers and ward educational officers attend different training on the use of tablets to access different information from registration to reporting. For example, in March 2020, Morogoro launched PiXI app as a sharing platform where teachers can access different learning materials, and past papers aiming to improve students' academic performance. However, lack of adequate ICT skills among most teachers limited its use.

#### **5.4.5 ICT Leads to Health Problems**

About 50 percent of students and 90 percent of teachers indicate that a long period use of ICT gadgets such as computers, projectors and smartphones is likely to have health problems such as eyestrain and regular headaches to both teachers and students. The study results are supported by the findings of the study conducted by Bosamia (2013) and seconded by Ghavifekr and Wan Athirah (2015) who found that frequent use of technological tools in learning or any other business leads to health problems such as prolonged headache, eyestrain, diabetes, stress as well as back and neck pains. The development of technology has both positive and negative impacts. In the education environment, teachers and students should take all due precautions when using ICT

gadgets in teaching and learning. However, Ghavifekr and Wan Athirah (2015) have shown that technological use has more positive effects than it had negative effects. Thus, negative effects should not discourage users from using ICT. Health problem can be addressed by taking protective gears that ensures students and teachers' health and safety.

Generally, the above findings indicate that adoption of ICT as a pedagogical tool in community secondary schools has both positive and negative impacts. The effects of ICT on pedagogical processes were enhanced teaching and learning processes, simplify implementation of competency-based curriculum, collaboration and increased interaction in learning, enhance accessibility of learning and instructional materials, and facilitate academic performance.

### **5.5 Chapter Conclusion**

This chapter provides an introductory part of the chapter it then focused on discussion of findings based on the study objectives. These include basic ICT skills, possibilities and constraints and impacts of ICT adoption as a pedagogical tool on pedagogical processes in community secondary schools in Serengeti district.

## **CHAPTER SIX**

### **SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS**

#### **6.1 Introduction**

This chapter presents summary of the study, and conclusions with regard to study objectives. It also delineates policy implications to educational stakeholders and recommendations for further studies.

#### **6.2 Summary of the Study**

The study explored students and teachers' experience in the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district, Tanzania. In achieving the study objective, the following three specific objectives were addressed, to determine students and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool, exploring possibilities and constraints of adopting ICT as a pedagogical tool and examining the impacts of ICT adoption as a pedagogical tool in community secondary schools in Serengeti district. The study used 210-sample size including 180 students and 30 teachers who were selected from five community secondary schools in Serengeti district using simple random sampling and convenient-purposive sampling techniques. The current study adopted descriptive survey design whereby observation checklist, interview guide, and questionnaires used to collect data. Descriptive analysis was employed whereby; qualitative data were transcribed, coded, and presented in frequencies and percentages based on categories of themes. Moreover, quantitative data from questionnaires and observational checklist were analysed descriptively using Statistical Product and Service Solutions (SPSS) version 25. The findings of frequencies and percentages were presented in tables.

The findings revealed that, teachers have varied experiences and basic skills on ICT use as a pedagogical tool. Moreover, students had inadequate skills on ICT use; few who can browse learning materials through ICT were taught in their O' level private schools. Also, the study revealed that most schools in urban centres had possibilities of adopting ICT as pedagogical tools. The available few technological devices such as computers,

teachers' readiness, and positive attitudes were the main determinants. However, inadequate TPCK, inadequate devices, absence of technical support, presence of scrappers and old ICT devices and regular power cuts, limit teachers and students' ability from accessing and using ICT in teaching and learning effectively. Finally, the study findings originate that, ICT has significance relationship with teachers' improvement on PCK and students' academic performance.

### **6.3 Summary of the Major Findings**

The first objective of the study sought to determine students and teachers' basic ICT skills on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district. The findings revealed that many students lack adequate basic ICT skills, only few of them had skills on browsing different learning materials from the internet, using mobile phones and television for communication and computer for learning. Likewise, few teachers had ICT skills for creating multimedia presentations using scanners and LCD projectors, in using computer/tablet for accessing online resources and communicating and choosing information technologies that enhance teaching approaches which help them adopt ICT as a pedagogical tool, however majority of teachers lacked TPCK for effective adoption of ICT in teaching activities.

The second study objective sought to explore possibilities and constraints of adopting ICT as a pedagogical tool. On possibilities, the findings revealed that both teachers and students showed that there were possibilities for ICT use in community secondary schools in Serengeti. Students' findings showed that there were uneven possibilities for adopting ICT in community secondary schools in the district as few identified availabilities of ICT devices and electricity. Teachers' findings revealed that there were limited and uneven possibilities for ICT use as few identified positive attitudes, and perceptions towards the use of technology in education. This shows that ICT is hardly adopted in community schools in Serengeti. On other hand, the findings on constraints for ICT adoption revealed that there were constraints that limit effective adoption of ICT as a pedagogical tool. Similarly, poor infrastructure, lack of ICT devices, and absence of technical support limited ICT undertaking in community schools in Serengeti District.

The third objective sought to reveal the impact of ICT adoption on pedagogical processes in community secondary schools in Serengeti district. The study findings revealed that ICT enhances teaching and learning processes, ICT simplify implementation of competency-based curriculum, collaboration and increase interaction in learning, ICT enhances accessibility of learning and instructional materials, ICT facilitates academic performance and leads to health problems were the major impacts of ICT adoption in community secondary schools.

#### **6.4 Conclusions of the Study**

Relying on objectives of the current study, the following conclusions are made.

##### **6.4.1 Basic ICT Skills for ICT Adoption**

Findings conclude that, regardless the significance of ICT integration in education, the adoption is still negligible in public schools. The findings indicated that teachers had varied experience on ICT adoption as a pedagogical tool. However, they had computer skills, they lacked technological content on pedagogical skills and knowledge on how to choose appropriate device for appropriate subject content. Similarly, it can be concluded that, most of the students have inadequate ICT skills for their learning activities. Few of them can only browse different learning materials from the internet and communicate with their teachers and fellow students in and out of their schools because they were taught in O'level private schools. Thus, the use of smart phones in searching learning materials and communicating were common phenomenon to teachers and students, although there is no permission for students to possess such gadgets at school.

##### **6.4.2 Possibilities and Constraints for Adopting ICT as a Pedagogical Tool**

Although teachers and students acknowledge that ICT is constrained by various factors, still it is important pedagogical tool in secondary schools due to its impacts in education performance. The study findings conclude that, students and teachers have positive attitudes towards technology use. They showed passionate and readiness to use ICTs in teaching and learning because other schools had already basic determinants for ICT

adoption as they had access to electricity power. Indeed, the available constraints such as inadequate ICT devices, lack of technological competent and inadequate technical support. The government should therefore invest adequately in both urban and rural schools. This will reduce the digital divides among teachers and students in the use of ICT.

#### **6.4.3 Impacts of ICT Adoption in Pedagogical Processes**

The study findings in this objective concluded that, ICT was significance on teachers' teaching and students' learning process. ICT has both positive and negative impacts on pedagogy; however, positive impacts surpass negative ones because it facilitates teaching and learning along learner centred approach on the expenses of inadequate learning materials over crowded classes. It can further be concluded that developing countries such as Tanzania, should adopt ICT in education as the best way of addressing the questions of inadequate teaching resources and facilities due to high number of enrolments.

#### **6.5 Implications of the Study**

This study has various implications to various educational stakeholders. The implications focus on both theoretical and practical viewpoints. On theoretical part, it presents the theory used in the current study while practical implications focus on the significance of the study to educational stakeholders involving teachers, students, and policy makers for action.

##### **6.5.1 Theoretical Implication**

The current study adopted constructivism theory that emphasises on freedom of an individual in constructing and sharing knowledge. The theory has implication that, the collection of data considered teachers and students views. Their perceptions, views, and opinions had helped the compilation of the basic skills, possibilities, and constraints on ICT use that teachers and students have in enhancing their teaching and learning process. The constructivism theory under the current study implies that, the problem and solution can be better addressed when grounded in real contexts. Therefore, the

recommended made for action will be only attained when all parts are engaged collaboratively involved in laying down strategies towards the adoption of ICT as a pedagogical tool.

### **6.5.2 Implications for Teachers**

The study implies that majority of teachers are aware of the advantage of ICT in education. It is clear that only few teachers possess ICT basic skills that help them in teaching. However, majority of teachers prefer traditional teaching approach as they lack TPCK, which is an important skill required for effective integration of ICT in teaching processes. Due to such circumstance, teachers have a great opportunity of ensuring that the adoption of ICT as a pedagogical tool throughout secondary schools when they are passionate and ready for it. To make this happen, teachers should encourage themselves to carry out indoor training along the school as the means of spiralling their TPCK. They are supposed to be proactive to keep pace with new technological changing world by creating their own ICT platforms such as apps and blogs to share issues related to prosperity of competences on integrating ICT as pedagogical tool.

### **6.5.3 Implications for Students**

The study implies that students are significant counterparts in teaching and learning process. Their inefficient skills in an ICT integrated learning environment prevent them from participating fully in academic arena. Students need guidelines and guidance on how to interact with educational sites in using technology in academic purposes. If they use the technology appropriately, their academic performance would be improved. Hence, they should be encouraged to use social networks platforms such as students' apps and blogs to communicate education affairs.

### **6.5.4 Policy Implications**

The study findings imply that there are contradictions between 2007 ICT policy for basic education and education Act 25 of 1978 over the possession of ICT gadgets. While the policy encourages the use of ICT in education, students are not allowed to possess ICT gadgets such as phones and computers at school. This prohibition implies a digital

divide among teachers and students. Therefore, the implementation of the policy remains in print not in practice. To achieve the broad government plans for Tanzanian Development Vision (TDV) of 2025 requires education to be a tool of economic transformation through technology; policy makers should make ICT policy more practical. They should lay down clear guidelines and strategies to be undertaken in education regarding both teachers and students. The policy makers should inform the government through curriculum planners to consolidate ICT studies in secondary schools as a compulsory subject as opposed to teaching it to a few piloted schools in urban leaving schools in the peripheral rural areas. Indeed, teachers should be given regular in-service training to spiral their TPCCK for their professional growth.

#### **6.6 Limitations and Area for Further Studies**

The current study focused on exploring students and teachers' experiences on the adoption of ICT as a pedagogical tool in community secondary schools in Serengeti district. This study was limited to descriptive design with mixed research approach to increase the study confidence level. In addition, because this study was confined to only five schools in Serengeti district out of 31 community secondary schools.

Similarly, because this study was conducted in only one district in the country, thus the study recommends that;

- i. Similar study with different participants from different districts different approach and different data collection procedures should be conducted to include a large population in order to see if teachers and students perceive the same.
- ii. Similar study can also be conducted in the same location to assess the effectiveness of ICT along enhancing content knowledge in the classroom situation. This implies that, a similar study should be conducted to assess how teachers can integrate ICT in classroom situation to check its practicability.
- iii. Indeed, the current study did not consider policy inclusion. Therefore, other studies in the same field can be done by integrating the inclusion of ICT materials for students with special educational needs so as to keep pace with the Tanzanian Educational and Training Policy (ETP) of 1995 and 2014.

## **6.7 Chapter Conclusion**

The chapter presented the study summary, conclusions, and policy implications. Categorically the chapter started with the chapter introductory part followed by study summary, summary of the major findings, study conclusion based on study objectives, implication of the study on theory to teachers, students and to the policy. Lastly, the chapter ended with limitation and suggestion for area for further studies.

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## APPENDICES

### Appendix 1: Estimated Budget

The researcher will depend on own source of income where Tsh. **2,977,000/=** is expected to be used in this study. The budget is estimated as follows:

S/N	ITEM	AMOUNT	AMOUNT (TSH.)	TOTAL
1.	<b>Preparation of proposal:</b>			
	Ream paper	2 PC @12, 000 X 2	24,000/=	
	Printing	75 Pp @100 X 75	7,500/=	
	Binding (simple)	4 Copies @5000 X 4	20,000/=	
	<b>Subtotal cost</b>			<b>51,500/=</b>
2.	Transport		250,000/=	
3.	Meal allowance	6 months @ 170,000	1,020,000/=	
	Accommodation	6 months @ 70,000	420,000/=	
4.	Contingency money		300,000/=	
5.	Data analysis		650,000/=	
	<b>Subtotal cost</b>			<b>2,640,000/=</b>
6.	<b>Preparation of research report:</b>			
	4 copies @ 100 X 190		76,000/=	
	Printing 190 Pp	4 copied @ 40,000	160,000/=	
	Binding (Book)	2 @ 25,000	50,000/=	
	CD making			
	<b>Subtotal cost</b>			<b>286,000/=</b>
	<b>Grand total</b>			<b>2,977,000/=</b>

**Appendix 2: Proposed Schedule of Activities.**

ACTIVITY	2018				2019			
	SEPT EMB ER	OCT OBE R	NOV EMB ER	DECE MBE R	JANU ARY	FEBR UARY	MARCH	APRIL
Proposal writing, presentation and submission								
Proposal assessment and pilot study to test research tools								
Actual data collection								
Data entry and analysis								
Report writing and presentation								
Incorporating comments, binding final report and submitting a dissertation								

### Appendix 3: Questionnaire for Secondary School Students

Dear student(s), my name is Mwema M. Warioba, a Master Degree candidate at Mzumbe University in Morogoro region, Tanzania. Meanwhile conducting a study on ***“Adoption of ICT as a pedagogical tool in community secondary schools in Tanzania. A case of Serengeti district”***. Please, kindly respond to the following questions in this questionnaire which are very important for the attainment of the study goals. The data given will be confidential and used for this study only. Also, findings of this study will be used for the sake of the research and in improving the state of technology use in community secondary schools in Serengeti district and Tanzania generally.

Thanks for understanding.

#### Personal Particulars

i. School Name/Code No. \_\_\_\_\_

ii. Sex (Tick that apply)

Male	Female
<input type="checkbox"/>	<input type="checkbox"/>

#### Section A: Availability, Access and Skills

1. Which ICT device is mostly available at your school? (Tick the mostly available device)

Device	Tick	Device	Tick
Desktop computer	<input type="checkbox"/>	Television (TV)	<input type="checkbox"/>
Laptop Computer	<input type="checkbox"/>	LCD Projector	<input type="checkbox"/>
iPad/Tablet	<input type="checkbox"/>	Radio	<input type="checkbox"/>
Smart phone	<input type="checkbox"/>	Internet services	<input type="checkbox"/>
<b>Other (please specify):</b>			

2. Which technological device that you are mostly accessible to at your school? (Tick one)

Device	Tick	Device	Tick
Desktop computer		Television (TV)	
Laptop		LCD projector	
Tablet		Radio	
Smart phone		Internet services	
Another (please specify):			

3. What Basic skills or ability do you have which helps you to use technological devices in learning? (Tick the highest skill that you have).

Basic skills / ability	Tick
Ability to browse materials on internet	
Skills to use computer in learning	
Skills to use TV or Mobile phone to enhance learning at school	
Ability to send email	
Skills to use Ms office application in learning e.g. Ms word	
Ability to save files	
Use social network e.g. WhatsApp, Facebook, blogs	
<b>Other (please specify):</b>	

**Section B: Possibilities, Impacts and Constraints**

4. What are the possibilities for you to use ICT in your school? (Tick the most available possibility)

Possibility	Tick
Availability of technological devices (e.g. computer).	
Positive attitude in technology use	
Availability of technical support	
Presence of reliable electricity	
<b>Another (please specify):</b>	

5. (a) Technological devices have any impact on learning processes?

Yes \_\_\_\_\_ No \_\_\_\_\_ (Tick that apply)

(b) If yes, what are the impacts (please mention)

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6. If you are using technology in learning, please indicate the constraints/challenges you are experiencing (Please tick)

No.	Constraints/change	Tick
i.	Inadequate of ICT skills	
ii.	Lack of technical devices e.g. computers	
iii.	Lack of technical support	
iv.	Negative attitude towards technology use	
v.	Presence of poor ICT infrastructure	
vi.	Absence of internet connectivity	
vii.	<b>Other (please specify):</b>	

**Thanks**

#### Appendix 4: Teachers' Questionnaire

Dear teacher (s), my name is Mwema M. Warioba, a Master Degree candidate at Mzumbe University in Morogoro region, Tanzania. Meanwhile I am conducting a study on *“Adoption of ICT as a pedagogical tool in community secondary schools in Tanzania. A case of Serengeti district”*. Please, kindly respond to the following questions in this questionnaire which are very important for the attainment of the study goals. The information gathered will strictly be treated as confidential. Also, findings of this study will be used for the sake of the research and in improving the state of technology use in community secondary schools in Serengeti district and Tanzania.

Thank you.

#### **Part A: Demographic information**

1. Kindly enter your school code.....

2. Sex (Tick that apply)

Male	female
<input type="checkbox"/>	<input type="checkbox"/>

3. Working experience (Tick that apply)

<b>1-3yrs</b>	<b>4-7yrs</b>	<b>8 and above</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Part B: Availability and Skills/knowledge of ICT use**

4. Which ICT devices are mostly available at your school? (Please tick)

Device	Tick	Device	Tick
Desktop		Smartphone	
Laptop		Tablet	
Tablet		Television	
LCD Projector		DVD player	
Radio			
Other (please specify):			

5. Kindly use the rating scale to tick the number that best describe your level of ICT skills/ability that you possess which help you in teaching and learning processes besides the given statements.

Use the following rate scale:

**4 = Well skilled, 3 = Moderate skilled, 2 = Poorly skilled and 1 = Not skilled at all**

No	ICT skill/ ability	Rating Scale			
		1	2	3	4
i.	Ability to use computers and LCD projector for making multimedia presentations				
ii.	Ability to use ICT gadgets like computer for accessing online teaching resources (i.e. accessing the internet)				
iii.	Skills to use Ms Office applications to prepare teaching materials, students' reports, lesson plans and schemes of work				
iv.	Ability to enhance instruction by using computers, interactive media, audio/video conferencing.				
v.	Ability to use ICT in different ways to assess student learning i.e. preparing tests and exams				
vi.	Skilled in choosing appropriate ICT for a specific lesson content delivery and improve what students learn				
vii.	Skilled in technological content knowledge, pedagogical content knowledge and technological pedagogical knowledge.				

**Part C: Possibilities, Constrains and Impacts of ICT use**

6. What environment/ factor that make possible the use of ICT in your school? (Tick that apply)

No	Possibility/ Factor	Tick
i.	Positive attitude/perception toward ICT use in education	
ii.	Presence of technical support	
iii.	ICT competence	
iv.	Availability of reliable power source i.e. Electricity	
v.	Presence of technological devices like computers, projectors, printers	
vi.	<b>Other (Please specify):</b>	

7. (a) In your experience are there any constraints/challenges/ problems which hinder you in using ICT in your school? **Yes** \_\_\_\_\_ **No**\_\_\_\_\_ (Please tick)

(b) If 'Yes' in (a) above, please mention

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8. How do you rate the impacts of ICT adoption as a pedagogical tool based on the following statements? (Tick the number that best describe your answer against each statement)

Use the following rating scale:

**1 = Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly agree**

No	Impact	Rating Scale			
		1	2	3	4
	Can increase student's academic performance				
	It enables implementation of Competence Based Curriculum (CBC)				
	Increase laziness and brain dependency to technology				
	Encourages students to actively involved in learning				
	Enhance easy accessibility of teaching and learning materials (e.g. Electronic Books, learning videos etc.)				
	Promote individuals to develop their learning skills and ability to work with others				
	Makes classroom management more difficult				
	Increase the desire to learn new technological knowledge				

**Thank you for your participation**

## Appendix 5: Classroom Observation Checklist

NAME OF THE SCHOOL: \_\_\_\_\_

### Introduction

This classroom observation checklist is primarily meant to observe presence of ICT devices and services in schools/classroom. A tick (√) in column '1' indicate that the device is presence and a (√) in column '0' indicate that the device is absent.

No	Observational Item	Rating	
		1	2
1	Presence of ICT device	Desktop computer	
		Laptop computer	
		Projector	
		Printer	
		Radio	
		Television	
		Tablet	
		DVD Player	
		White interactive board	
		Smartphone	
2	Services	Internet	
		electricity	
		Maintenance	

**Thank you**

## **Appendix 6: Teachers' Interview Guide**

School Name: \_\_\_\_\_

Beloved teacher (s), my name is Mwema M. Warioba, a Master's Degree candidate at Mzumbe University in Morogoro region, Tanzania. Meanwhile I am conducting a study on *“Adoption of ICT as a pedagogical tool in community secondary schools in Tanzania. A case of Serengeti district”*. Please, kindly respond to the following questions which are very important for the attainment of the study goals. The data you provide will strictly be treated as confidential. Also, findings of the study will be used for the sake of the research and in improving the state of technology use in community secondary schools in Serengeti district and Tanzania in general.

Thank you very much for your understanding.

### **Questions**

- i. What are the basic ICT skills do you possess that helps you to easily use ICT in teaching?
- ii. A) In your experience, what do you think are the possibilities in your school that allows the use of?  
B) Can you at least mention some barriers which hinder effective use of technologies in classroom teaching and learning activities at your school?
- iii. Do ICT use has impacts on teaching and learning processes? What are those impacts?
- iv. What do you think will be the solutions for the challenges facing ICT adoption in learning at your school?

**Thank you**

## Appendix 7: Clearance letter from Mzumbe University



### OFFICE OF THE DEPUTY VICE CHANCELLOR (ACADEMICS)

E-Mail: [vc@mzumbe.ac.tz](mailto:vc@mzumbe.ac.tz)  
Tel: +255 023 2931212  
Fax: +255 023 2931213  
Cell: +255 0754694029  
Website: [www.mzumbe.ac.tz](http://www.mzumbe.ac.tz)

P.O. Box 1  
Mzumbe  
TANZANIA

Ref. No. MU/DPGS/INT/38/Vol. IV/69

Date: 16<sup>th</sup> December, 2019

**TO WHOM IT MAY CONCERN**

**RE: INTRODUCTION OF MR. MWEMA MACHAGE WARIOBA**

The bearer of this letter Mr. Mwema Machage Warioba whose registration number is 15408138/T.18 is a postgraduate student at our University (Mzumbe University) pursuing **Master of Art in Education (MA-EDU)**. As part of requirements for completion of his studies, he is collecting information on: **ADOPTION OF ICT AS A PEDAGOGICAL TOOL IN COMMUNITY SECONDARY SCHOOLS IN TANZANIA: A CASE OF SERENGETI DISTRICT.**

This letter serves to achieve three purposes. Firstly, to introduce him to you, secondly, to request you to grant him permission to undertake the mentioned research at your Organization, and thirdly to request you to facilitate any form of assistance he might need in order to successfully pursue this noble exercise at your organization. We can assure you that this activity is entirely for academic and will never be used for any other purposes.

We trust that you will accord our student with necessary assistance.

Sincerely yours,

Dr. Fred Alfred (PhD)

**FOR: DEPUTY VICE CHANCELLOR (ACADEMICS)**

QUOTATION OF REF. NO IS ESSENTIAL

## Appendix 8: Permission letter from Serengeti District Executive Director

### SERENGETI DISTRICT COUNCIL

*Mara Region :*  
*Tel. No. 0732-985408*

*Fax:Na.0732-985408*  
*E-Mail:serengetidc@gmail.com*



District Executive Director's Office,  
(Administration Department)  
P.O.Box 176,  
Mugumu/Serengeti.

*In reply please quote:*  
*Ref. N0.SDC/T.40/26/56*

Date: 15/01/ 2020

Fred Alfred (PhD),  
For: Deputy Vice Chancellor (ACADEMICS),  
P.O.BOX .01,  
**MZUMBE.**

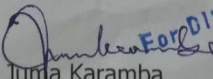
**Ref: YOUR REQUEST TO CONDUCT RESEARCH (FIELD) AT SERENGETI DISTRICT COUNCIL FOR MR. MWEMA MACHAGE WARIOBA.**

Please attention is made to the above heading; also refer your letter **dated on 16<sup>th</sup> 09/2019 with Ref. N0.MU/DPGS/INT/38/VOL.69.**

We are happy to inform you that your request regarding research training for the student namely **MWEMA MACHAGE WARIOBA**. has been granted to practice at **SERENGETI DISTRICT IN EDUCATION DEPARTMENT** collection information on: "**ADOPTION OF ICT AS A PEDAGOGICAL TOOL IN COMMUNITY SECONDARY SCHOOLS IN TANZANIA**".

However, our Institution does not provide any emoluments to students during their practical training.

Yours sincerely,

  
Junja Karamba

For: District Executive Director

DISTRICT EXECUTIVE DIRECTOR  
SERENGETI

**C. MR.MWEMA MACHAGE WARIOBA**