FACTORS INFLUENCING INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY IN TEACHING GEOGRAPHY IN SECONDARY SCHOOLS IN RACHUONYO SOUTH SUB-COUNTY, KENYA

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DECLARATION

This research project is my original work and has not been presented for an award in any institution.

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DEDICATION

This project is dedicated to my parents Mr.Peter Ojwang' and Mrs. Pamela Ojwang, my siblings, Ann Adhiambo, Festus Rady and Michael Were.

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TABLE OF CONTENTS

DECLARATION ..... **ii**
DEDICATION ..... **iii**
ACKNOWLEDGEMENTS ..... **iv**
TABLE OF CONTENTS ..... **v**
LIST OF TABLES ..... **ix**
LIST OF FIGURES ..... **xi**
ABBREVIATIONS AND ACRONYMS ..... **xii**
ABSTRACT ..... **xiii**

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study 1
1.2 Statement of the Problem 7
1.3 Purpose of the Study 9
1.4 Objectives of the Study 9
1.5 Research Questions 10
1.6 Significance of the Study 11
1.7 Limitation of the Study 11
1.8 Delimitation of the Study 11
1.9 Assumption of the Study 12
1.10 Definition of Significant Terms 12
1.11 Organization of the Study 13

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction 14
2.2 The Concept of ICT Integration in Education 14
2.3 Teachers' Level of ICT Literacy and Integration of ICT in Teaching of Geography 15
2.4 Teachers' Pedagogy and Integration of ICT in Teaching of Geography 16

2.5 Teachers' Attitude Towards Use of ICT and Integration of ICT in Teaching of Geography....18
2.6 Formulation of Students' Assessments and Integration of ICT in Teaching of Geography....19
2.7 Summary of Literature Review....20
2.8 Theoretical Framework....22
2.9 Conceptual Framework....24

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction....26
3.2 Research Design....26
3.3 Target Population....27
3.4 Sample Size and Sampling Procedures....27
3.5 Research Instruments....29
3.5.1 Validity of Instruments....31
3.5.2 Reliability of the Instruments....31
3.6 Data Collection Procedures....32
3.7 Data Analysis....33
3.8 Ethical Considerations....34

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction....36
4.2 Questionnaire Return Rate....36
4.3 Demographic Information....37
4.3.1 Gender Distribution of Respondents....37
4.3.2 Age Distribution of Geography Teachers and Students....38
4.3.3 Respondents' Academic Qualifications....39
4.3.4 Teaching Experience....41

4.4 Teachers' Level of ICT Literacy and Integration of Information Communication Technology....42
4.4.1 Teachers Responses on Teachers' Level of ICT Literacy and Integration of Information Communication Technology....44
4.5 Teachers' Pedagogy and Integration of Information Communication Technology....47
4.5.1 Geography Teachers Responses on Teachers' Pedagogy and Integration of Information Communication Technology....47
4.6 Teachers' Attitude towards ICT and Integration of Information Communication Technology....59
4.6.1 Teachers Responses on Teachers' Attitude towards ICT and Integration of Information Communication Technology....60
4.7 Formulation of Students' Assessments in Geography and Integration of Information Communication Technology....64
4.7.1 Teachers Responses on Formulation of Students' Assessments and Integration of Information Communication Technology....64
4.8 Geography Teachers' Views on Integration of Information Communication Technology....72
4.9 Relationship Between Independent Variables....73
4.9.1 Relationship between Independent Variables....71
4.9.2 Relationship between ICT Integration and Teachers ICT Literacy, Teachers' Pedagogy, Teachers Attitude and Formulation of Students Assessment....74

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction....77
5.2 Summary of the Study....77

5.2.1 Influence of Teachers' Level of ICT Literacy Influences Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County 79
5.2.2 Influence of Teachers' Pedagogy on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County, Kenya 79
5.2.3 Influence of Teachers' Attitude on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County, Kenya 80
5.2.4 Influence of Formulation of Students' Assessments in Geography on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County Kenya..... 80
5.3 Conclusion 81
5.4 Recommendations 82
5.5 Suggestion for Further Study 83
REFERENCES 84
APPENDICES 88
Appendix I- Letter of Introduction 88
Appendix II: Questionnaire for Teachers 89
Appendix III: Questionnaire for Students 97
Appendix IV: Interview Schedule for Principals 101
Appendix V: Observation Checklist 102
Appendix V: Research Permit 104

LIST OF TABLES

Table 1. 1 Number of Computers and Projectors in Secondary Schools in Rachuonyo South Sub-county 6

Table 3. 1 Sampling framework correlational research designs 28

Table 4. 1 Questionnaire Return Rate 36
Table 4. 2: Gender Distribution 37
Table 4. 3: Distribution of Respondents' Age 38
Table 4. 4: Distribution of Geography Teachers Academic Qualifications 39
Table 4. 5: Teaching Experience 41
Table 4. 6: Level of Expertise in ICT Related Areas 42
Table 4. 7: Teachers Response on Integration of Information Communication Technology 44
Table 4. 8: Students knowledge on computer use 46
Table 4. 9: Teachers Pedagogy 47
Table 4. 10: Students Response on Teachers Pedagogy 48
Table 4. 11: Teachers Response on Advantages of ICT Integration 49
Table 4. 12: Students Response on Advantages of ICT Integration 50
Table 4. 13: Teachers Response on ICT Integration Frequency 55
Table 4. 14: Students Response on ICT Integration Frequency 56
Table 4. 15: ICT Equipment 57
Table 4. 16: Teachers' Attitude towards ICT and Integration of Information Communication Technology 61
Table 4. 17: Teachers Response on Formulation of Students' Assessments and Integration of Information Communication Technology 64
Table 4. 18: Students' Response on Formulation of Students' Assessments and Integration of Information Communication Technology 65
Table 4. 19: Teachers Response on Connectivity of Internet to the ICT Equipment 67
Table 4. 20: Students' Response on Connectivity of Internet to the ICT Equipment 68
Table 4. 21: Teachers' Response on How They Cope during Power Failure 69
Table 4. 22: Students' Response on How They Cope during Power Failure 70
Table 4. 23: Teachers' Response on Integration of Information Communication Technology 72
Table 4. 24: Relationship between Independent Variables 73

Table 4. 25: Relationship between Dependent and Independent Variables..... 74
Table 4. 26: Relationship between Independent Variables..... 75
Table 4. 27: Coefficients of ICT Integration and Teachers ICT Literacy, Teachers' Pedagogy, Teachers Attitude and Formulation of Students Assessment..... 75

LIST OF FIGURES

Figure 2.1: Conceptual framework 25

ABBREVIATIONS AND ACRONYMS

CD	Compact Disk
CDF	Constituency Development Fund
CESA	Continental Education Strategy for Africa
CFSP	Computer for School Project.
DVD	Digital Versatile Disk
ESP	Economic Stimulus Program
GITR	Global Information Technology Report
ICT	Information Communication and Technology.
KICD	Kenya Institute of Curriculum Development.
KNEC	Kenya National Examination Council
MoE	Ministry of Education
NACOSTI	National Council for Science, Technology, and Innovation.
PC	Personal Computer
SPSS	Statistical Package for Social Science
TPACK	Technology Pedagogical competent Knowledge
TPD	Teacher Professional Development
TSC	Teachers Service Commission.
UNESCO	United Nations Educational Scientific and Cultural Organizations

ABSTRACT

The purpose of this study was to investigate factors influencing integration of information communication technology in teaching Geography in secondary schools in Rachuonyo South Sub-County, Kenya. The objectives of the study were; to establish the extent to which teachers' level of ICT literacy, teachers' pedagogy, teachers' attitude and formulation of students' assessments in Geography influence integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya. The study adopted descriptive and correlational research designs. It targeted 32 principals, 128 Geography teachers and 1,378 form four students in Rachuonyo South Sub-County, Kenya. The sample composed of 10 principals, 39 Geography teachers and 138 form four Geography students from selected schools. The tools used for collecting data comprised of observation check list, interview guide and questionnaires. The university supervisors checked and advised on the instruments to ensure their validity. The reliability of the instruments was achieved through test-retest method. Data was analyzed through descriptive and inferential statistics. Quantitative and qualitative data were analyzed by correlation and regression through mean and standard deviations. The results were presented in tables of percentages and frequencies. Statistical Package for Social Sciences version 23.0 was used for data analysis. The major findings of the study were as follows; from the first objective, it was established that teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography. From the second study objective, it was established that teachers' pedagogy influences integration of information communication technology in teaching of Geography. From the third study objective, it was established that teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography. From the fourth study objective, it was established that formulation of students' assessments in Geography influences integration of information communication technology in teaching of Geography. This study concludes that integration of information communication technology in teaching Geography is influenced by teachers' level of ICT literacy, teachers' pedagogy, teachers' attitude, and formulation of students' assessments. The recommendations are as follows; the ministry of education should avail enough computers in schools and also to ensure stable internet connection for easy and effective access of teaching and learning materials. Curriculum developers should design teachers' pre-service and in-service training programs that promotes effective integration of ICTs in teaching and learning of geography. The school principals should be aware of educational national ICT policies as this would enable them develop school ICT polices that would ensure proper integration of ICTs in teaching and learning of geography.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Information, communication and technology (ICT) has been of great importance to the 21st century society. The society is highly depending on information for progress and development with Knowledge on ICT as the main driving force. Daily usage of ICT include, online reading of newspapers, booking of planes, browsing on internet, sending of e-mails, accessing e-books, e-library, and digital repository among other uses. This requires human resource with the ICT capabilities, imaginative, creative and critical thinking individuals who can enable effective and efficient learning of the current knowledge (Al-Hariri, Mohammed and Abdulghani, 2017).

Use of ICT for instruction especially in Geography instruction aids in simulating and modeling geographical environments, enable creation of online classes, motivates learners and promotes learner centered learning. It also helps in solving the challenges of shortage of teachers and of high teachers' workload. Due to these benefits, many nations worldwide have adopted the use of ICT in classroom instruction, though they are faced with various challenges (Kent & Philips, 2019).

Most nations have seen the need of integrating ICT in teaching and learning programs due to its crucial role in the achievement of international education

commitments such as Education for All objectives and Sustainable Development Goals, for instance it aids in achieving the fourth goal of Sustainable Development which aims at provision of quality education and to promote continuous learning for everyone. Many nations have adopted the digital literacy programs in their education sectors which aims at improving students' skills and classroom participation. However, the rate at which nations integrate ICT in classroom instruction varies from nation to nation and is met with various teacher related challenges among other obstacles (Sutter and Kihara, 2019).

Sweden and Singapore for instance despite being among the top nations as per the Global Technology Ranking Report (GTRR), (2017-2019), are still experiencing the challenge use of ICT in classroom instruction due as a result of teachers negative attitude towards technology. Teachers who are pessimist in relation to use of technology, rarely employ the use of ICT for instruction and this hinders a country's progress in relation to adoption and of use of ICT (Arkorful & Aboagye ,2021).

Regionally, high number of ICT illiterate teachers has posed a challenge to both developing and developed nations in their effort of integrating ICT in teaching. In South Africa for instance, due to high number of ICT illiterate teachers employed in various education institutions, the government developed a policy of equipping and assisting every teacher to apply ICT in teaching and learning. The policy was

aimed at achieving African Education Strategy (CESA 16-25) whose objective is to develop Africans who can aid in the achievement of the Continent's sustainable development agenda (Mwapwele, Marais, Dlamini, & Van ,2019).

In Tanzania, integration of pedagogy, content and technology in teaching has been a challenge to most teachers. Teachers have the content knowledge, but most teachers have a challenge of integrating content, pedagogical and technological knowledge for effective instruction. The Tanzanian government therefore introduced the TPACK framework into the country's policy of basic education. TPACK framework is aimed at increasing teachers' uptake of ICT skills in instruction of learning areas such as English, Geography, and science subjects. In addition, the country faces other challenges such as, inadequate computer gadgets and shortage of electricity supply among other challenges (Malekani & Andrew, 2018)

For over fifteen years, the Kenyan Government has been keen to utilize ICT with an aim of improving education quality with little success. The Kenyan Government have funded the design and development of e-government strategy, out of which an ICT policy was developed which developed standards for use of refurbished ICT gadgets in secondary schools. To ensure use of ICT for instruction in secondary schools, the government has devoted huge amounts of money for purchase of ICT gadgets, for example, through the computer for

School Project (CFSP) which led to distribution of several computers to public secondary schools in addition to training of 300 trainers and 180 ICT champions. The government had been continually allocating finance for purchase of ICT gadgets and training of teachers under the stimulus program (ESP) (KEMI, 2019).

Most Kenyan schools are connected to electricity through the government rural electrification project. The schools have also received computers through; CDFs, NGOs and through the school's own means. Despite of all these efforts of equipping the schools with ICT equipments, a survey by the education saga in charge of development of the curriculum, KICD (2018), revealed that most schools were endowed with the computers, laptops and tablets, but were rarely using ICT in instruction. Teachers' ICT illiteracy and negative attitudes towards ICT were some of the factors attributed to low use of ICT in schools (Ngwacho, 2019). Mwendwa (2018), on the other hand hold the view that use of ICT in classroom instruction fails as a result of the government top down approach where most reforms and policies in education are made and implemented without consideration of the teachers' perception, attitude and relevant knowledge.

Anyango (2019) established that use of ICT for geography instruction adds value to instruction process as ICT aids in simulation of various geographical environments. He observed that use of PowerPoint presentations including videos motivates students to participate in class. Kenya national examination report of

2020 on Geography papers affirms Anyango's (2019) findings as the report recommended that Geography teachers should incorporate ICT into teaching of abstract Geographical concepts such as land forming processes, internal structure of the Earth, the solar system among other concepts.

According to the report, use of ICT would lead to a change from instruction process that is teacher centered (knowledge dissemination) to an instruction process that is learner centered (knowledge creation) (KNEC report on Geography paper,2020, pp.15 & 20).The importance of learning Geography in secondary schools in the 21st century society should not be ignored as it forms a basis for further study leading into geography related careers such as climate change analyst, geomorphology, soil conservationist and climatology among other careers which may help in solving today's challenges of global warming, among other challenges (Mwanda, Midigo & Maundu, 2017).

The situation in Rachuonyo South Sub-county is not of any difference in relation to availability of ICT equipments and electricity supply in schools. Most schools are equipped with ICT facilities such as computers and projectors through government projects, CDFs, NGOs and the schools own means , however, the ICT equipments are mostly used for administrative purposes and entertainment in schools rather than for teaching (Mwanda et.al, 2017). Many studies that have been done in other parts of Kenya on integration of ICT in teaching and learning

process in public schools are general studies with only few reference to specifics subjects such as Geography (Kinyali, Paul & Mutemi 2018; Musumba, 2019 and Mwendwa, 2018) , however, these studies cannot be generalized to Rachuonyo South Sub-County due to contextual difference. There is therefore a need for a study to be done in Rachuonyo South-Sub County on factors influencing integration of ICT in teaching of Geography despite availability of ICT equipments as shown in table 1.1

Table 1. 1 Number of Computers and Projectors in Secondary Schools in Rachuonyo South Sub-county

School	**Computers**	**Projectors**	**School**	**Computers**	**Projectors**
Saye mixed	8	2	Sino	6	1
Nyahera	6	1	Dol	3	0
St. Anns	10	2	Nyabola girls	3	1
St. Georges	4	1	Kwoyo	9	2
Nyangiela	13	2	Yala Kotieno	8	1
AgoroMixed	6	1	Kokwanyo	4	1
Ombek	5	1	Nyalenda	7	1
Nyakiya	4	1	Mithui	6	1
God Agak	6	1	Kodera	8	1
Nyatindo	8	1	Kachieng	7	1
Kalanding	3	1	Adega	5	1
Oyugis	5	1	Obisa	3	1
Aolo Girls	3	1	Kalusi	6	1
Nyafare	4	1	God Agulu	3	0

Kosele	6	1	Karabok	6	1
Agoro high	40	4	Wire	25	3

Source: Rachuonyo South Sub-county Education statistics booklet, 2019, page 28-29.

1.2 Statement of the Problem

Information, communication technology integration in instruction in secondary schools in Kenya still remain below 50% global threshold despite the government strategies that have been employed aimed at improving education quality through use of ICT (Sutter and Kihara, 2019)

From table 1.1 (Rachuonyo South Sub-county education statistics booklet, 2019, pp. 28-29) it is evident that in Rachuonyo South, all public schools have computers and projectors with exception of two schools that do not have projectors. In addition a study done by Ojuok, Gogo & Olel (2020) established that more than 75% of public secondary schools in Rachuonyo South have adequate ICT facilities such as laptops, computers, Tvs among others.

The government's economic stimulus program led to the funding of five schools for construction of ICT infrastructure and teachers' capacity building, in Rachuonyo South. The program further led to training of 324 teachers in April 2018, including teachers from the sub-county. Computer Trust fund also led to

distribution of computers in six schools within the sub-county. In addition schools have also been sponsoring their teachers for ICT training workshops organized by ministry of education and other stakeholders whose goal is not only to improve the uptake of education but also its quality (Ojuok et.al, 2020).

Despite of all these efforts, data from Rachuonyo south sub-county education statistics booklet of 2019 on page 31, shows that only four schools are integrating ICT for instruction out of a total of 32 schools. This signifies that above 87% of public secondary schools have not embraced the use of Information Communication Technology for instruction despite the numerous strategies employed by government and other stakeholders in an effort to equip schools with ICT facilities in addition to training of teachers to embrace technology.

In addition, the KNEC 2020 geography report, recommended use of ICT for instruction due to its various benefits such as increasing students' retention of concepts among other benefits, failure to use ICT would disadvantage geography students as they would not be able learn from simulated geographical contents through videos like other students whose teachers use ICT and this may lead to low mastery of concepts leading to scoring of poor grades .This may discourage students from enrolling for Geography related courses such as climatology and meteorology among others, which are very essential in solving todays' environmental challenges such as global warming . This study therefore sought to

investigate factors influencing integration of ICT in Geography teaching in secondary schools in Rachuonyo South sub-county with a large percentage of schools having ICT facilities but do not integrate them in teaching of Geography.

1.3 Purpose of the Study

The study investigated factors influencing integration of information communication technology in teaching Geography in secondary schools in Rachuonyo South Sub-County, Kenya.

1.4 Objectives of the Study

The study aimed at achieving the following objectives;

i) To determine how teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya.
ii) To examine how teachers' pedagogy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya
iii) To determine ways in which teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya

iv) To examine how formulation of students' assessments in Geography influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya

1.5 Research Questions

The study sought to answer the following research questions;

i) How do teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya?

ii) How do teachers' pedagogy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya?

iii) In what ways do teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya?

iv) How do formulation of students' assessments in Geography influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya?

1.6 Significance of the Study

The study findings provides the Ministry of Education and curriculum planners with information that can be used for designing suitable programs for training geography teachers on ways of integrating ICT in teaching. School principals can use the study findings to know the strategies of improving integration of technology in instruction of Geography .Geography may also become aware of the benefits of using technology for instruction. Study findings and recommendations provides information to other individuals who want to do similar research or advance the research based on the recommendations of the study.

1.7 Limitation of the Study

A few respondents who took part in this study were unwilling and reluctant to give answers to some questions which were asked. To check on this, the researcher established good relations with the participants and guaranteed them that their responses would be treated with a lot of confidentiality. Respondents were informed not to indicate their name and not to append their signatures. This increased their confidentiality when answering the questions.

1.8 Delimitation of the Study

The geographical area of this study was confined to Rachuonyo South, Kenya. Study participants were limited to principals, Geography teachers and form four

Geography students in Rachuonyo, South public secondary schools. Geography students in form four were chosen for this study because they have been in school longer than students from other forms and have therefore benefited and experienced the challenges of integrating ICT in teaching. The variable of concern to this study were Geography teachers' ICT literacy, teachers' pedagogy, teachers' attitude towards use of ICT and formulation of students' assessment.

1.9 Assumption of the Study

Assumptions made in this study were:

i) Respondents cooperated and gave truthful information.
ii) Geography teachers were aware of the facilities that were needed for incorporation of ICT in the learning process.
iii) Sampled public secondary schools for this study were representative of all public secondary schools in Rachuonyo South sub-county.

1.10 Definition of Significant Terms

Attitude: means the feeling of like or dislike towards something that is expressed by the outward behavior.

Integration: **Refers to** incorporating information communication technology in learning

Information communication and Technology; Refers to the use of a variety of hardware's like laptops, desktops, tablets, mobile phones flash disks, recording

machines and use of software such as internet to access, analyze and disseminate information to the relevant people.

ICT Literacy; it is the capability of applying the skill and the knowledge in use of the ICT hardware's and software to get the relevant information.

Perception: Refers to the organization and interpretation of sensory impression in order to give meaning to one's environment.

1.11 Organization of the Study

This study comprises of five chapters. The first chapter covers introduction which consist of the study background, statement of the problem, purpose of the study, study objectives , research questions, the significance of the study, study limitations, delimitation of the study, study assumptions , Definition of significant terms and the organization of the study. Chapter two deals with the study literature Review; organized into introduction, literature review on factors influencing integration of ICT in Geography teaching, literature review summary, theoretical and the conceptual frameworks. The third chapter entails the methodology of the research which include the research design, the target population, sample and sampling procedures, instruments of the research, research instruments validity and reliability, techniques of data collection and analysis and ethical considerations. The forth chapter consists of data presentation, interpretation and discussions of findings while the fifth chapter presents the study summary, conclusions from the study, the recommendations and suggestions for further studies .

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Introduction, reviewed literature on factors influencing integration of information communication technology in different schools and reviewed literature on factors influencing integration of ICT in geography instruction in public schools are well presented in this chapter. The variables include; teachers' level of ICT literacy, teachers' pedagogy, teachers' attitude on ICT and formulation of students assessments. Literature review summary, theoretical and conceptual frameworks of the study study are also presented in this chapter.

2.2 The Concept of ICT Integration in Education

As per the UNESCO (2019) definition of ICT, it encompasses a wide range of technology instruments used in data making, storage, transmission and transfer of information from one individual to another. The instruments incorporated in ICT include the PCs, online newspapers and books, radios, TVs, sound and video recorders and players, satellites, online conferring apps among another instrument (Prestridge, Tondeur, & Ottenbreit, 2019).

Ngeze & Sridhar (2019) additionally notices that other ICT devices used in teaching and learning include Projectors, scanners, DVDs and PC programming

among other equipments. Due to the importance of ICT in today's economy, most education systems endeavor to incorporate ICT in instruction of their learners.

Tondeur, Jo, Krug, Mike, Maaike and Chang (2019), are of the view that successful utilization of ICT in teaching benefits both the instructors and the learners. It enables the instructors to embrace students focused instruction thus improving students' proficiency, it increases collaboration among learners and the instructors and lessen the burden of the instructors. It also improves the learners reasoning abilities, imaginations, confidence, creativity and intelligence leading to accomplishment of many tasks. For effective integration of ICT as per the TPACK model, pedagogy, content and technology must be properly integrated. In addition to instruction, ICT can be used in classroom management and transformation (Indembukhani, 2021).

2.3 Teachers' Level of ICT Literacy and Integration of ICT in Teaching of Geography

In Indonesia, in a study done by Saripudin, Sumarto, Junala, Abdullah & Ana, (2020) in West Java on ICT integration in instruction among vocational school teachers, teachers with higher levels of education proved to have high levels of ICT literacy than teachers with lower levels of education. While ICT illiterate teachers felt intimidated by the computers, their ICT literate counterparts enjoy

use of ICT, for instance, use of videos of different places and events in their Geography lessons.

In Ghana, Enu et al. (2018) did an investigation on competency of secondary school instructors on ICT. The findings revealed that teachers frequently used ICT for their private consumption through platforms such as Facebook and whatsap, however they rarely integrate ICT in classroom teaching. They attributed this to lack of integration skills and poor infrastructure. The study therefore recommended that the government should to fund instructors' professional development training aimed at imparting the teachers with IT integration skills.

In Kenya, a study done by Sutter and Kihara (2019) on factors influencing effective implementation of the government's program of digital literacy in public schools in Baringo, Kenya, revealed that many teachers had low ICT competency which negatively influenced the implantation of the program in Baringo. The study further revealed poor school infrastructure such as inadequacy of computers and lack of electricity supply to have posted greater challenge to teachers in their attempt to use ICT in classrooms than other factors.

2.4 Teachers' Pedagogy and Integration of ICT in Teaching of Geography

Musumba (2019) on his study on incorporating ICT in Geography instruction in public schools at Matungu, Kakamega Kenya, observed that use of ICT in

instruction leads to a change from learning process that is teacher centered to a learning process that is learner centered this makes learning more authentic, contextual, personalized and self –directed learning. He was therefore of the view that some teaching methods such as demonstration, class discussion and small group discussion can easily be used by the aid of ICT than when methods such as lecture method are used in teaching. For instance, he was of the view that a video could be demonstrated to students on land forming processes such as volcanicity and folding after which the students could be asked to discuss the process in their groups and make notes. He further observed that the quality of content delivered by use of the facilities depends on teachers' knowledge and competence in use of ICT, they however observed that some teachers' lack of confidence and knowledge in use of ICT as well as inadequate time hinders effective instruction by use of the ICT materials.

The advantages associated with incorporating ICT in geography instruction include the following; it enables simulation of geographical environment especially the physical aspects, such as land formations like formation of mountains, plateaus, plains, volcanic eruptions among others. Various aspect of human geography such as settlement, farming, tourism, religion and politics among others can be simulated by use of videos. In addition use of ICT reduces classroom boredom and reduces teacher centered learning among other benefits. Challenges faced in using ICT include, inadequate time for preparation of use of

ICT and lack of confidence and knowledge to operate the ICT facilities. Some instructors lack the required confidence to handle the ICT equipments as a result they resort to traditional teaching methods even in topics where integration of ICT could have helped the students to understand the concepts better (Omwoki Kennedy & Obuba, 2017).

2.5 Teachers' Attitude towards Use of ICT and Integration of ICT in Teaching of Geography

According to Eickelmann, Birgit, and Mario (2017), effective incorporation of ICT in Geography teaching process highly depends on instructors' perception, intention, self-belief and their attitudes towards the application of ICT for instruction. Teachers' awareness on importance of infusing technology in instruction influences their choice to use technology in classroom. Negative attitudes to use of technology negatively affect instruction of subjects such as Geography as the teachers tend to rely on traditional teaching methods instead of use of ICT to simulate various geographical environments.

A study done in Malaysia on variables influencing ICT integration in public schools, established that many teachers were not integrating ICT in their teaching despite the country's well-developed infrastructure. This was as a result of most teachers' failure to commit to school regulations on use of ICT in teaching. The

lack of commitment can be attributed to teachers' negative attitudes towards the use of ICT (Razak Jalil & Ismail, 2019).

Mwanda (2017) established that the attitudes that teachers have towards integration of ICT ranges from avoidance, dislike, hatred, anxiety, enthusiasm and confidence in relation to the usefulness of the computers in personal and social life. The number of years that a teacher have had contact with the computer , computer training and being in possession of a personal computer are also some of the factors that may influence the instructors attitudes towards use of computer for the instruction process , a view that is also held by Semerci, Ali & Kemal (2018).

2.6 Formulation of Students' Assessments and Integration of ICT in Teaching of Geography

Musumba (2019), is of the view that formulation of students' assessment through ICT has a number of benefits , such as, it minimizes on use of papers, it saves on the examiners time as one copy of exams may be administered to several learners online, it also enable the examiner to give a standard time for the examined. The challenges of use of ICT in students' assessment are that it requires knowledge and skills to operate the various applications used in administering online examination, it requires ICT equipments which may be costly to students, and it also need additional cost of internet and power supply

which at times may be limited during examinations leading to disruption of exams.

Langat, (2020) is in agreement with Musumba (2019) on the view that teachers' ability to formulate students assessment by use of ICT largely depends with teachers knowledge and skills to operate the ICT equipments. In addition Langat observes that for effective use of ICT there may be need of adequate supply of electricity, internet connection, and adequate photocopying papers for printing and adequate ICT gadgets such as students' laptops for students' online examinations.

2.7 Summary of Literature Review

Reviewed literature has highlighted some teacher related variables which influence incorporation of ICT in geography instruction in public schools, however, they have presented gaps that provide a basis for the current research.

Sutter and Kihara (2019) research focuses more on school leadership and facilities as greater variables influencing ICT integration in Geography instruction leaving out other important teacher related factors such as teacher's level of ICT literacy, this warrant research since the study was done in Baringo county where the sampled schools had poor infrastructure as per Sutter and Kihara (2019). The research may have therefore focused more on infrastructure, in addition the result of the study may not be suitably replicated to Rachuonyo South sub- County due

to varying infrastructural conditions and variation in time of study. ICT changes at a fast rate and carrying out another related study in a different location within a period of over three years may give a completely different findings..

On teachers' pedagogy and integration of ICT in geography teaching, both Musumba (2019) and Omweki et.al. (2017) are in agreement that inadequate time is a major factor influencing incorporation of ICT in Geography instruction in schools. Basing on the two studies recommendations, most teachers need more time to prepare for incorporation of ICT in Geography lessons instruction, this therefore implies that the instructors use ICT equipments as extra learning aids that requires more time in their use rather than being complementary learning aids like use of atlases.

Musumba (2019) and Langat (2020) both concur with one another in their view that teachers' ICT literacy is a prerequisite in formulation of students' assessments and examinations through use of ICT, however, the additional requirements for effective integration of ICT such as stable internet connection and students access to enough laptops for online examinations has always been sidelined by most researchers. In addition the literature reviewed have failed to identify the frequency of students' assessment in geography which help in improvement of students' mastery of content. Frequency of students' assessment can be aided by the teachers' literacy on ICT which help in formulation of the assessments. In order to fill the identified gaps in the reviewed literatures, this

study used variables of; teachers' level of ICT literacy, teachers' pedagogy, teachers' attitude towards use of ICT and formulation of students' assessment to determine factors influencing integration of ICT in teaching of geography in Rachuonyo south sub-county.

2.8 Theoretical Framework

This research adopted Diffusion of innovation theory by E.M Rogers (2003). The diffusion of innovation theory explains why, how a new idea works and the rate at which a new idea is accepted and used by members of a given community. The four elements of diffusion theory are; a) innovation; which is the new idea or technology being presented to members of a given community, b) Communication channel; which refers to how an individual creates and explain new idea to community members to reach a common understanding, b) Time; which refers to the duration that one takes to adopt a new idea, iv) Social system meaning groups of units which are related and engages in a common problem solving in order to a achieve common goal.

In Rodgers' view there are five stages involved in the adoption and implementation of a new idea, these include, the knowledge stage where an individual inquiries about what the idea is all about, how it work and why it should be adopted, the persuasion stage where one forms either a positive or

negative attitude towards the idea, decision stage where one either adopt or reject a decision , the implementation stage where one puts the new idea into practice and the confirmation stage where one find reasons to continue using the idea. The five factors that influence adoption of innovation as per Rodgers are compatibility, observability, relative advantage, complexity and triability. Rodgers is also of the idea that there are various categories of adopters ranging from innovators who are the first people willing to take risk by adopting a new technology, early adopters who are interested in trying out new ideas to establish their importance, early majority who pave way for use of the technology in the community , late majority who follow the early majority in adoption of technology and laggards who are the last people to adopt an idea having realized how the idea has benefited other people.

This theory fits this research since integration of ICT in teaching of Geography may be treated as a new idea in most educational institution of developing countries. The rate at which a teacher may decide to adopt the use of ICT in teaching may depend with the teacher's individual characteristic such as the teacher's attitude, pedagogy and ICT literacy which may lead to their groupings in the categories of adopters. In addition the teacher's attitude and level of ICT literacy will influence the teachers' view of the relative advantage, compatibility and complexity of use of ICT in instruction which will then influence their decision on whether to incorporate ICT in Geography instruction.

2.9 Conceptual Framework

The study examined factors influencing integration of ICT in teaching of Geography in public secondary schools in Rachuonyo South sub- County. Incorporation of ICT in Geography instruction may be influenced by various independent variables; however, the variables that were of interest to this study are teachers' level of ICT literacy, teacher's pedagogy, teacher's attitude towards use of ICT and formulation of students' assessment. Extraneous variables that may influence integration of ICT during classroom instruction may be students' attitudes towards use of ICT and school policy on access to and usage of ICT gadgets.

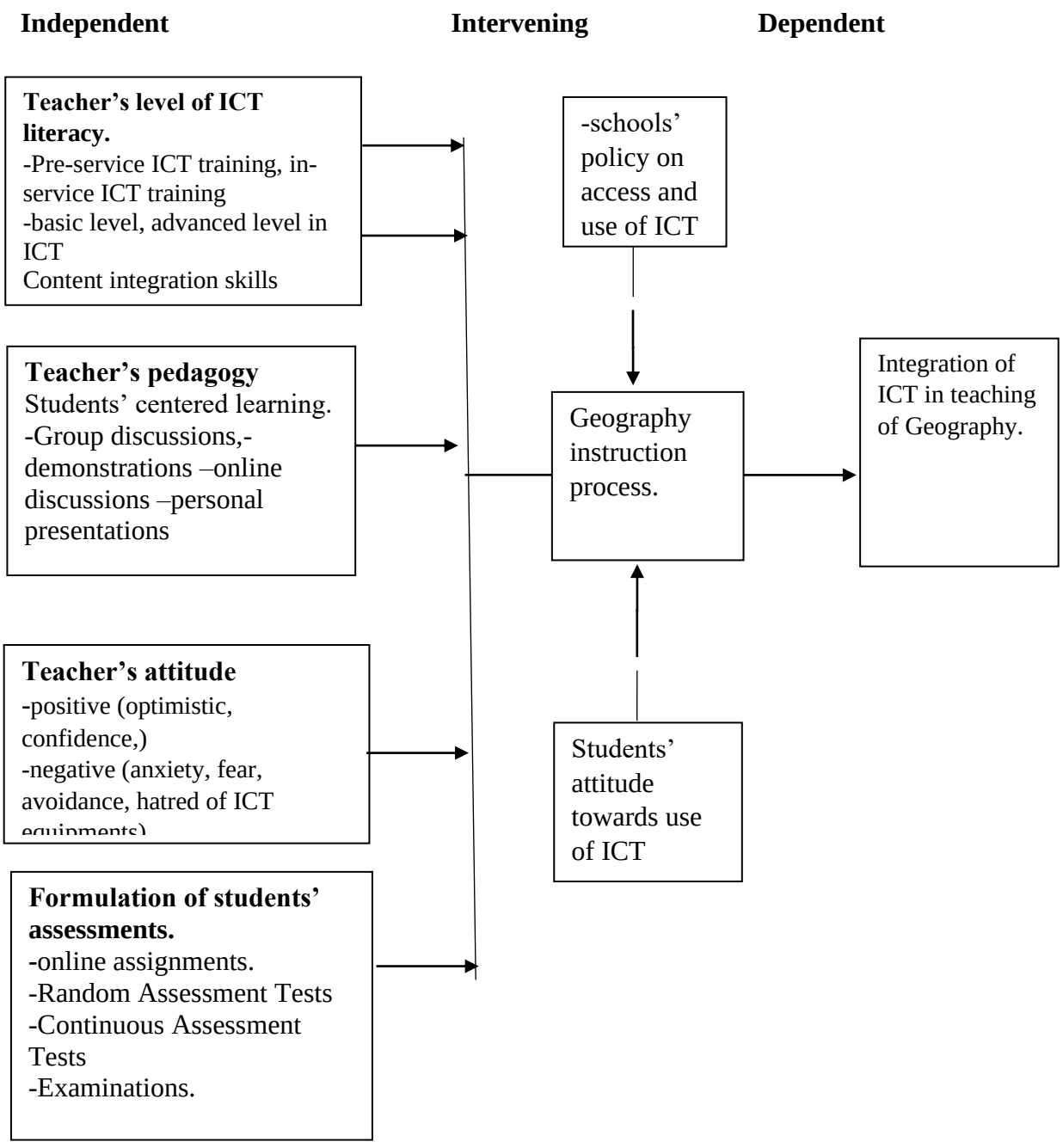

Figure 2.1: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The role of this chapter is to describe the methodology used in this research. It focuses on study design, the population targeted, sample size and sample procedures, instruments of the research, validity and reliability of the instruments, data collection procedure, techniques used in data analysis and ethical considerations.

3.2 Research Design

The researcher used a correlational and descriptive survey designs. According **to** Harrison & Creswell (2020) correlational design uses quantitative methods to gather, record, analyze and interpret data for clarification purposes. It attempt to discover relationship between non-manipulated variables. Correlational research design was employed in this study because the study sought to establish the relationship between the independent variable which is integration of ICT in teaching of Geography in secondary schools and dependent variables such as teachers ICT literacy, teachers' attitude and pedagogy without manipulating any variable. The study also employed the use of descriptive survey design because it aided the researcher in collecting large data sample within a short period of time. Observation checklist, interviews and questionnaire were used to collect data on views of geography teachers, students and school principals on factors influencing

integration of ICT in teaching and learning of Geography. Descriptive survey and correlational research designs were therefore suitable for this study due to their appropriateness in fact finding.

3.3 Target Population

The study targeted all public secondary schools in Rachuonyo South Sub- County. The target population was 32 schools, 32 principals, 128 Geography teachers and 1,378 form four Geography students from schools targeted (Rachuonyo South sub county education statistics booklet, 2022).

3.4 Sample Size and Sampling Procedures

Allan, (2020) define sampling as a systematic selection of individuals for a study in a way that the individuals selected become a representative of the entire group. Kothari (2017), suggest that a good representative of a sample should be made up of between ten percent to thirty percent of the population. Mohajan (2020) concur with Kothari (2017) as he is also of the view that a sample size of 10% to 30% of entire population is suitable for a study. For this study 10% was used to sample form four geography students, while 30% was used to sample schools, Geography teachers and the principals. The sample was composed of 10 schools, 10 principals, 39 teachers of Geography and 138 form four students of Geography from the selected schools. Study population and the study sample size are given in Table 3.1 below

Table 3. 1 Sampling framework

Category	Population	Sample size	Percentage
Schools	32	10	30%
Principals	32	10	30%
Geography teachers	128	39	30%
Form four students	1,378	138	10%

Sampling procedure

Stratified sampling and simple random sampling were employed in getting the samples. Simple random sampling was used since it gives every member of targeted population an equal opportunity to be selected, while stratified sampling was used since it enables the researcher to capture key characteristics of a population in a sample (Mweshi & Sakyi, 2020). Stratified and simple random sampling were used in sampling of the schools. Schools were placed into three categories of sub-county, county and extra county schools. The three county schools (one girls' school and two mixed schools) and the extra-county school (boys' school) were chosen to take part in the study. In sampling of the sub-county schools, Stratified and simple random sampling was used. The schools' names were written in small pieces of cards, placed inside a box and then shaken, the names of the first six schools picked from the box were chosen for the study.

All principals from the sampled were chosen to take part in the study. For Geography teachers sampling' Stratified sampling was used. Names of the teachers were written on pieces of papers placed in boxes based on school category and were picked as follows; seven teachers were chosen from the extra county school, twelve teachers from the three county schools, and twenty teachers from the sub-county schools (where each sub-county school produced a maximum of four teachers) were chosen to take part in the study.

Simple random and stratified sampling were used in selection of students .Based on school categories, selection was done in the following procedure; numerical numbers were written on small pieces of papers that equals to the total number of form four geography students per school, the pieces of paper were placed in a box and mixed, then the form four geography students were asked to pick one paper each, the students who picked the first thirty three numerical numbers from the extra county school, the first fifteen numerical numbers from each of the three county schools(totaling to forty five) and the first ten numerical numbers from each of the six sub-county schools (totaling to 60 students) were chosen to be study participants.

3.5 Research Instruments

Interviews, questionnaires and observation check list were used in data collection. Kothari (2017) is of the view that interview schedule enable the

researcher to explain research items that may not be clear and in explaining the research purpose. Questionnaire aided in conducting the research within a short period of time since the researcher to contact many study participants within a short duration (Allan, 2020).

Questionnaires were administered to geography teachers and the students in their respective schools by the researcher himself while interview was given to the principals. The data that was collected by the teachers' questionnaires were data on Geography teachers ICT literacy, teachers' pedagogy, attitude of teachers in relation to technology and formulation of students' assessments. Questionnaire issued to students collected data on students' knowledge on compute use, teachers' pedagogy and on students' assessments. The Principals' interview schedule was used in collecting data on whether the schools organize ICT training for teachers, school infrastructure and strategies in place to improve the use of technology in Geography instruction.

The observation check list collected data on ICT integration in teaching of Geography, availability of computer laboratory and internet connection. It also collected data on the availability of ICT equipments; that is type, number and functionality. The observation check list therefore aided in triangulation of data from teachers' and students' questionnaires on availability of ICT infrastructure in schools as well as ICT integration in learning process.

3.5.1 Validity of Instruments

Instrument of research is valid when it is able to measure what it was designed to measure and when it performs what it was designed to perform (Baran & Jones, 2019). The content of the research instruments was therefore constructed in relation to the objectives of the research. Content of the observation check list, questionnaires and interview guide were constructed by the researcher and approved by the researchers' supervisor to ensure their validity.

Mugenda and Mugenda (2019) indicate that a sample that is composed of ten percent in relation to the target population is suitable to be used in pilot study. Three schools that were not chosen as participants in final study were chosen for pilot study. Pilot study population comprised of 3 principals, 10 teachers of geography and 138 geography students from the three schools.

3.5.2 Reliability of the Instruments

Reliable instruments give similar results when administered repeatedly over a number of times (Kothari, 2017). The method of Test-retest was employed by the researcher in assessing instruments reliability. Fourteen days after piloting, the same questionnaires were administered again to the same respondents. The two tests scores were computed and then correlated with the aid of Pearson product moment correlation co-efficient (r).

$$\text{Correlation (r)} = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{(\sum x^2 - (\sum x^2))(n\sum y^2 - (\sum y^2)}}$$

Where; n refers to Number of score, r represent Degree of reliability, x refers to scores obtained from first set , y represents scores obtained from second scores while s $\sum xy$ refers to the sum of the product of the first and second score

According to Mugenda and Mugenda (2019), a strong positive correlation exist where the coefficient ranges between +0.7 to +1.0 while weak negative correlation exists where the coefficient is between -0.3 to +0.3. The pilot study coefficient obtained from the studies pilot study were +0.84 from teachers' questionnaires, +0.81 from students' questionnaires while the principals' interviews had +0.72, the instruments were therefore deemed reliable and appropriate.

3.6 Data Collection Procedures

Researcher sought clearance from the University of Nairobi, Department of Educational Management, policy and curriculum studies. He sought the authority to conduct research from the National Commission for Science Technology and Innovation (NACOSTI) by applying for a research permit. Researcher then sought clearance from the Sub-County Director of Education, Rachuonyo South, after which he prepared a letter of intent and request that was sent to the principals of the schools' where the researcher planned to collect the data. He then visited the sampled schools for data collection. While in school, the researcher made arrangement and distributed the questionnaires to the geography teachers and the students' .The researcher booked for an interview date with the principals,

thereafter, he requested for permission from the principal to allow him access the classroom and various facilities for the purpose of filling the observation checklist. The students' questionnaires were collected on the same day of issue to prevent cases of misplacement of questionnaires. The teachers' questionnaires were collected after two days to give the teachers enough time to answer the questionnaires and also to avoid inconveniencing the teachers. Collection after two days led to high questionnaires returns rate as none of the teachers misplaced his/her questionnaire. The principals' interview was held on two different days , to some principals' it was held on the same day of distribution of the teachers' questionnaires while to other principals the interview was done on the day when teachers' questionnaires were being collected, this depended on when each of the principal had agreed to have an interview.

3.7 Data Analysis

Data analysis refers to systematic processing of raw facts, figures and numerals into information by sorting, cording, processing and interpreting data aimed at increasing the understanding of the researcher so as to arrive at appropriate findings (Kothari, 2017). The researcher cross checked all the questionnaires to ensure that they were answered before compiling and coding. Analysis of data was based on the research objectives. Quantitative data that was obtained from closed –ended questionnaire items on the objectives of teachers' level of ICT

literacy, teacher's pedagogy, teachers' attitudes and data from the observation checklist were analyzed by use of descriptive statistics of mean, frequency and percentile. Qualitative data obtained from open ended questionnaire items on the objectives of teachers' pedagogy, on formulation of students' assessments and data from interview schedule was analyzed using content analysis technique where the ideas from the responses were grouped into themes. Data analysis was done through descriptive and inferential statistics where tables of mean, percentages and standard deviation were used to present the data. Correlation and regression were also used in data analysis. Statistical Package for Social Sciences version 23.0 aided in the analysis of data. In Mugenda and Mugenda,(2019) view, descriptive statistics gives a true picture of a situation thus making researchers to draw appropriate conclusions based on findings, this enable policy and decision makes to make decisions based on rationality.

3.8 Ethical Considerations

The researcher abode by all the protocols that are laid down by University of Nairobi, Department of Educational Management, policy and curriculum studies. The questionnaires were accompanied by a research permit in accordance with the ethical policies of the government rules and regulations. Objective of the research was explained to respondents and only willing respondents were allowed to participate in the research. In addition, the respondents were informed of the procedures to follow when responding to the interviews and the questionnaires.

The researcher acknowledged all the references and scholarly works that are cited in the research proposal and the research project.

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

The study findings which are based on the objectives of the study are presented in this chapter. It presents; the returns rate of the questionnaires, demographic data concerning the principals, teachers of geography and the form four geography students. It also present data analysis, presentation, and discussion according to research objectives.

4.2 Questionnaire Return Rate

The questionnaire return rate for the study is shown in Table 4.1.

Table 4. 1 Questionnaire Return Rate

Respondents category	**Number Administered**	**Number Returned**	**Percentage Returned**
Geography teachers	39	100	100%
Form four geography students	138	130	94.20%

The return rate for geography teachers was 100 percent. In Kothari (2017) view, 50 percent and above response rate is adequate for a study. The high returns rates of both questionnaires for both Geography teachers and students could be

attributed to the effort made by the researcher to visit the schools in person, administer the questionnaires to the respondents and collect the students' questionnaires immediately while the teachers' questionnaires were collected after two days. The short period given to the students and teachers helped in reducing chances of misplacing the questionnaires.

4.3 Demographic Information

The section presents both biographic and other attributes of study responds. The respondents' age and gender have been presented to give the distribution of geography teachers and students by their age and sex in Rachuonyo secondary schools. Teachers' highest academic qualification and the length of stay in service have also been presented. Questionnaires were used in obtaining the demographic data Demographic data.

4.3.1 Gender Distribution of Respondents

The study sought to determine gender distribution of both students and teachers within the sampled schools. The findings are presented in the Table 4.2

Table 4. 2: Gender Distribution

Gender	Geography Teachers		Geography Students	
	Frequency	Percentage	Frequency	Percentage
Male	21	53.8	89	68.25

Female	18	46.2	41	31.75
Total	**39**	**100**	**130**	**100**

As indicated from table 4.2, there a slight gender parity in relation to geography teachers distribution by sex in secondary schools. However, the slight parity noticed confirms Mwanda et.al (2017) findings who noted that secondary schools have in the recent past been pre-dominated by male teachers, a situation which is begging to change. The representation of students by gender shows that male students taking Geography were slightly higher than their female counterparts. Geography is taught as an optional subject alongside other humanities like C.R.E and History, more female students may therefore prefer other optional humanities to Geography which is deemed to be technical by some students.

4.3.2 Age Distribution of Geography Teachers and Students

The study respondents were asked to indicate their ages. The finding on distribution of ages among the respondents are represented in table 4.3.

Table 4. 3: Distribution of Respondents' Age

Age in years	**Geography Teachers**		**Geography Students**	
	Frequency	**Percent**	**Frequency**	**Percent**
15-18	-	-	78	60
18 and above	-	-	52	40
18-29	6	15.4	-	-

31-40	18	46.2	-	-
41-50	11	28.2	-	-
Over 50	4	10.3	-	-
Total	**39**	**100**	**130**	**100**

Data from table 4.3 shows that the ages of most geography teachers ranges between 25 years to 40 years which accounted to 61.6 percent of all the teacher respondents. Most geography teachers in Rachuonyo South Sub-county are therefore in their mid-twenties and in thirties. Since most Geography teachers are young, they are likely to have a better understanding of technology since they are likely to have interacted with new developments in technology from a tender age. The finding therefore indicate that the teachers are likely to have the requisite knowledge to integrate technology in teaching. This is in agreement with the findings of Alufohai and Ibhafidon (2015) who established that teachers of young age are more effective in embracing digitalization than older teachers.

4.3.3 Respondents' Academic Qualifications

The level of teachers' educational qualification was considered as an important contributor to integration of information communication technology in teaching Geography. The teachers were therefore required to write their highest level of education qualification. Table 4.1 represents the findings.

Table 4. 4: Distribution of Geography Teachers Academic Qualifications

Level of	**Geography Teachers**

Education	**Frequency**	**Percent**
Diploma without IT	3	7.7
Diploma with IT	2	5.1
Degree without IT	25	64.1
Degree with IT	9	23.1
Total	**39**	**100**

It can be noted from table 4.4 that most geography teachers 64.1% had bachelor's degree without IT, 9 geography teachers representing 23.1% had bachelor's degree with IT while 3 geography teachers representing 7.7% teachers had diploma without IT. The result shows that a higher percentage of teachers acquired Bachelors' degree without IT. This implies that majority of the Geography teachers in Rachuonyo South Sub-county have not acquired relevant technological knowledge required to implement the Geography curriculum. Teachers' academic qualification also reveals that most educational training colleges for teachers have not fully blended ICT as a teacher requirement course in the teachers programs. Technology changes at a very high rate, teachers therefore require refresher in-service training to keep them up to date with the latest technological changes. Due to lack of or insufficient training of teachers in relation to technology , most teachers have developed resilience to new

technological changes being introduced in the education, a finding similar to Alharbi et.al. (2017) findings. The new changes always disadvantage ICT illiterate teachers as they are always worried of how to respond to issues that require use of technology.

4.3.4 Teaching Experience

The questionnaire required teachers to indicate their years of teaching experience. Table 4.5 presents the finding

Table 4. 5: Teaching Experience

	Teachers	
Years	**F**	**%**
1-5	12	30.8
6-10	14	35.9
Over 10	13	33.3

Table 4.5 reveals that 69.2% of teacher have had teaching experience of over six years. This therefore implies that most teachers in the sub-county have been exposed to the benefit and challenges of integration of ICT in teaching. The 33.3 % of the teachers who have taught for a period of over 10 years are likely to be well conversant with integration of ICT in teaching as well as its challenges.

4.4 Teachers' Level of ICT Literacy and Integration of Information Communication Technology

The first study objective was to establish the extent to which teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya. Measures of central tendencies of mean and standard deviation were used in the analysis to show dispersion

Geography teachers were asked to rate their level of expertise in the following ICT related areas. Scale 5= Excellent, 4=Very Good, 3= Good, 2=Fair, 1= No capacity. Table 4.6 present the findings.

Table 4. 6: Level of Expertise in ICT Related Areas

Area	Excellent	Very good	Good	Fair	No capacity
Word processing	30(23%)	43(33%)	53(41%)	4(3%)	-
Spreadsheets(Excel)	10(8%)	10(8%)	43(33%)	57(43%)	10(8%)
Presentation tool (power point)	3(2%)	10(8%)	34(26%)	34(26%)	49(38%)
Use of internet	6(4%)	27(21%)	60(46%)	3(2%)	-
Data base management	-	23(18%)	53(41%)	53(41%)	-

As indicated from table 4.6, majority of teacher of geography are proficient in word processing as compared to Data base management, Use of internet, Spreadsheets (Excel) and Presentation tool (power point) .It can be inferred that there is no adequate on the job training on computer proficiency. In-service training of teachers on ICT would have enabled the teachers to have excellent knowledge on complex ICT applications such as data management.

The teachers were then asked to indicate any other ICT related area/areas that they have received training on that could be of importance to Geography instruction.

Most teachers (25) indicated that a part form the ICT related areas that they had been asked on, they have not received training on any other ICT related areas that could aid in teaching of Geography, only fourteen teachers listed Graphic Designs as another area on ICT that they have received training on. These results are indications that most teachers have only received training on basic computer packages.

During interviews, seven principals have revealed that they have never organized for teachers due to lack of budgetary allocation for such trainings .the seven principals represented 70% of the total principals that were interviewed. A principal from the sub -county school complained about low school fee payment from the parents, he therefore admitted that he had never organized for training

since the funds are always inadequate and are used in student meals among other important activities. All the interviewed principals said that they have never benefited from the government economic stimulus program of providing ICT equipments in secondary schools. Nine principals said that computer studies is not taught in their school and they do not have a teacher specialist in ICT.

4.4.1 Teachers Responses on Teachers' Level of ICT Literacy and Integration of Information Communication Technology

From the questionnaires teachers' views on integration of information communication technology was sought. The teachers were to indicate their views by showing the extent to which they agreed to the statements that were provided. Response of the teachers are presented in Table 4.7.

Table 4. 7: Teachers Response on Integration of Information Communication Technology

Statements	SA		A		NS		D		SD			
	F	%	F	%	F	%	F	%	F	%	Mean	Studv
I'm able to type and store Geography lesson notes in computer/laptop	21	54	18	46	-	-	-	-	-	-	4.46	.50
I can use audio and visual media such as you-tube downloads for Geography lessons	7	18	25	64	5	13	1	5	-	-	3.94	.72
I can retrieve geography content from the CD	7	18	24	62	4	10	4	10	-	-	3.87	.83
I can effective use online meeting apps for online classes and examinations	5	13	17	44	7	18	4	10	6	15	3.28	1.27
I mostly get revision questions and papers online for teaching and learning of geography	10	26	28	71	-	-	1	2	-	-	4.20	.57

I can use projectors in my geography lessons	4	11	14	36	1	5	4	11	15	38	2.69	1.54
I can use resources from internet to construct Geography content	4	11	35	89	-	-	-	-	-	-	4.12	.33
(n=39, Average Mean=3.79)												

Table 4.7 indicates that 39(100%) of the geography teachers agreed that they are able to type and store Geography lesson notes in computer/laptop (M=4.46, SD=0.50). This may also be an indication that geography teachers are proficient in computer package application especially in the use of Microsoft Word. Further 38(98%) of the geography teachers indicated that they mostly get revision questions and papers online for teaching and learning of geography. This may infer that geography teachers have integrated information communication technology in teaching geography (M=4.20, SD=0.57).In support of this 39(100%) of the geography indicated that they can use resources from internet to construct Geography content (M=4.12, SD=0.33). This is implies that the teachers can use ICT to acquire resources from the internet that can help in to add more relevant content during geography instructions.

Geography students' level of ICT literacy was also sought by the study.

The students were required to indicate their level of knowledge in using a computer. Key 5=excellent knowledge, 4= very good knowledge, 3= Good knowledge, 2= Fair knowledge, 1=no knowledge. The results have been tabulate in table 4.8

Table 4. 8: Students knowledge on computer use

Knowledge on Computer Use	Frequency	Percentage
I have no knowledge in computer use	67	40
I have fair knowledge in computer use-I can use Microsoft word for typing	43	47
I have good knowledge- I can use internet to download notes from computer	15	8
I have very good knowledge in computer use- I can apply basic usage of excel	10	3
I have excellent knowledge in computer use-- I can apply complex application of excel and other computer applications	5	2
Total	**130**	**100**

Table 4.8 shows that 67(40%) of students have no knowledge in computer use. While 43(47%) affirmed that they have fair knowledge in computer use-I can use Microsoft word for typing. This finding suggest that majority of students have limited knowledge on computer usage hence limiting the efforts of integrating ICT in geography lessons. This can be as a result of absence of computer laboratories, unreliable networks and absence of computer application lessons in the school. Jensen (2002) established from his research that a major hindrance in Africa for use of ICT in communication is unreliable communication networks.

4.5 Teachers' Pedagogy and Integration of Information Communication Technology

The second objective of the study aimed at establishing the extent to which teachers' pedagogy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya. Mean and standard deviation was used in the analysis.

4.5.1 Geography Teachers Responses on Teachers' Pedagogy and Integration of Information Communication Technology

The study sought to establish the views of geography teachers' pedagogy on integration of information communication technology.

Teachers of geography were required to indicate the teaching method that they have always preferred using when integrating ICT during Geography instructions. The findings are in table 4.9.

Table 4. 9: Teachers Pedagogy

Pedagogy	**Frequency**	**Percentage**
Demonstration	10	26
Group discussion	4	10
Individual assignment	6	15
Lecture	11	28
Lecture and group discussion	5	13
Lectures and individual assignment	3	8
Total	**39**	**100**

Data from table 4.9 shows that 11(28%) teachers uses lectures, 10(26%) affirmed that employ demonstrations during lessons, another 6(15%) of teachers confirmed that they administer personal assignments. Moreover 5(13%) of the teachers indicated use both Lecture and group discussion.

From the interview, principal 005 suggested that in order for a teacher to effective utilize technology in teaching of subject content, they need to understand and to know how to integrate technological knowledge, pedagogical knowledge and content knowledge which is challenging to most teachers. For instance , geography teachers needs to understand this relationship to teach geography content such as GIS application by using technology in the classrooms effectively.

Geography students were asked to indicate the teaching method that have always been preferred by their teachers when integrating ICT in teaching of Geography. The findings are in table 4.10.

Table 4. 10: Students Response on Teachers Pedagogy

Pedagogy	**Frequency**	**Percentage**
Demonstration	42	32
Group discussion	20	16
Individual assignment	13	10
Lecture	46	35
Lecture and group discussion	6	5
Lectures and individual assignment	3	2
Total	**130**	**100**

Table 4.10 indicates that 46(35%) of students indicated that their teachers use lectures, 42(32%) affirmed that teachers employ demonstrations during lessons, another 20(16%) of students confirmed that their teachers use group discussions. Moreover 13(10%) of the students indicated that their teachers employ individual assignments.

The findings from both teachers and students affirmed that lecture method is the most used method of teaching Geography in Rachuonyo South-Sub County. While lecture method of teaching could be good in integrating ICT in teaching geography, for instance in use of power point presentations, it should be used along other teaching methods to allow students to benefit from other teaching methods as well.

Based on each individual teachers understanding they were requested to choose on a statement that best describe the advantage of integrating ICT by use of the teaching method that they use while teaching geography .Table 4.11 was used to represent the findings.

Table 4. 11: Teachers Response on Advantages of ICT Integration

Advantage of ICT integration	**Frequency**	**Percentage**
Use ICT leads to an improvement of students' participation in class	18	46
Use of ICT reduces classroom boredom	10	26

Use of ICT enables the students to formulate their own understanding of concepts	3	8
Use of ICT leads to improvement of students retention of concepts	2	5
Use of ICT in teaching saves teachers' time that would have been used for note writing	2	5
Total	**39**	**100**

From table 4.11, 18(46%) teachers indicated that use of ICT leads to improvement of students' participation in class, this could be attributed to the fact that use of ICT in teaching is interactive hence engaging students to participate in lessons. Again 10(26%) indicate that use of ICT reduces classroom boredom.

Geography students were also asked to choose on one statement that best describe the advantage of integrating ICT by use of the teaching method that their teachers use while teaching. Table 4.12 has been used for findings representation

Table 4. 12: Students Response on Advantages of ICT Integration

Advantage of ICT integration	**Frequency**	**Percentage**
Use ICT leads to an improvement of students' participation in class	52	40
Use of ICT reduces classroom boredom	61	47
Use of ICT enables the students to formulate their own understanding of	10	8

concepts		
Use of ICT leads to improvement of students retention of concepts	4	3
Use of ICT in teaching saves teachers' time that would have been used for note writing	3	2
Total	**130**	**100**

Findings in table 4.12 indicate that 61(47%) students indicated that use of ICT reduces classroom boredom. This could be attributed to the fact that use of ICT in teaching is interactive hence mitigation of boredom during class lessons. Another 52(40%) indicate that use ICT leads to an improvement of students' participation in class. Use of ICT enables the students to formulate their own understanding of concepts at 10(8%).

Geography teachers were then asked to state any other benefits of the pedagogy that they prefer using when integrating ICT in teaching of Geography.

Twenty teachers indicated that integration of ICT by use of lecture method enable the teachers to share content to a large number of students within a short period of time, sixteen teachers added that integrating ICT in teaching of geography makes the classes to be more lively while three teachers added that it minimizes on use of paper work. The responses from the teachers shows that teachers are aware of benefits of integrating ICT in teaching of Geography. Being aware of

advantages of ICT motivates teachers to use technology in teaching of Geography.

The teachers' respondents then required to identify three challenges of integrating ICT in the pedagogy that they have chosen.

The three most common challenges that majority (31) of the teachers wrote were, preparation for use of ICT requires much time, inadequate knowledge in connection of the ICT equipment and power failure at times of use while in the classroom .Two teachers identified inadequacy of ICT facilities as the challenge while six teachers did not answer the question and the subsequent question.

Geography teachers where then asked to identify possible solutions to the challenges they have identified.

The most commonly identified solutions were as follows: twenty nine teachers stated that geography teachers should find extra time to prepare for use of ICT before they attend the lessons, seven teen stated that ICT technicians should be employed in schools to help in fixing the ICT equipments, fifteen stated that they need in-service ICT training while twelve teachers stated that they need a power back up to help at times when there is electricity failure.

The same questions on the challenges and possible solutions to the challenges of integrating ICT in the pedagogy that Geography teachers use when teaching Geography were asked to the students and their responses were as stated below.

On the question of any other benefits that students get when their teachers integrate ICT in their pedagogy when teaching Geography.

Most (120) students stated that use of integrating ICT in demonstration method when teaching Geography enable the students to observe simulations of real geographical environment and thus increasing students motivation to learn the subject.

In response to the challenge of integrating ICT in pedagogy that their teachers use when teaching Geography.

The most common response from the students was that, most students (115) had experienced electricity failure during lessons when an ICT equipment like projectors are being used and this interrupted the lessons while ten students listed inadequate ICT gadgets as a challenge. Most students (112) indicated that their schools need to have other sources of power while fifteen students stated that their schools need to purchase more computers as the possible solutions to the challenges.

From principals' interviews it emerged that eight principals do not have a computer laboratory in their schools and only one principal showed that he had

forty computers, the rest had below thirty five computers. The observation checklist also confirmed the principals' findings as the most common ICT equipment in the schools was the computers where none had over 41 computers, nine schools had printers, and four had smart boards while three schools had projectors.

The findings from the principals' interviews and the observation checklist are indications that the challenges that the teachers and the students had identified were true. Most teachers do not have the requisite skills to use in operations of the ICT equipments, in addition it is evident that there are inadequate number of ICT equipments in the schools. These findings are similar to findings by Malekani & Andrew (2018), which established that for effective use of technology for instruction in schools, apart from ICT knowledge that teachers require to operate the equipments, there should be adequate ICT infrastructure such as adequate ICT gadgets and power supply among others. In addition to ICT knowledge and infrastructure, being aware of the advantages and the challenges of ICT by both teachers and students are some of the factors that influence the adoption and use of technology as supported by Rodgers' theory of diffusion (2003) in his idea of the relative advantage, compatibility and complexity of new technology as factors influencing adoption of technology.

The researcher sought to know the frequency at which the teachers integrate ICT during Geography lessons. The findings are tabulated in table 4.13.

Table 4. 13: Teachers Response on ICT Integration Frequency

ICT integration	**Frequency**	**Percentage**
Every Lesson	1	3
After two lessons	5	13
Once a week	1	3
When necessary	14	36
Never	18	46
Total	**39**	**100**

From table 4.13 46% of the teachers do not integrate ICT in their lessons, 36% integrate ICT when necessary, 3% once a week, 13% after two lessons while 3% of the teachers integrate ICT in every lesson. This may be attributed to inadequate number ICT gadgets in schools thus limiting teachers' efforts of integrating ICT in teaching. The low frequency at which teachers integrate ICT in teaching is an indication that most students do not benefit from the advantages of use of ICT in lessons.

Geography students were also asked to indicate the rate at which their teachers integrate ICT during geography lessons, the findings from the responses are presented in table 4.14.

Table 4. 14: Students Response on ICT Integration Frequency

ICT integration	Frequency	Percentage
Every Lesson	2	2
After two lessons	10	8
Once a week	3	2
When necessary	48	37
Never	67	51
Total	**130**	**100**

Data in table 4.14 shows that 67(51%) teachers do not integrate technology in their lessons, 48(37%) integrate ICT in their lessons when necessary and 3(2%) once a week while 10(8%) of the teachers after two lessons, 2(2%) every lesson. These findings confirms teachers' responses where it was revealed that majority of teachers do not integrate ICT during geography lessons, this can be attributed to inadequacy of ICT equipments in schools

Teachers were further asked to indicate ICT equipments that are available in their schools that can be used in teaching of Geography.

Key: 5=adequately available and in use, 4= adequately Available but Not in Use, 3=inadequately available and in Use, 2=inadequately available but not in Use, 1 =Not Available. Table 4.15 gives the findings.

Table 4. 15: ICT Equipment

ICT equipment	Adequately available and in use	Adequately available but not in use	Inadequately available and in use	Inadequately available but not in use	Not available
Laptop	-	-	29(74%)	-	10(26%)
Smart phone	22(56%)	17(44%)	-	-	-
Video recorder cameras	-	-	-	14(36%)	25(64%)
Computers	5(13%)	-	34(87%)	-	-
Printers	13(33%)	-	26(67%)	-	-
Projectors	10(26%)	-	-	-	29(74%)
Smart boards	7(18%)	-	21(54%)	-	11(28%)

From table 4.15 it is evident that 25(64%) teachers indicated that video recorder cameras are not available, 14(36%) affirmed that video recorder cameras are inadequately available but not in use another ,29(74%) of teachers confirmed that projectors are not available. Moreover 10(26%) of the teachers indicated that laptops are not available, again 29(74%) of teachers indicated that laptops are inadequately available and in use. The findings suggest that inadequacy of ICT equipment affects incorporation of technology in teaching of Geography.

This implication of this finding may be that ICT gadgets are inadequate in Rachuonyo secondary schools. The few available ICT equipments are always found in officers for administrative duties. Geography teachers cannot therefore effectively integrate ICT in teaching of geography due to inadequacy of the ICT gadgets.

From the interview, principal 002 commented that use of ICT is of great importance to learning and may also be influenced by the school infrastructure. He was of the view that use of ICT affects learners' motivation which plays a significant role in learning outcome. He therefore suggested that ICT should be integrated in teaching of geography curriculum.

Findings from observation check list revealed inadequacy of computers in secondary schools. 56.3% of schools observed had less than five computers, schools totaling to 10.4% had between ten to fifteen computers, a total of 18.8% of the schools had fifteen to twenty computers while 14.6% of the total number of the schools sampled had over 20 computers. This shows that ICT equipments were are inadequate in most schools making it difficult to effectively use them for classroom instruction.

The principals' interviews also revealed that only a few schools use the technological tools to access video compact disc or watch educational programs aired by various media stations .This finding is in agreement with Sutter and

Kihara (2019) work which indicated that inadequacy of computers is a barrier to effective integration of ICT for instruction.

Findings from observations checklist indicated that in the extra county school, form four East were being taught Geography by use on ICT equipment. The topic was Land reclamation, the sub topic was on problems associated with irrigation farming. The Geography teacher was using the laptop and a projector to show videos of various places where irrigation farming was being carried out and how it was being carried out. This observation, confirm the findings from the teachers' and the students' questionnaires on the availability and use of ICT equipment in schools. Although the equipments may not be adequately available but the few which are available are in use.

4.6 Teachers' Attitude towards ICT and Integration of Information Communication Technology

The third study objective sought to determine ways in which teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South, Kenya. Measures of central tendencies of mean and standard deviation were used in the analysis.

4.6.1 Teachers Responses on Teachers' Attitude towards ICT and Integration of Information Communication Technology

The study inquired to get information on teachers' attitude on integration of information communication technology. Teachers' responses are presented in Table 4.16.

Table 4. 16: Teachers' Attitude towards ICT and Integration of Information Communication Technology

	SA		A		NS		D		SD			
Statements	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**Mean**	**Stdv**
ICT equipment are challenging to use in teaching	2	5	11	28	1	3	16	41	9	23	2.51	1.27
I find it interesting to use ICT equipment like, Phones, laptops and projectors when teaching Geography	11	28	15	38	4	10	9	23	-	-	3.71	1.12
Integration of ICT in teaching of geography consumes much time	11	28	19	49	1	3	7	18	1	3	3.82	1.12
I fear using ICT gadgets like projectors and laptops because I don't know how to fix them	4	10	12	31	4	10	14	36	5	13	2.89	1.27
Integration of ICT in teaching of Geography breaks classroom monotony hence increasing students' retention of concepts	15	38	18	46	6	15	-	-	-	-	4.23	.70
When presented with an opportunity I can attend a training on ICT to upgrade my skills	26	67	13	33	-	-	-	-	-	-	4.66	.47
Incorporation of ICT in teaching of Geography does not bring any significance change in students' performance.	-	-	7	17	12	29	17	41	3	7	2.58	.88
ICT use in Geography can help students understand abstract Geographical content	12	31	22	56	5	13	-	-	-	-	4.17	.64
(n=39, Average Mean=3.57)												

Data from table 4.16 shows that 39(100%) geography teachers agreed that when presented with an opportunity they can attend a training on ICT to upgrade their skills (M=4.66, SD=0.47). This signify that geography teachers are in need of ICT training to enable them integrate ICT in teaching geography. Further 33(84%) of the geography teachers indicated that integration of ICT in teaching of Geography breaks classroom monotony hence increasing students' retention of concepts. This may be inferred that integration of information communication technology in teaching geography make lessons more interactive (M=4.23, SD=0.70). It can also be observed from the table that 130(100%) of the geography teachers indicated that ICT use for Geography instruction aids students in understanding abstract Geographical content (M=4.17, SD=0.64). These findings are indications that teachers have positive attitudes towards incorporation of technology in Geography instruction in public schools in Rachuonyo South sub-county.

From the principles' interviews it was established that incorporation of technology within education sector results into a "more stimulating learning environment" thereby making the teaching learning process to be interactive, interesting, entertaining and innovative. The principles interviews also revealed that in the education sector, technology may be applied in the following ways: i) it may be used as part of the curriculum for example as a subject in computer studies ii) It can be used for instruction to deliver subject content , for example

use of projectors to display notes, videos and pictures for learning purposes , iii) It can also be used as a learning aid for example , use of computers to download subject content from the internet. The principals' interviews also revealed that technology also have negative effects and so its usage should be monitored within the learning institutions. For instance, some students use technology just for fun and to access unimportant inappropriate content from social media rather than focusing on important issues in their education. This mostly happen when teachers do not monitor students while using the technological equipments. The principals suggested that teachers should advice students on proper use of technology and schools should develop ICT polices to be adhered to in their respective institutions.

Technology is not only used for classroom instruction but it is also used to enhance assessment, assessment is an integral part of learning and the learning process may be considered incomplete without proper assessment (De Witte & Rogge, 2014). This therefore implies that ICT has a great impact on education and it has enriched learning and teaching in schools and colleges in various ways. ICT have a great potential to support and to positively improve the education sector. Instructors and learners therefore should utilize technology to promote better quality teaching and learning process including the assessment for learning. Thus, technology can considerably be helpful for teachers and students if it is used appropriately in the learning environment.

4.7 Formulation of Students' Assessments in Geography and Integration of Information Communication Technology

The fourth study objective aimed at establishing ways in which formulation of students' assessments in geography influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Kenya. Measures of central tendencies of mean and standard deviation was used in the analysis.

4.7.1 Teachers Responses on Formulation of Students' Assessments and Integration of Information Communication Technology

The aimed at establishing the views of teachers on influence of formulation of students' assessments in geography on integration of information communication technology. Teachers' responses are presented in Table 4.17.

Table 4. 17: Teachers Response on Formulation of Students' Assessments and Integration of Information Communication Technology

Statements	SA		A		NS		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
I normally administer online assessments to my students	-	-	20	48	6	14	8	19	5	12	3.05	1.12
I prefer online assessment than physical assessment	-	-	5	12	19	45	14	33	1	2	2.71	.72
My students prefer online assessments	-	-	23	55	15	36	1	2	-	-	3.56	.55

Use of ICT makes it easy to administer students' assessment	-	-	4	10	10	24	21	50	4	10	3.00	.79
(n=39, Average Mean=3.08)												

Data from table 4.17 shows 23(55%) geography teachers agreed that their students prefer online assessments (M=3.56, SD=0.55). Further 20(48%) of the geography teachers indicated that they normally administer online assessments to their students. Moreover, 130(100%) of the geography teachers affirmed that use of ICT makes it easy to administer students' assessment

(M=3.00, SD=0.64).

The researcher aimed at establishing the views of students on influence of ICT in formulation of students' assessments in geography on integration of information communication technology. Teachers' responses are presented in Table 4.18.

Table 4. 18: Students' Response on Formulation of Students' Assessments and Integration of Information Communication Technology

Statements	**SA**		**A**		**NS**		**D**		**SD**		**Mean**	**Stdv**
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**		
I normally do online assessments	-	-	65	50	39	30	26	20	-	-	3.24	.84

My teachers prefer online assessment than physical assessment	-	-	26	20	65	50	39	30	-	-	2.96	.12
Use of ICT makes it easy for teachers to administer students' assessment	59	45	72	55	-	-	-	-	-	-	4.12	1.05

(n=130, Average Mean=3.44)

Table 4.18 indicates that 65(50%) of the geography students agreed that they normally do online assessments (M=3.24, SD=0.84). Further 26(20%) of the geography teachers indicate that their teachers prefer online assessment than physical assessment. Moreover, 130(100%) of the geography students affirmed that use of ICT makes it easy for teachers to administer students' assessment (M=3.12, SD=1.05).

The findings from the teachers and the students' responses on formulation of students' assessment indicates that minority of teachers 48% agreed that they normally administer online assessment, 65% of the students who responded agreed that they normally do online assessment, 12% the teachers indicated that they prefer online assessment to physical assessment while 20% of the students indicated that their teachers prefer online assessment to physical assessment. Form these findings it can be inferred that majority of the teachers do not prefer

giving online assessments to students, this may be attributed to the fact that most teachers do not have the required ICT knowledge that may be involved in the preparation and administration of online assessment and as a result they may prefer physical assessment even in situations where physical gatherings may not be required due to health related issues.

From the principals interviews it was established that using ICT in geography education may encourage teachers to change their method of teaching geography from conventional ways to contemporary ways. Integrating ICT in geography education can help students to develop their geography skills, knowledge and think critically in relation to geography topics. This help the students to develop the ability to make decisions and solve geography problems. Implementing ICT in learning and teaching geography not only enhances lesson instruction but it also enhances assessment for learning and teaching geography in secondary schools and in higher education.

The teachers were asked to comment on the connectivity of internet to the ICT equipments in their schools. The findings are tabulated in table 4.19.

Table 4. 19: Teachers Response on Connectivity of Internet to the ICT Equipment

Connectivity of Internet	**Frequency**	**Percentage**
Full time connection	8	21
Connection only when in use	7	17
No connection at all	24	62

Total	**39**	**100**

Data tabulated in table 4.19 shows that majority of teachers 24 (62%) indicated that ICT equipments in their schools do not have internet connection at all.

The students were required to comment on internet connectivity to ICT equipment in their school. The findings are tabulated in table 4.20.

Table 4. 20: Students' Response on Connectivity of Internet to the ICT Equipment

Connectivity of Internet	**Frequency**	**Percentage**
Full time connection	14	10
Connection only when in use	28	22
No connection at all	88	68
Total	**130**	**100**

From the results tabulated in table 4.20, 68% of this students indicated that ICT equipments in their schools have no network connection at all. This reveals that most secondary schools do not have internet connection at all.

Findings from the principals' interviews shows that most schools have full time internet network connection as mentioned by seven out of the ten interviewed principals. This finding contradicts the findings from the teachers and the students where majority of them indicated the ICT gadgets have no internet connection at all, while a few of the students and teachers respondents indicated

that internet connections to the ICT gadgets where done only when there was need. The teachers and the students response is the reality in most the secondary schools in relation to internet connectivity. This limits teachers in their effort to integrate ICT in teaching as they would always request for internet connection from the relevant authorities whenever they need to search for information from the internet.

The teachers were asked to comment on how they cope during power failure. Table 4.21 have been used to present the findings.

Table 4. 21: Teachers' Response on How They Cope during Power Failure

Response to power failure	**Frequency**	**Percentage**
Use backup generators	12	31
Examination stops until power resumes	21	54
Move to nearby school with power	6	15
Total	**39**	**100**

From the data tabulated in table 4.21, 21(54%) (Majority) commented that upon power failure examination that need use of computers stops until power resumes. The students were also asked to comment on how they cope during power failure. The study finds are presented in table table 4.22.

Table 4. 22: Students' Response on How They Cope during Power Failure

Response to power failure	Frequency	Percentage
Use backup generators	29	22
examination stops until power resumes	75	58
Move to nearby school with power	26	20
Total	**130**	**100**

From the results tabulated in table 4.22, 75(58%) students commented that upon power failure examinations that need computers stops until power resumes.

The results from principals' interviews confirms the findings from the teachers and the students on what happens in case of electricity power failure as 6 out of the 10 interviewed principals indicated that they did not have a power back up. They all depended on electricity power supply. For effective use of ICT in geography teaching in secondary schools, the schools should have stable power supply.

The interviews further revealed that secondary schools in Rachuonyo south sub-county have low internet connectivity is low internet connectivity in the secondary schools. 68% of schools depend on prepaid modern for internet connection while only 32% of the schools have their connection through the

internet server. Continued reliance on modern for internet often result in poor internet connectivity while it is also expensive to pay the modems. This brings a challenge to teachers' effort of integrating technology n teaching.

The teachers were then asked to state other ways in which they use the internet apart from searching for examination materials. The responses were as discussed below.

Most teachers who had access to the internet had a wide range of uses ranging from personal use to official duties. Few teachers (12) stated that use the internet to write and receive mails, however majority of the teacher (27) indicated that they mostly use the internet for personal consumption, mainly to access social media platforms.

All the principals confirmed that they lack ICT policy in their schools. This confirms the findings from teachers' response where most teachers stated that they mostly use the internet to get to social media platforms. Lack of proper ICT policy in schools may make both teachers and students to spend much of their times on the internet on non-academic issues such as browsing on face-books, twitter and whatsap among other media platforms. . This finding is in agreement with Mureithi and Munyua (2006) findings who established that establishment of ICT policy in schools give the school administrators opportunities to ICT infrastructure for sharing knowledge. They further stated that lack of ICT policy

may lead to improper use of ICT facilities and access to irrelevant information from the internet which may disadvantage the students.

4.8 Geography Teachers' Views on Integration of Information Communication Technology

The study sought the opinion of geography teachers regarding integration of information communication technology. The findings from the respondents are presented in table 4.23 below

Table 4. 23: Teachers' Response on Integration of Information Communication Technology

Statements	N	Mean	Std dv
I normally use ICT tools in teaching frequently	39	2.51	1.27
Teachers use of ICT facilities in teaching	39	3.71	1.12
I teach a number of topics using of ICT facilities	39	3.82	1.12
Students use of ICT in doing assessment and assignments	39	2.89	1.27

Table 4.23 shows that teachers scored the highest mean (M=3.82,SD=1.12) in teaching a number of topics by use of ICT suggesting that geography teachers teach a number of topics using of ICT facilities. This was followed by teachers use of ICT facilities in teaching (M=3.71, SD=1.12).This was closely followed by

students use of ICT in doing assessment and assignments (M=2.89, SD=1.27), while teaching frequently by use of ICT tools came last (M=2.51, SD=1.27).

4.9 Relationship between Independent Variables

This section presents regression, ANOVA and co-efficient of determination.

4.9.1 Relationship between Independent Variables

Table 4. 24: Relationship between Independent Variables

Correlations

		Integration of ICT	ICT literacy	teachers' pedagogy	Teachers attitude	Students assessment
Integration of ICT	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	39				
ICT literacy	Pearson Correlation	.613**	1			
	Sig. (2-tailed)	.000				
	N	39	39			
teachers' pedagogy	Pearson Correlation	.423**	.449**	1		
	Sig. (2-tailed)	.000	.000			
	N	39	39	39		
Teachers attitude	Pearson Correlation	.081	.095	.083	1	
	Sig. (2-tailed)	.477	.400	.463		
	N	39	39	39	39	
Students assessment	Pearson Correlation	.172	-.017	-.164	-.156	1
	Sig. (2-tailed)	.126	.878	.142	.161	
	N	39	39	39	39	39

Deductions from table 4.24 shows existence positive correlation between ICT literacy and integration of ICT at significant 0.05 level, the strength is average, at 61.3 %. Further, the deductions reveal the existence of a positive correlation between teachers' pedagogy and integration of ICT at significant 0.05 level, the

strength is though strong, at 42.3%. The findings further shows existence of positive correlation between teachers' attitude and integration of ICT at 0.05 level, the strength is however average, at 47.7%. The findings reveals existence of positive correlation between formulation of students' assessment and integration of ICT at 0.05 level, the strength is however average at 17.2%.

4.9.2 Relationship between ICT Integration and Teachers ICT Literacy, Teachers' Pedagogy, Teachers Attitude and Formulation of Students Assessment

Table 4. 25: Relationship between Dependent and Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.623[a]	.388	.356	.43323

a. Predictors: (Constant), teachers ICT Literacy, teachers' pedagogy, Teachers attitude and formulation of Students assessment

b. Dependent Variable: ICT integration.

Based on table 4.25 R is established to be 0.388 , this implies that 38.8%, of integration of ICT in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya is explained by teachers ICT Literacy, teachers' pedagogy, Teachers attitude and formulation of Students assessment leaving (61.2%) unexplained.

Table 4. 26: Relationship between Independent Variables

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.146	4	2.287	5.55	.000[b]
	Residual	14.452	35	.412		
	Total	23.598	38			

a. Dependent Variable: Integration of ICT

b. Predictors: (Constant), teachers ICT Literacy, teachers' pedagogy, Teachers attitude and formulation of Students assessment

Table 4. 27: Coefficients of ICT Integration and Teachers ICT Literacy, Teachers' Pedagogy, Teachers Attitude and Formulation of Students Assessment

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.040	.766		.052	.959
Teachers ICT literacy	.597	.132	.453	4.525	.000
Teachers pedagogy	.185	.081	.232	2.292	.025
Teachers attitude	.057	.100	.052	.577	.566
Formulation of students assessment	.258	.106	.223	2.438	.017

a. Dependent Variable: ICT integration.

Specifically, Teachers ICT literacy had higher influence on ICT integration, followed by Formulation of students' assessment, Teachers pedagogy and Teachers attitude. Individual significance of the predictor variables was tested using t-test. The findings reveal that Teachers ICT literacy, Teachers pedagogy, and Formulation of students assessment were individually statistically significantly related to ICT integration p-value<0.05.However, Teachers attitude was not individually statistically significant related to ICT integration p-value>0.05.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study purpose was to investigate factors influencing integration of information communication technology in teaching Geography in secondary schools in Rachuonyo South Sub-County, Kenya. The study summary, conclusion, recommendations and suggestion for further research have been presented in this study.

5.2 Summary of the Study

The study examined factors influencing integration of information communication technology in teaching Geography in secondary schools in Rachuonyo South Sub-County, Kenya. The research objectives that guided the study were; To establish the extent to which teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography in secondary schools; to examine how teachers' pedagogy influences integration of information communication technology in teaching of Geography in secondary schools; to determine ways in which teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography in secondary schools and to examine how formulation of students' assessments in Geography influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County Kenya. The

research was guided by Roger's theory of Diffusion of Innovation (2003). The conceptual framework which was used to show the inter relationships between the independent and dependent variables was presented. Descriptive and correlational research designs were used in this study .Descriptive research design was employed due to its appropriateness to the researcher in acquiring content that explains situation as it exist by asking respondents about their views, attitudes, behavior and values. The target population of the study was 32 principals, 128 teachers of geography and 1,378 form four students in the targeted schools. Stratified and simple random sampling was used in sampling of the schools and other participants who participated in the study. The study sample comprised of 10 principals, 39 teachers of geography and 138 form four Geography students from selected schools.

The data collection tools were tested and then retested to enhance their reliability. The validity of the instruments was assured through seeking the advice of the researchers' supervisors. Stratified random sampling was used to sample teachers. The analysis of data was done by use of the SPSS Computer Software version 23.0 because the software is effectiveness and efficiency in analyzing large amounts of data. The findings which are based on each research objective are summarized in the sub sections that follows

5.2.1 Influence of Teachers' Level of ICT Literacy on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County

The first study objective was to establish the extent to which teachers' level of ICT literacy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya. Statistically it was found to be significant by teachers ($M=3.79$, $r=0.613$, $p<0.05$). It was established that that 39(100%) of the geography teachers agreed that they are able to type and store Geography lesson notes in computer/laptop ($M=4.46$, $SD=0.50$). Further 38(98%) of the geography teachers indicate that they mostly get revision questions and papers online for teaching and learning of geography ($M=4.20$, $SD=0.57$).

5.2.2 Influence of Teachers' Pedagogy on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County, Kenya

The second objective of the study was to examine how teachers' pedagogy influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya. It was found that 11(28%) of teachers indicated that they use lectures, 10(26%) affirmed that employ demonstrations during lessons, another 6(15%) of teachers confirmed

that they administer personal assignments. Moreover 5(13%) of the teachers indicated use both Lecture and group discussion.

.

5.2.3 Influence of Teachers' Attitude on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County, Kenya

The third objective study objective was to determine ways in which teachers' attitude towards ICT influences integration of information communication technology in teaching of Geography in secondary schools in Rachuonyo South Sub-County, Kenya. Statistically it was found to be significant by teachers ($M=3.57$, $r=0.081$, $p<0.05$). The study have established that that 39(100%) of the geography teachers agreed that when presented with an opportunity they can attend a training on ICT to upgrade their skills ($M=4.66$, $SD=0.47$). Moreover, 39(100%) of the geography teachers affirmed that ICT use in Geography can help students understand abstract Geographical content ($M=4.17$, $SD=0.64$).

5.2.4 Influence of Formulation of Students' Assessments in Geography on Integration of Information Communication Technology in Teaching of Geography in Secondary Schools in Rachuonyo South Sub-County Kenya

The fourth objective study objective was to examine how formulation of students' assessments in Geography influences integration of information communication technology in teaching of Geography in secondary schools in

Rachuonyo South Sub-County Kenya. Statistically it was found to be significant by teachers (M=3.08, r=0.172, p<0.05). The study established that 23(59%) of the geography teachers agreed that their students prefer online assessments (M=3.56, SD=0.55). Further 20(51%) of the geography teachers indicate that they normally administer online assessments to their students. Moreover, 39(100%) of the geography teachers affirmed that use of ICT makes it easy to administer students' assessment (M=3.00, SD=0.64).

5.3 Conclusion

The following conclusions were drawn from the research questions and the findings of the study:

Technology is cable of improving all the sectors of the economy including education. From the study finding the researcher concludes that interplay of factors have negatively slowed the pace of incorporation of technology in teaching geography in secondary schools in Rachuonyo South sub-county Such factors include unavailability and inappropriate ICT infrastructure in the secondary schools; limited ICT knowledge and skills for both the teachers and the students, lack of or inadequate in-service teacher training programs on ICT, limited ICT technical support and restrictive administrative practices mainly limited budgetary allocations and lack of proper ICT policies in the secondary schools. The use of ICT for geography instruction in secondary schools in Rachuonyo South has therefore been limited.

5.4 Recommendations

Based on the findings of the study, the researcher recommends that:

i. The government should improve ICT infrastructure in secondary schools by constructing computer laboratory and equipping them with adequate computers with proper internet connection to ease access to teaching learning materials from the websites

ii. Curriculum developers should redesign pre-service teacher training courses to incorporate use of technology for instruction.

iii. The education ministry should develop in-service teacher training programs that are linked to the school programs so as to keep teachers updated on the latest technological developments.

iv. The ministry of education should deploy at least one ICT specialist in all secondary schools to assist teachers and students in use of technology for learning. There should be ICT technicians at the county and sub-county education levels to help teachers with the computer hardware or the software that would assist the teachers handle any computer breakdown.

v. The school principals should be aware of national ICTs policies especially in education in order for them to develop school ICT policies that would enable them integrate ICTs in teaching and learning of geography in their schools.

vi. Government should make available avenues in which the schools can acquire computers at a reduced cost. This can be done through tax waiver on computers meant for learning in the secondary schools.

5.5 Suggestion for Further Study

Based on the present study, the following suggestions has been made by the researcher for consideration of further studies:

i. This study was carried out in Rachuonyo south sub-County only; a similar study could be carried out in the other sub-Counties.

ii. A study can also be done to determine if biological factors such as age and gender of teachers influence integration of ICT in geography teaching

iii. A study could be carried out to find out the factors that influence the use of ICTs in the private secondary schools.

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APPENDICES

Appendix I: Letter of Introduction

Fredrick Ojwang'

P.O.Box 40332- 44,

Kosele.

The principal,

…….. Secondary school,

Rachuonyo South Sub –County,

Dear Sir/ Madam,

RE: PERMISSION TO COLLECT DATA IN YOUR SCHOOL.

I am a post graduate student at the University of Nairobi. I'm currently pursuing a course leading to the award of master's degree in curriculum studies. I'm undertaking a study on factors influencing integration of ICT in teaching of Geography in secondary schools in Rachuonyo South Sub- County, Kenya. I wish to conduct this study in your school, I therefore humbly request for your assistance and cooperation to enable me come up with accurate findings

I would like to assure you that all the information obtained from any respondent shall only be used for academic purpose. No reference shall be made to the name of any school, institution or to individual respondent.

Yours faithfully,

Fredrick Ojwang'.

Appendix II: Questionnaire for Teachers

Instructions.

You have been identified to participate in the study as respondent. Please fill in the questionnaire as accurately as possible. Honesty will highly be valued. This exercise is purely for academic purpose and the information you provide shall only be used for this research work. Do not write your name, the name of your school and do not append your signature. Please tick **(√)** the box that best fit your response and give a narration/brief explanation where necessary

Part A; Demographic data:

1. What is your gender: Male ( ) female ( )

2. What is your age bracket?

   i) 18years -29 years ( ) ii) 31 years – 40 years ( )

   iii) 41 years _ 50 years ( ) iv) Over 50 years ( )

3. What is your highest level of academic qualification?

i) Diploma in education (without IT) ( ) ii) Diploma in education (with IT) ( )

iii) Degree in education (without IT) ( ) iv) Degree in education (With IT) ( ) v) Master or PHD ( )

4. How long have you been teaching Geography subject?

   i) 1 -5 years ( ) ii) 6 – 10 years ( ) iii) Over 10 years ( )

Part B; Teachers' level of ICT literacy and integration of ICT in teaching of Geography.

5. Please rate your level of expertise in the following ICT related areas by use of a tick (√**).**

Scale 5= Excellent, 4=Very Good, 3= Good, 2=Fair, 1= No capacity

Area	Excellent	Very good	Good	Fair	No capacity
a. Word processing					
b. Spreadsheets(Excel)					
c. Presentation tool (power point)					
d.use of internet					
e. Data base management					

6. State any other ICT related area/ areas that you have received training on and is of importance to teaching and learning of Geography.

……

……

7. By use of a tick **(√)** indicate the extent to which you agree with the statement in the bracket below.

Scale: Strongly Agree (**S A**) 5, Agree (**A)** 4, Not Sure (**NS**) 3, Disagree (**D**) 2 Strongly Disagree (SD) 1

Statement	**S A**	**A**	**NS**	**D**	**SD**
i) I'm able to type and store Geography lesson notes in computer/laptop					
ii) I can use audio and visual media such as you-tube downloads for Geography lessons					
iii) I can retrieve geography content from the CD					
iii) I can effective use online meeting apps for online classes and examinations					
iv) I mostly get revision questions and papers online for teaching and learning of geography					
v) I can use projectors in my geography lessons					
vi) I can use resources from internet to construct Geography content					

Part C: Teachers' pedagogy.

8. Tick **(√)** the teaching method that you have always preferred using when integrating ICT in teaching of Geography.

i) Lecture method ( ) ii) Demonstration ( ) iii) Group discussion ( )

iv) Individual assignment ( ) v) any other, specify_____

9. Choose on a statement that best describe the advantage of integrating ICT by use of the teaching method you have chosen in 8 above.

i) Use ICT leads to an improvement of students' participation in class ( )

ii) Use of ICT reduces classroom boredom ( )

iii) Use of ICT enables the students to formulate their own understanding of concepts ( )

iv) Use of ICT leads to improvement of students retention of concepts ( )

v) Use of ICT in teaching saves teachers' time that would have been used for note writing and drawings ( )

10 Outline any other benefits of the pedagogy you have chosen in 8 above when integrating ICT in teaching of Geography.

---

11 Outline any three challenges of integrating ICT in the pedagogy you have chosen in 8 above.

……

……

……

…….

12. Suggest possible solutions to the challenges in 11 above

……

……

……

……

13. At what frequency do you integrate ICT in teaching of Geography? (Use a tick (√**)** to choose one answer).

a) Never ( ) b) In every lesson ( )

c) After every two lessons ( ) d) Once in a week ( ) e) when necessary

14. Below are some of the ICT equipments that are used in teaching of Geography. Tick **(**√**)** where appropriate.

Key: 5=adequately available and in use, 4= adequately Available but Not in Use, 3=inadequately available and in Use, 2=inadequately available but not in Use, 1 =Not Available.

ICT equipment	Adequately available and in use	Adequately available but not in use	Inadequately available and in use	Inadequately available but not in use	Not available
Laptop					
Smart phone					
Video recorder cameras					
Computers					
Printers					
Projectors					
Smart boards					

Part D: Teacher's attitude and integration of ICT in teaching of Geography.

16. By use of a tick **(√)** State the level to which you agree to each of the statement provided in the table below.

Scale: Strongly Agree (**SA**) 5, Agree (**A)** 4, Un- Decided (**UD**) 3, Disagree (D) 2 and Strongly Disagree (SD) 1

Statement	S A	A	UD	D	SD
i) ICT equipments are challenging to use in teaching					
ii) I find it interesting to use ICT equipment like, Phones, laptops and projectors when teaching Geography					

iii) integration of ICT in teaching of geography consumes much time					
iv) I fear using ICT gadgets like projectors and laptops because I don't know how to fix them					
v) integration of ICT in teaching of Geography breaks classroom monotony hence increasing students' retention of concepts					
vi) When presented with an opportunity I can attend a training on ICT to upgrade my skills					
vii) Incorporation of ICT in teaching of Geography does not bring any significance change in students' performance.					
viii)ICT use in Geography can help students understand abstract Geographical content					

Part E: Formulation of students' assessments and integration of ICT.

17. State the extent to which you agree to the statements below.

Scale: Strongly Agree (**S A**) 5, Agree (**A)** 4, Not Sure (**NS**) 3, Disagree (**D**) 2

Strongly Disagree (SD) 1

Statement	**S A**	**A**	**NS**	**D**	**SD**
I normally administer online assessments to my students					
I prefer online assessment than physical assessment					
My students prefer online assessments					

Use of ICT makes it easy to administer students' assessment					

18. Comment on the connectivity of internet to the ICT equipment in your school

a) Full time connection ( ) b) connection only when in use ( ) c) No connection at all ( )

19. How do you cope when there is power failure in your school during a lesson or examination that need students to use computer?

i) use backup generators ( ) ii) examination stops until power resumes ( )

iii) move to nearby school with power ( )

20. State any other ways in which you use the internet apart from searching for examination materials?

Part F: Integration of ICT.

21. State the extent to which you agree to the statements stated below

Scale: Strongly Agree (**S A**) 5, Agree (**A)** 4, Not Sure (**NS**) 3, Disagree (**D**) 2 Strongly Disagree (SD) 1

Statement	**S A**	**A**	**NS**	**D**	**SD**
I normally use of ICT tools in teaching frequently					
Teachers use of ICT facilities in teaching					
I teach a number of topics using of ICT facilities					
Students use of ICT in doing assessment and assignments					

Appendix III: Questionnaire for Students

Instructions. You have been identified to participate in the study as respondent. Please fill in the questionnaire as accurately as possible. Honesty will highly be valued. This exercise is purely for academic purpose and the information you provide shall only be used for this research work. Do not write your name, the name of your school and do not append your signature. Please tick **(√)** the box that best fit your response and give a narration/brief explanation where necessary.

Part A. background information.

1. What is your gender? i) Male _____ii) Female _____

2. What is your age bracket? i) 15 - 18 ( ) ii) 18 and above ( )

Part B. knowledge of computer use.

3. Tick (√) the level which best suit your knowledge on computer use.

Key 5=excellent knowledge, 4= very good knowledge, 3= Good knowledge, 2= Fair knowledge, 1=no knowledge

I have no knowledge in computer use. ( )

I have fair knowledge in computer use-I can use Microsoft word for typing. ( )

I have good knowledge- I can use internet to download notes from computer ( )

I have very good knowledge in computer use-I can apply basic usage of excel ( )

I have excellent knowledge in computer use-- I can apply complex application of excel and other computer applications. ( )

Part Teachers' pedagogy.

4. Tick (√) the teaching method that your Geography teacher have always preferred using when integrating ICT in teaching of Geography.

i) Lecture method ( ) ii) Demonstration ( ) iii) Group discussion ( )

iv) Individual assignment ( ) v) any other, specify_____

5. Choose on a statement that best describe the advantage of integrating ICT by use of the teaching method your teacher uses in 4 above.

i) Use ICT leads to an improvement of students' participation in class ( )

ii) Use of ICT reduces classroom boredom ( )

iii) Use of ICT enables the students to formulate their own understanding of concepts ( )

iv) Use of ICT leads to improvement of students retention of concepts ( )

v) Use of ICT in teaching saves teachers' time that would have been used for note writing ( )

6. Outline any other benefits that students get as a result of the use of pedagogy your teacher uses in 4 above when integrating ICT in teaching of Geography.

……

……

……

7. Outline any three challenges of integrating ICT in the pedagogy your teacher uses in 4 above.

……

……

……

……

8. Suggest possible solutions to the challenges in 7 above

……

……

……

……

9. At what frequency do your teachers integrate ICT in teaching of Geography?

a) Never ( ) b) In every lesson ( )

c) After every two lessons ( ) d) Once in a week ( ) e) when necessary ( )

Part E: Formulation of students' assessments and integration of ICT.

11. By use of a tick **(√)** State the level to which you agree to each of the statement provided in the table below.

Scale: Strongly Agree (**S A**) 5, Agree (**A)** 4, Not Sure (**NS**) 3, Disagree (**D**) 2 Strongly Disagree (SD) 1

Statement	**S A**	**A**	**NS**	**D**	**SD**
I normally do online assessments					
My teachers prefer online assessment than physical assessment					
I prefer online assessments					
Use of ICT makes it easy for teachers to administer students' assessment					

12. Comment on the connectivity of internet to the ICT equipment in your school

a) Full time connection ( ) b) connection only when in use ( ) c) No connection at all ( )

13. How do your school cope when there is power failure during an examination that need students to use computer?

i) use backup generators ( ) ii) examination stops until power resumes ( )

iii) move to nearby school with power ( )

Appendix IV: Interview Schedule for Principals

1. Do your school organize in service ICT training for Geography teachers?
2. What suggestions can you give to improve the level of geography teachers ICT competency?
3. Which government programmes aimed at increasing improving integration of ICT in schools have your schools benefited from?
4. Do you have computer laboratory in your school?
5. What is the total number of computers in your school?
6. A part from the computers, what other ICT equipment do you have in your school that can be used for teaching and learning of Geography?
7. What is the rate of connection of the equipments to internet (always connected, connection only when in use, no connection).
8. How do the ICT gadgets get internet connections? a) use pre-paid modemns.ii) use of internet server
9. How do your school survive in case of electricity failure during examinations or lesson that need computers?
10. What ICT policies and strategies do you have in place to ensure that teachers and students do not misuse the internet while in access of the school network?
11. What are some of the ways in which technology can be of benefit to the education sector?

Thank you for your responses

Appendix V: Observation Checklist

School:_____

Observation schedule.

The observation check list will be used on two occasion, in geography class and on availability of ICT infrastructure in the school in terms of their number, functionality and internet connection.

Section A. ICT usage in classroom instruction.

1. Class being taught;_____Topic_____

   sub- topic_____

2. i) Are ICT tools being used during the lesson?: Yes ( ) No ( )

   ii) If ICT are being used which ones? _____

SECTION B. availability of ICT facilities.

ICT equipment	Available	Not available	Number	Functional	
				Yes	No
Laptop					
Smart phone					
Video recorder cameras					
Computers					
Printers					
Projectors					

Smart boards					
Generators					
Electricity infrastructure					
Computer laboratory					

Rate of internet connection in school.

a) Full time connection ( ) b) connection only when in use ( ) c) No connection at all ( )

Appendix V: Research Permit

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NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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