

**INFORMATION COMMUNICATION AND TECHNOLOGY IN INSTRUCTION
AND INFLUENCE ON STUDENTS' ACHIEVEMENT IN GEOGRAPHY: CASE
OF WILLIAM VACANRAT SHADRACH TUBMAN COLLEGE, LIBERIA**

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REGISTRATION NUMBER: E55F/20456/2021**

**A RESEARCH THESIS SUBMITTED IN PARTIAL FULFULMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTERS OF EDUCATION IN THE
DEPARTMENT OF EDUCATION COMMUNICATION AND TECHNOLOGY,
SCHOOL OF EDUCATION AND LIFELONG LEARNING,
KENYATTA UNIVERSITY**

MARCH, 2025

DECLARATION

I declare that this thesis is entirely my own work and has not been submitted for certification consideration at any other school or university. The references in this thesis have been properly cited. When text, data (including spoken words), photos, photographs, or tables are obtained from other sources, such as the internet, they must be properly acknowledged and references are cited in compliance with antiplagiarism regulations and the current APA system.

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DEDICATION

I dedicate this Master Thesis to my children, siblings, family members, mentor, friends, and classmates who inspired me with words of wisdom and encouragement in completing this work.

ACKNOWLEDGEMENTS

Permit me the opportunity to extend my heartfelt gratitude to God for granting me the strength, good health, provision, and self-tenacity that have empowered me to complete this study. Secondly, I would like to express my esteemed gratitude to Prof. Samson Rosana Ondigi and Dr. Florence Abuyeka Miima for their expert guidance and unwavering support, patience, and critical remarks on my study during the supervision exercises. They were always available to ensure that I made all the necessary adjustments to this thesis.

Thirdly, I am grateful to Kenyatta University for providing me with an enabling environment to study and the Department of Educational Communication and Technology family at Kenyatta University for their generosity, strength, and support and for diving into their fortune of knowledge and skills that have reached me this far. In addition, I appreciate the World Bank, the Ministry of Education of Liberia, and the William V.S. Tubman College of Education for their support through the IRISE Scholarship Project. Furthermore, I am grateful to Mr. Kpayoun Phillip Wakocco and Mr. Omodu P. Mollay for their crucial contributions and recommendations during the data collection process. To my friend and brother, Mr. Fred T. Sodone, who provided some financial assistance to me, I am indeed pleased to express my gratitude and special thanks. Finally, I would like to thank my mommy, Mrs. Christina K. Toll, for her unwavering prayers and support, which kept me going to finish my studies successfully. I would also like to express my sincere gratitude to my beloved companion, Leamue B. Geeleh, and our adorable children for supporting me through all the challenging obstacles this study has presented. She took on the responsibility of the children's medical care and school expenses while I was away.

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ABBREVIATIONS AND ACRONYMS

AR	Augmented Reality
BPjBL	Blended Project Based Learning
CBC	Competency Based Curriculum
CD	Compact DIC
CK	Content Knowledge
DCP	Digital Communications Protocol
DL	Digital Literacy
EdTech	Education Technology
GIS	Geography Information System
GPCK	Geography Pedagogical Content Knowledge
GPS	Global Position System
GSM	Global System for Mobile communication
ICT	Information Communication Technology
IDA	International Development Association
IRI	Interactive Radio Instruction
IRISE	Improving Results In Secondary Education
IT	Information Technology
ITD	Integrated Technology Development
KICD	Kenya Institute for Curriculum Development
LCD	Liquid Crystal Display
LEAP	Liberian Education Advancement Program
LRREN	Liberia Research and Education Network
MDG	Millennium Development Goals
MNO	Mobile Network Operator

MOE	Ministry of Education
MTN	Mobile Telephone Network
NACE	National Assessment and Examination Centre
NGO	Non-Governmental Organizations
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
RS	Remote sensing
RTTI	Rural Teacher Training Institute
SDG	Sustainable Development Goals
SPSS	Statistical Package for social Sciences
STEM	Science, Technology, Engineering And Mathematics.
TCK	Technological Content Knowledge
TPACK	Technological Pedagogical Content Knowledge
TV	Television
UAE	United Arab Emirates
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USA	United State of America
USAID	United State Agency for International Development
WASSEC	West African Senior School Certificate Examination

ABSTRACT

ICT integration in education enhances skills like creativity, literacy, critical thinking, problem solving, geography, and cognitive abilities, thereby improving learning experiences, engagement, and academic outcomes, thus enhancing overall learning experiences. This study investigates the use of information and communication technology (ICT) resources in geography instruction at the Williams Vacanrat Shadrach Tubman College of Education, University of Liberia. The research aims to establish the type of ICT resources available for geography instruction, investigate the extent to which geography instructors and students are using ICT during instruction, determine the perceptions of geography instructors and students towards the use of ICT, and identify the challenges experienced while utilizing ICT resources during geography instruction by instructors and students. The study utilized a descriptive research design involving 218 respondents, including administrators, geography instructors, part-time instructors, and 202 students. Data of this study was gathered through questionnaires, interview guides, and checklists for observations. The Statistical Package for Social Sciences (SPSS) Version 26.0 was used to analyze the data. The findings revealed that the main ICT resources available for geography instruction at the college are YouTube, the internet, computers, Google Meet, projectors, tablets, printers, Google Maps, mobile phones, Zoom, and spreadsheets. However, the use of ICT resources for geography instruction is inadequate, with most geography instructors making little effort to use student-centered approaches such as field trips to places of geographical concepts. Learning geography with ICT requires highly developed skills and strategies, field trips, and audio and video materials to make students creative. The use of ICT resources like GIS, Remote Sensing, satellite imagery, and digital mapping facilitates making learning geography practical. The study recommends the need for college management and the government to strengthen the use of ICT resources in geography instruction to improve students' achievement. This research equips educational stakeholders with knowledge and skills to effectively incorporate ICT and utilize available resources for teaching and learning, which can be utilized by the Liberian Ministry of Education and other collaborating organizations to plan in-service programs for teacher training.

CHAPTER ONE

1.1 INTRODUCTION

This chapter serves as a cornerstone for the study, laying out the key elements that shape its direction and purpose. It firstly begins by establishing a clear background, setting the stage for understanding the core issues the research seeks to address. The statement of the problem follows, clearly defining the specific challenges and gaps that this study intends to explore, particularly within the context of geography education and the utilization of ICT resources in geography instruction.

Secondly, this chapter outlines the purpose of this study, which centers on examining how ICT tools are utilized and their influence on geography instruction and to ensure focus and clarity, the research objectives are presented, offering a roadmap for the investigation that are complemented by the research questions, that guide the inquiry and provide structure to data collection efforts. In regards to the scope, this chapter also addresses its limitations, considering factors that might affect the scope or generalizability of the findings. This chapter highpoints the study's significance, displaying its potential to contribute to academic discourse, inform educational practices, and influence policy-making within the field.

Thirdly, thi chapter captures the theoretical and conceptual frameworks that reinforce this study and these frameworks act as interpretative tools, connecting established theories with the study's findings and grounding the analysis in scholarly context. Finally, operational definitions of key terms are provided to ensure a shared understanding of the concepts central to this study, fostering clarity and precision throughout this study.

1.2 Background to the Study

Information Communications and Technology, refers to any tool or program that makes communication easier. which includes satellite systems, Android phones, computers (laptops and desktops), networks, hardware, and software. In addition to the various services and applications that are connected to these technologies, such as videoconferencing and distance learning, information communication technology also includes them (Dutton, 2021). Geography as a discipline involves the study of spatial relationships, environmental systems, and human-environment interactions, requiring students to develop strong analytical and spatial-thinking skills. ICT tools such as Geographic Information Systems (GIS), remote sensing, satellite imagery, and digital mapping facilitate these learning goals by enabling students to interact directly with data, conduct spatial analysis, and visualize complex geographic information in real-time (Sharma & Kapoor, 2021).

The use of ICT in education has been widely recognized for its ability to engage students, promote critical thinking, and improve academic achievement. In geography instruction, ICT tools such as GIS and remote sensing software allow students to engage in hands-on data analysis, spatial visualization, and real-world problem-solving (Selwyn, 2019). However, several studies indicate that barriers such as limited access to technology, lack of training, and insufficient support limit the effectiveness of ICT in geography instruction (Hassan & Rukundo, 2021). This study will build on existing research by exploring the specific impact of ICT resource utilization on geography achievement in the college setting.

Increasing evidence suggests that the use of ICT in geography classrooms not only improves academic performance but also prepares students for careers in technology-

driven fields such as urban planning, environmental science, and disaster management. For example, a study by Yousuf and Hamza (2020) found that students who engaged with GIS-based assignments demonstrated a 20% improvement in spatial reasoning skills and reported higher engagement levels compared to students in traditional geography classes. Furthermore, ICT integration aligns with the 21st-century skills framework, which emphasizes digital literacy, problem-solving, and critical thinking as essential for student success in a rapidly evolving job market (UNESCO, 2022).

However, the effective integration of ICT in college geography instruction faces challenges. Limited funding, insufficient training, and disparities in access to technology can restrict the availability and utilization of ICT resources in educational settings. According to Khan and Azhar (2021), nearly 40% of geography instructors in public institutions reported barriers to accessing advanced ICT tools like GIS and remote sensing software, often due to budgetary constraints or lack of institutional support. Moreover, differing levels of digital literacy among students create additional disparities in learning outcomes, as students with more advanced technology skills often perform better academically (Patel, 2023).

Despite these limitations, the push for ICT-enabled learning environments continues to grow. Recent studies highlight the transformative impact of technology on academic performance in geography. For instance, Peters and Clarke (2024) observed that students in technology-enhanced geography courses scored an average of 15% higher on exams measuring spatial and analytical skills than those in traditional, lecture-based courses. This trend underscores the need for educational institutions to

prioritize the integration of ICT tools in geography curricula, with potential long-term benefits for student learning and career preparedness (Gonzalez, 2023).

The integration of information and communication technology (ICT) in education has revolutionized teaching methodologies, particularly in geography, where tools like Geographic Information Systems (GIS), satellite imagery, and data visualization software enrich learning experiences. Studies have demonstrated that ICT resources improve spatial thinking, data analysis, and engagement, which are crucial skills for the academic success and future careers of geography students (Selwyn, 2019 & Al-Nuaimi et al., 2021). By allowing students to interact with real-time data and spatial models, these tools support a critical understanding of geographical phenomena that traditional teaching cannot achieve.

Studies indicate a positive correlation between ICT utilization in geography instruction and improved academic performance as students gain practical skills in spatial analysis and problem-solving. For instance, Lwanga et al. (2020) found that geography students using GIS software outperformed peers in spatial data interpretation, showing better engagement and retention of complex topics. Similarly, Chen and Niu (2022) observed increased academic motivation and achievement among students with access to advanced ICT resources, such as digital mapping and data visualization tools.

However, ICT implementation in geography education faces obstacles, including limited access to high-quality resources, variability in instructors' ICT skills, and institutional budget constraints (Ahmad et al., 2023). This study aims to evaluate the current level of ICT integration in college-level geography, its impact on students'

academic achievements, and the challenges hindering broader ICT utilization in instructional settings.

Integration and utilization are global trends of the 21st century that begin in schools and higher institutions in teaching and learning every subject (Brasileño and Bidad, 2021). Similarly, in the USA and the UK, the program began with elementary schools, replete with teacher training, technical assistance, and network infrastructure. ICT has become an integral part of education systems in countries such as Finland, the United Kingdom, Australia, India, the United States, South Korea, Nigeria, and others that make extensive use of ICT to bridge technological and communication gaps (EduSys, 2019).

Evidence-based geography is promoted through the integration and use of appropriate and cost-effective ICT to support program outcomes in teaching and learning. ICT encompasses a wide range of technologies, including phones, e-readers, tablets, flash drives, radios, and other audio or visual devices, and the potential applications for education are diverse and include applications such as curriculum management, student assessment, professional development, community commitment, and content delivery. Furthermore, ICT use in geography education will provide teachers and students with the knowledge and skills necessary to contribute to climate change mitigation. This presents difficulties for educational infrastructure and learning outcomes (Educationlinks & USAID, 2022).

Geography is a physical and social science that examines the numerous phenomena that take place on the surface of the globe as well as how different societal norms impact them (Global Scholarships, 2022). Using ICT in geography will help teachers and students focus on different environmental and social problems so they can come

up with ways to solve them and protect the earth's future. There are currently 3.6 billion people without an internet connection worldwide. Nearly one-third of students worldwide, or at least 463 million people, are unable to access remote learning, either because there aren't any regulations governing online learning or because they lack the necessary tools to connect from home. Most pupils lack the necessary connectivity, devices, and digital abilities to locate and use technologically based educational content (UNESCO, 2022).

ICT in geography aids learning by providing students with access to a wealth of knowledge about people, places, and ecosystems. It provides a data analytic framework for studying patterns and correlations in a geographic context. Once students have made their findings, ICT can help them organize, edit, and present material in numerous ways. In a classroom or learning environment, it supports engaging geography education. ICT gives teachers and students instant access to current geographical information and our linked globe (Geographical Association 2021). Correspondingly, when utilized effectively, it may strengthen and expand geographical knowledge and comprehension. ICT affects and influences every region. ICT is now present in every sector of every country, including education (Turalbayeva et al., 2021). According to Manco-Chavez *et al.* (2020), many classrooms in underdeveloped nations lack access to specialist knowledge and assistance for exploiting and integrating ICT resources in teaching and learning.

To support instructors' efforts at socioeconomic development and ICT in education policy, several African countries have concentrated on creating national ICT policies and National Information and Communication Infrastructure Plans. Several African governments have also emphasized or at least agreed upon strategies to employ ICTs

in education to achieve significant strategic development goals. Although technology and market structure have changed quickly, developing nations have found it difficult to adjust rules and regulations (World Bank Group, 2019).

By altering the processes of teaching and learning and giving students opportunities to expand their creativity and abilities, ICTs empower educators and students. Numerous studies on student achievement about the use of ICT resources in education have been conducted; however, the impact of ICT use on education has not yet been conclusively demonstrated. Student success can be positively impacted by the proper use of ICT tools to support a teacher's pedagogical skills. But what precisely constitutes a true student accomplishment? ICT use is less effective when its goals are not clear (Stosic, 2017). According to Aladejana (2007), ICT may enhance students' intellectual abilities through higher-order thinking, problem-solving, increased communication skills, and a full understanding of the learning tool and the subjects to be taught. ICT may provide a helpful, participatory teaching and learning setting and foster larger communities of learning that equip students with learning tools. ICT being treated as a separate topic has minimal effects on the learning outcomes of students (Burden & Shea, 2013). Without a shift in the methods used to teach and learn ICT in schools, it is unlikely that many young people will learn how to utilize the potential that ICT offers. In other words, in the absence of clear government direction, ICTs may worsen inequality for specific populations (Mukuna, 2013).

Chirwa and Mubita (2021) found that using ICTs can help children get ready for life beyond school. To educate and train geography teachers on pedagogical skills that will equip them with strategies for successfully integrating ICTs in classrooms, this study also recommended that Continuous Professional Development (CPD) programs

and seminars be implemented. Additionally, to ensure that learning is a continuous process that does not start and end in the classroom, schools should inform parents of learners' guardians about the advantages and disadvantages of ICTs through Parent-Teacher Association (PTA) meetings. The necessity for appropriate exposure to and instruction in the use of ICTs in geography was shown by the learners. Learners will not fall behind if ICT resources are employed in geography teaching and learning, as indicated by classroom observations in which learners were more interested in learning the operations of a computer or tablet than geographical subjects (Chirwa & Mubita, 2021).

ICT and education policies are not often matched by telecommunications policies that encourage development (Oyeleye, 2018). However, information literacy definitions should emphasize basic ideas, not capabilities. ICT helps teachers transition from being classroom teachers to instructional managers. This study also revealed that most professional development programs don't educate instructors on how to use technology to coach and guide students. Teachers were keen to incorporate ICT into their classrooms and learning environments. Major barriers to integrating ICT in the classroom include a lack of genuine software and inadequate computer facilities, as well as a lack of motivation to use ICT on both the teacher and student sides, a lack of proper training skills, and a lack of access to cutting-edge ICT equipment and expert staff (Miima, 2014). Teachers should continue to improve their abilities in order to demonstrate new teaching and learning techniques (Habibu et al., 2022).

Abstract knowledge is a key component of secondary geography education (physical, regional, and practical geography) (Antwi *et al.*, 2018). As a result, teachers must employ suitable information technologies to transmit geographical knowledge to

students. These issues may be solved by strengthening the necessary equipment, providing suitable training, and making information technology more accessible. Policymakers should know how important it is for students to understand spatial ideas when information technology is used (Antwi *et al.*, 2018).

In Nigeria, students and teachers must have ICT proficiency at the UNESCO ICT-fourth CFT level (Onuyi, 2021). This implies that student-teachers understand the benefits of incorporating ICT into their classroom instruction. In order to properly integrate and use ICT in teaching and learning exercises, student-teachers in Nigeria must have a high degree of ICT knowledge and skills. Education colleges in Nigeria are under pressure to use ICT to provide future teachers with the knowledge and skills they need to flourish in the twenty-first century. The professionalization of teachers is becoming a requirement for altering education. Education colleges are being pushed to use ICT to better train future teachers for the twenty-first century. Adequate teacher professionalization is critical to altering education so that teachers have the technological and pedagogical expertise as well as the ability to use ICT to satisfy students' desires. As a result, educational institutions must provide students with the skills necessary to use ICT in their chosen vocation (Onuyi, 2021).

A study conducted in Kenya, revealed that 13.6% (59) of the teachers were unprepared to utilize ICT since it was not addressed in the college throughout their training, and it also surfaced that emerging challenges of employing technology to teach in the classroom, such as the usage of GIS in Kenyan schools, reveal a decline in attitudes about geography. With the introduction of e-learning in Kenya, instructors are at a disadvantage when it comes to teaching pupils, who may be well-informed and willing to confront the teacher who is supposed to deliver. This is paradoxical

given the existing training structure at Kenyan universities, and pupils are likely to have doubts about the teacher's ability to handle the field without sound technological knowledge (Ondigi, 2012).

According to reports from the Ministry of Posts and Telecommunications in Liberia, the nation needs an ICT policy that encourages all stakeholders to actively participate in the development of infrastructure, internet broadband, human capacity, and digital skills. Ensuring the availability of resilient infrastructure that supports increased connectivity to draw investment and advance job opportunities is the policy's vision and mission (Ministry of Posts and Telecommunications, 2018). ICT may have a major role in providing great education to instructors and students in Liberia. However, ICT-based solutions are not used in primary, secondary, or higher education, and stimulating the education industry with ICTs is a long-term option for Liberia's social and economic development (Dodoo, 2020). A modernized education system that utilizes ICTs may catalyze and expedite education expansion in Liberia, allowing the country to establish and sustain a rich human resource pool. At all educational levels, ICTs have shifted the teaching paradigm. Liberia uses archaic teaching techniques whereas other countries have adopted 21st-century pedagogy and traditional teaching approaches should be eliminated from classrooms and improvement initiatives (Dodoo, 2020).

Information, Communication, and Technology, have fuelled many, if not all, of the significant theoretical advancements that have occurred in the twenty-first century. Government, business, academia, and other sectors are all affected by information and communication technology (University of Liberia, 2018). The University of Liberia, the nation's primary school of higher learning, nevertheless, has had difficulty

embracing and integrating ICTs as effectively as other universities throughout the world over the years. This means that the university is falling behind in its efforts to integrate ICT into its mission and strategic goals to gain a competitive advantage and provide administration and faculty with the tools they need to use ICT to improve student learning, improve business processes, and provide high-quality services (University of Liberia, 2018).

Despite efforts by initiatives like the Liberia Research and Education Network (LRREN) to improve online instruction at the University of Liberia, significant challenges remain that hinder student achievement, particularly in the College of Education. During the pandemic, LRREN's training enabled 13,000 of 20,000 students to continue their studies through Moodle, but 7,000 students could not access online learning. Furthermore, nearly half of those who participated did not complete their courses. This high dropout rate was driven by factors such as the unpreparedness of professors, insufficient ICT teaching resources, unstable internet connectivity, and unreliable electricity (Chemonics, 2021). These issues are further compounded within the William V.S. Tubman College of Education, where Kennedy (2020) identified a severe lack of ICT infrastructure and inadequate support for instructors. Deficiencies in computers, internet facilities, projectors, and ICT training create barriers to integrating technology effectively into teaching. Consequently, these limitations undermine the educational quality and negatively impact student performance.

According to the Department of Geography (2022) reports, student performance in geography has shown considerable fluctuation of preservice and in-service geography students in Geography 101 from 2018 to 2022 academic school years, raising significant concern among educational stakeholders and institutions responsible for

teacher training. Given that geography is a critical discipline for fostering environmental sustainability, these performance trends warrant serious attention. This study addresses the consistently low performance levels in geography in the college of education from 2018 to the present, potentially linked to instructional methods and teaching strategies employed by instructors.

While these traditional approaches may be a contributing factor, it remains unclear whether the limited and inefficient use of ICT resources in geography education is a primary cause of poor student outcomes. Understanding this relationship is essential, as ICT, resources can provide interactive and practical learning experiences crucial for grasping complex geographical concepts. Therefore, this study seeks to evaluate whether the effective and efficient integration of ICT tools in geography instruction can positively influence student performance, offering insights to inform improved teaching practices and educational policy. Table 1.1 demonstrates students' poor performance in geography 101 exams from 2018 to 2022.

Table 1.1: Students Performance in Geography 101 Examinations

Academic Year	Number of Student who sat the Exam	Pass (%)	Fail (%)
2018/2019	215	45.12	54.88
2019/2020	205	63.41	36.58
2020/2021	329	34.04	65.96
2021/2022	230	44.78	55.22

Table 1.1 Preservice and In-service Teachers Performance in Geography 101 Exams

Table 1.1 presents an extensive overview of student performance in Geography 101 examinations over four academic years. In the 2018/2019 academic year, 45.12% of students passed the exam, while 54.88% did not meet the required threshold. In the 2019/2020 academic year, the pass rate increased to 63.41%, while the fail rate dropped to 36.58%. In the 2020/2021 academic year, the pass rate fell sharply, with only 34.04% passing and 65.96% failing. While in the academic year 2021/2022 44.78% passed and 55.22% failed.

The underlying reasons for these poor outcomes remain unclear, but a potential factor may be the limited or ineffective use of ICT resources in geography instruction. Consequently, this study explored how ICT is utilized in teaching geography and its impact on student achievement at the William V. S. Tubman College of Education in Monrovia, Liberia. The data indicates a critical need to investigate instructional practices and the role of ICT in potentially enhancing geography education outcomes.

1.2 Statement of the Problem

Professional experience has shown that the integration and utilization of Information Communication and Technology (ICT) resources into geography instruction has significantly transformed the teaching and learning process. These tools, such as GIS software, virtual field trips, and interactive mapping, enable students to engage with content in meaningful ways, foster critical thinking, and develop essential skills in today's technology-driven world. However, underutilization remains a significant challenge, with limited access to ICT resources, inadequate teacher training, and a lack of integration into the curriculum leading to suboptimal outcomes.

Infrastructural deficits, insufficient teacher capacity, and inconsistencies in resource allocation contribute to the challenges faced by geography students. From 2018-2022,

students' geography performance was poor, with 54.88%, 36.58%, 65.96%, and 55.22% failing the geography 101 examination. This study aimed to determine whether geography instructors and students in college use accessible ICT resources and methodologies when teaching and learning about geography.

The study examined the utilization of ICT resources in geography instruction and evaluated their influence on students' academic achievement. It aimed to address gaps in ICT resource utilization and provide actionable recommendations for maximizing the potential of technology in fostering a robust and engaging learning environment.

1.3 Purpose of the Study

The purpose of this study was to establish the type of ICT resources, investigated the extent of ICT resource integration and utilization in college-level geography instruction, and investigate its impact on student academic achievement. Furthermore, this study investigated the perceptions of geography instructors and students toward the use of ICT resources in geography instruction and explored the challenges and barriers that educators face in implementing ICT resources effectively in their instruction and how these challenges may influence educational outcomes. By understanding both the benefits and obstacles associated with ICT utilization, this study provided actionable insights and recommendations for educators, administrators, and policymakers to optimize ICT usage in geography education. Ultimately, the study aspires to highlight the role of ICT in preparing students with critical skills for geography-related fields, contributing to improved academic success and career readiness.

1.4 Objectives of the study

The specific objectives that guided this study were to:

- i. Establish the type of ICT resources available for geography instruction at the William V.S Tubman College of Education.
- ii. Investigate the extent to which geography instructors and students utilize ICT during instruction at the William V.S Tubman College of Education.
- iii. Investigate the perceptions of:
 - a) Geography Instructors towards the use of ICT in Geography Instructions at the William V. S Tubman College of Education.
 - b) Students towards the use of ICT in Geography Instructions at the William V. S. Tubman College of Education.
- iv. Explore the challenges experienced while utilizing ICT resources during geography instructions by:
 - a) Geography instructors at the William V. S. Tubman College of Education
 - b) Students at the William V. S. Tubman College of Education

1.5 Research Questions

The following research questions serve as a guide for this study:

- v. Which ICT resources are accessible in the college for teaching geography at the William V.S Tubman College of Education?
- i. To what extent are Geography Instructors and students utilizing ICT resources during Instructions at the William V.S Tubman College of Education?

- ii. What are the perceptions of geography instructors and students towards the use of ICT resources during instruction at the William V.S Tubman College of Education?
- iii. What are the challenges experienced by geography instructors and students while utilizing ICT resources during instructions at the William V.S Tubman College of Education?

1.6 Significance of the Study

This study provided valuable insights into the impact of ICT on academic performance in geography, offering recommendations for institutions and educators on enhancing ICT integration. The findings informed policy decisions and funding allocations to improve ICT infrastructure, training, and support in geography education.

This study findings will be used by the Liberian Ministry of Education's Division of Teachers. The research findings might also assist rural teacher training institutes (RTTIs) in determining how to integrate ICT into the delivery and planning of courses, enabling the institutions to better educate new teachers with the necessary ICT integration expertise. The findings of this study will be helpful to other education-related organizations (local and international NGOs) in assisting the Ministry of Education in developing and promoting its educational system by allocating pertinent ICT resources and supporting teacher preparation to achieve educational objectives. In addition, the outcomes of this study contributed to the body of knowledge in the area of ICT integration and use in education, and they inspired other academics to conduct related research on various topics.

1.7 Limitations of the Study

The University of Southern California (2022) describes study limitations as factors inherent in the research design or methodology that affect the interpretation and generalizability of the findings. These limitations may restrict the applicability of results, describe practical implications less comprehensively, or reduce the study's utility. Constraints may arise from initial design choices or unforeseen challenges encountered during the research process that affect the internal and external validity of the study.

This investigation encountered several specific limitations:

- a) Student protests led to a month-long university closure, disrupting the research timeline. This situation reduced opportunities to conduct the study as planned, and some instructors and administrators were unable to participate, thereby limiting the sample size.
- b) An unstable electrical power supply significantly disrupted the study timeline, limiting the opportunities to research as initially planned.
- c) Additionally, the shortage of sufficient and capable computers for instructors and students further affected the schedule, hindering the seamless execution of the study.
- d) The lack of reliable internet connectivity for students compounded these challenges, further affecting the study's progression and reducing the effectiveness of planned research activities.

1.8 Delimitation of the Study

Delimitations outline the boundaries set by the researcher to focus the scope of a study. These parameters specify what the study will and will not cover, including aspects like duration, population size, and participant selection criteria (DiscoverPhDs, 2020).

This research primarily examined the use of ICT resources in the teaching and learning of geography, highlighting the persistently low performance of students in the geography 101 examinations from 2018 to 2022. A mixed-methods approach and a descriptive research design were employed, allowing the study to collect data from the College of Education through questionnaires, interview guides, and classroom observation checklists. The study specifically targeted 202 students enrolled in geography units, 2 part-time geography instructors, 10 administrators, and 12 full-time geography instructors. However, it should be noted that several administrators and instructors chose not to participate. The William V. S. Tubman College of Education was selected for its pivotal role in preparing pre-service and in-service teachers for various educational levels, including business, early childhood, primary, and secondary education. Participants were limited to geography majors and minors, along with geography instructors and relevant administrators. The research aimed to explore the types of ICT resources available at the college for geography instruction, the extent of their utilization by students and instructors, perceptions of ICT use in geography education, and the challenges faced in integrating ICT tools. Additionally, the study reviewed the curriculum, the ICT policy framework of the college, instructors' preferred teaching methods, and the ICT literacy levels of both students and instructors. These delimitations were crucial for ensuring a focused and

manageable scope, allowing the research to yield targeted and actionable insights into ICT use in geography education.

1.9 Assumptions of the Study

The following assumptions were made by the researcher:

- i. The college had appropriate ICT tools for both teaching and learning. ICT is effectively used by geography instructors and students during geography lessons.
- ii. To operate various ICT resources, it was assumed in this study that the chosen participants had some basic computer and other mobile device knowledge and comfort.
- iii. This study also assumed that all participants were eager to participate and offer their open responses to questions throughout the study's duration.

1.10 Theoretical Framework

The Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), provides a comprehensive model for integrating technology into teaching practices. TPACK identifies three core knowledge domains that teachers must balance and integrate to use technology effectively in the classroom: **content knowledge (CK)**, **pedagogical knowledge (PK)**, and **technological knowledge (TK)**. Together, these domains emphasize the need for educators to understand not only the content they are teaching but also the best pedagogical approaches and relevant technological tools to enhance student learning. In the context of geography instruction, the TPACK framework is particularly valuable for supporting ICT integration. Figure 1.1.

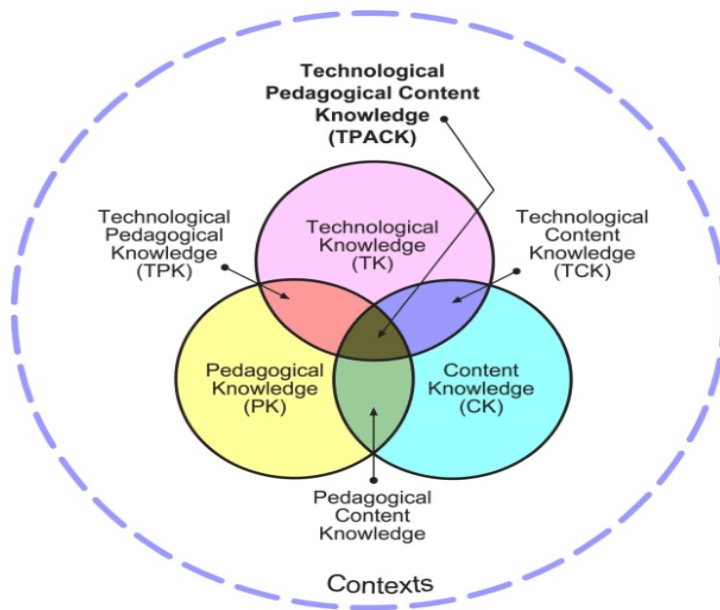


Figure 1.1: TPACK Framework and its Knowledge components

Source: Koehler et.al. (2013)

Content Knowledge (CK) in Geography Instruction

- i. Content knowledge refers to the educator's expertise of the subject matter, specifically geography. This comprises an understanding of geographic ideas, spatial linkages, physical and human geography, and environmental systems.
- ii. ICT resources in geography, such as GIS, remote sensing, and satellite imaging, enable students to see and engage with complicated geographic phenomena, leading to a better understanding of spatial ideas and environmental challenges. Using the TPACK framework, educators may link these technologies directly to fundamental geographical ideas, making learning more relevant and engaging.

Pedagogical Knowledge (PK) in Geography Instruction

- i. Pedagogical knowledge entails knowing successful teaching strategies. In geography, this encompasses methods such as inquiry-based learning, geographical analysis, problem-solving, and collaborative learning.
- ii. The TPACK framework promotes ICT-based pedagogy to enhance geography learning. Educators can employ inquiry-based strategies, such as prompting students to evaluate real-world issues using GIS, to encourage hands-on learning and the development of critical thinking and analytical abilities.

Technological Knowledge (TK) in Geography Instruction

- i. Technological knowledge refers to the effective use of digital technologies and resources. In geography, this entails proficiency with ICT technologies related to spatial and environmental research, such as GIS, digital mapping, and data visualization software.
- ii. The TPACK framework helps instructors acquire and use ICT resources that correspond with geographic concepts and improve learning outcomes. This understanding allows teachers or instructors to select relevant technology, such as GIS for spatial analysis or mapping software for showing environmental data, to make abstract concepts more accessible and impactful to students.

Technological Pedagogical Knowledge (TPK)

- i. Effective integration of technology and pedagogy is key to TPK. Geography educators can utilize TPK to create lessons that mix ICT tools with teaching practices, such as collaborative map-making exercises, which allow students to collaborate in exploring geographic data.

- ii. This encourages dynamic, student-centered learning experiences that foster engagement and deeper knowledge.

Technological Content Knowledge (TCK)

- i. TCK involves understanding how technology can support specific topic areas. In geography, ICT technologies enable students to study spatial data and analyze real-world geographic challenges, which would be difficult to do without technology.

Using the TPACK paradigm, geography instructors can link ICT tools to specific geographic material, such as satellite imagery for climate trends or GIS for urban planning projects, allowing for more nuanced content comprehension through technology. The TPACK framework is a significant accelerator for the successful use of ICT resources in geography education. Aligning technical, pedagogical, and topic knowledge aids in the fulfillment of these study objectives. This study revealed that when TPACK is used effectively with the appropriate ICT resources, it boosts student engagement and equips students with important 21st-century skills. When used correctly, TPACK ensures that ICT resources become transformative instruments for geography teaching and learning. Furthermore, the theoretical framework formed the study's cornerstone or foundation.

1.11 Conceptual Framework

The conceptual framework describes the specific focus of the study. The direction of the investigation is provided by the conceptual framework depicted in Figure 1.2.

Independent Variables

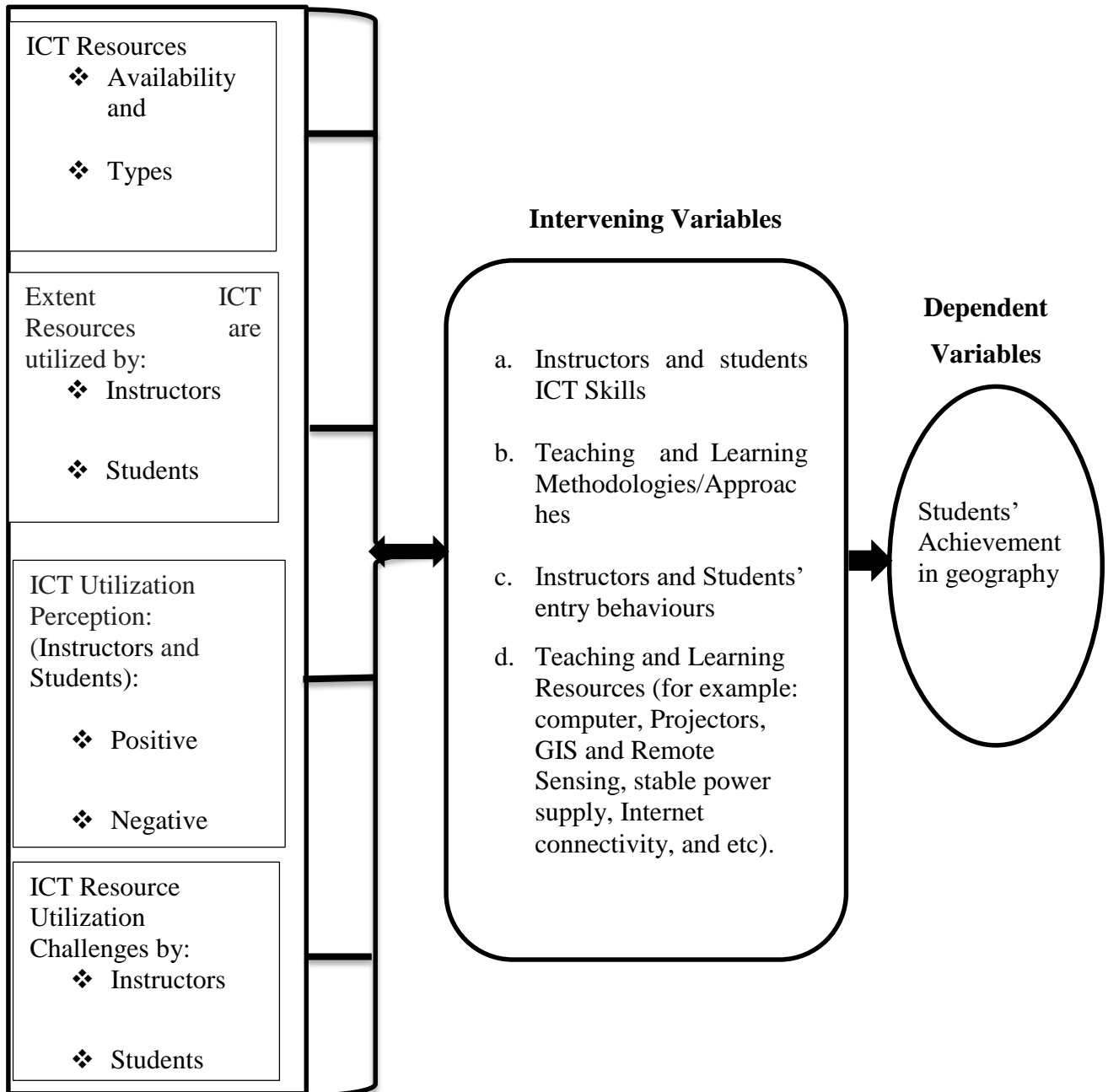


Figure 1.2: Conceptualized Framework

The conceptual framework of this study revolves around understanding how the availability and utilization of ICT resources influence geography instruction and students' achievement. Specifically, the independent variables examined include the types of ICT resources accessible at the college, the perceptions of both instructors

and students toward using ICT in geography lessons, and the extent to which these resources are actively employed during teaching and learning. Additionally, this framework considers the challenges encountered by instructors and students when utilizing ICT resources in instructional contexts. These independent variables were pivotal in the development of research tools, such as questionnaires and interview guides. They also informed the creation of a classroom observation schedule and the design of documentary analysis tools, which were essential for collecting meaningful data and fulfilling the study's objectives. Furthermore, other key components influencing the effectiveness of ICT use in geography instruction include instructors' and students' ICT skills, teaching and learning methodologies, and classroom management strategies. The methods explored encompass teacher-centered approaches, student-centered learning, problem-based learning, flipped classroom models, and other innovative instructional strategies. Effective classroom management techniques are also crucial for maximizing ICT utilization. The framework also incorporates the concept of instructors' and students' entry behaviors, which refer to their attitudes and predispositions toward using ICT in geography instruction. Positive or negative attitudes can significantly influence the effectiveness of ICT-based teaching and learning. Teaching and learning resources such as computers, projectors, Geographic Information Systems (GIS), remote sensing tools, stable power supply, and reliable internet connectivity are also critical factors. Additionally, the conceptual framework identifies several intervening variables that may influence the relationship between the independent variables and the dependent variable, which is students' achievement in geography. These intervening variables include the quality and availability of ICT infrastructure, administrative support, and professional development opportunities for instructors to enhance their ICT and

pedagogical skills. In essence, when teaching and learning resources are adequately available and when teachers possess the necessary ICT and pedagogical competencies, the dependent variable (students' achievement in geography) becomes more attainable. This relationship highlights the importance of a well-rounded approach that integrates resources, skills, methodologies, and supportive learning environments to enhance educational outcomes.

1.12 Operational Definition of Terms

Geographic Information System (GIS): is a computer application that analyses and presents geographically connected information. It uses information associated with a certain area.

Global Positioning System (GPS): The system tells us where we are and where we're heading on the planet.

ICT or Digital Literacy: refers to the teacher's ability to use ICT or digital content and infrastructures (printers, computers, projectors, laptops, tablets, software, etc.) in facilitating instruction in the classroom.

Information Communication and Technology (ICT): the process of data transmission, storage, production, sharing, and exchange involves the use of several technical instruments and resources.

Information Communication and Technology Resources: ICT resources for geography instruction refer to the tools and technologies that facilitate the teaching and learning of geographic concepts. These resources encompass both hardware and software elements.

Instruction: teaching and learning activities within a learning environment.

Nature of the ICT Tools: this is a concern about the state of those digital infrastructures, such as printers, computers, projectors, laptops, tablets, and software tools like Google Meet, Google Spreadsheets, zoon, Google Class, Team, and etc.

Pedagogical Content Knowledge (PCK): this does not refer only to the teacher's knowledge about the subject matter but how effectively cans him or she can deliver it.

Remote Sensing: is a type of geospatial technology that collects data about an object or an event in a given region without having physical contact with it.

Utilization of ICT: is the ability to use technological resources to meet instructional goals in a specific teaching and learning setting.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

Chapter two examines numerous relevant reviews of related literature that pertain to the concept of utilizing ICT during geography instruction for this study. The Literature review is organized in line with the study objectives that includes: the availability and types of ICT resources at the William V.S. Tubman College of Education used to teach Geograpghy, the extent to which Geography instruction and students are utilizing ICT during instruction. the perception of geography instructors and students, and to Explore the challenges experienced by geography instructors and students in using ICT in instruction.

2.2 Type of ICT Resources Available for Geography Instructions

This study,. Mensah and Osei (2023) conucted a study in Accra, Ghana involved 120 college students and 40 instructors and explored the types of ICT resources in geography education. The results of this study revealed that while schools had computers, smartphones, and internet access, the application of these tools to geography education was minimal. Google Earth and basic satellite imagery tools were utilized, but advanced GIS resources and field data collection technologies were absent. This study also provided understandings on basic ICT resources utilization, however, this study did not explore how these colleges can integrate advanced geography-specific resources or suggest pathways for technology upgrades. Furthermore, the findings highlighted the limitations of using only basic ICT resources in geography education. This study addressed these gaps by evaluating the

benefits of advanced digital tools and advocating for targeted investments in these resources to foster spatial awareness and analytical skills among students.

Information and Communication Technology (ICT) resources are pivotal in modern geography instruction, enabling enhanced learning through tools such as Geographic Information Systems (GIS), satellite imagery, digital mapping, and interactive multimedia. ICT resources, including desktop computers, projectors, smartphones, geospatial software, and online platforms, offer substantial benefits by improving spatial thinking, data analysis, and student engagement in geography classes (Australian Geography Teachers Association, 2019; Usharani & Nachimuthu, 2020). Antwi et al. (2018) conducted a study in Ghana on the utilization of ICT resource in geography instruction. The findings of this study revealed that some high schools provide ICT tools such as projectors, Google Earth, and interactive whiteboards, but utilization remains low due to inconsistent resource availability and lack of integration with geography curricula.

Raj and Patel (2023) conducted in New Delhi, India that targeted 220 students and 35 instructors, focusing on the types of ICT resources available in geography classrooms. The study found that most instructors used digital maps, multimedia projectors, and basic GIS applications. While resources like interactive boards and advanced satellite imagery were present in some institutions, they were not consistently used due to a lack of training. This study identified the availability of advanced resources and did not examine how training gaps affect the consistent use of these tools in the classroom. This study findings highlighted the potential for advanced tools to transform geography education if instructors are adequately trained. This study further explored the role of professional development in enabling instructors to make full use

of these technologies, ensuring that ICT resources in geography instruction contribute to more meaningful learning outcomes.

Studies conducted across developing nations, such as those in Kenya and Nigeria, highlight significant disparities in ICT access (Miima, 2014, Ndolo, 2020 & Opeoluwa-Olagbaju et al., 2021). For instance, while Nigeria's University of Ibadan reports frequent use of social media platforms like WhatsApp and YouTube for instructional purposes, the absence of dedicated geographic software like GIS restricts the development of specialized skills (Opeoluwa-Olagbaju et al., 2021). This study pointed out inconsistency that indicated a gap on how educational institutions prioritize geography-specific ICT tools over general-purpose resources, a pattern observed in both primary and secondary levels but insufficiently explored in college-level geography education. Addressing this gap requires strategic investments in dedicated geography ICT tools that support higher-order spatial and analytical skills.

Olsson and Jansen (2024) conducted a study in Swedish colleges that targeted 180 geography students and 25 instructors to understand the types of ICT resources utilized in geography education. The results of this study discovered that colleges in urban settings had access to GIS, digital mapping, satellite imagery, and virtual fieldwork software. However, there was limited use of these resources in rural areas, where students mainly relied on basic Internet research tools and multimedia resources. In addition, this study highlighted resource disparities, it did not address strategies for extending advanced ICT resources to rural areas or analyze the influence of these resources on students' learning outcomes. Furthermore, this study pointed out to a geographic divide in resource availability that mirrors broader issues in equitable educational access. This research explored ways to bridge this divide, examining the

role of remote and mobile technologies in expanding access to advanced geography tools.

Asif and Khan (2023) conducted a study in Lahore, Pakistan that established the ICT resources available for teaching and learning of geography in urban colleges. This study targeted 200 students and 30 instructors as respondents. The findings of this study disclosed that many colleges were equipped with multimedia projectors, computers, and internet connectivity, but lacked specialized geography tools such as GIS and remote sensing applications. Instructors often improvised, using general internet resources to supplement geographic content. The study identifies a gap in specialized ICT resources but does not delve into the potential educational impact of providing students with tools that allow hands-on geographic data analysis. This study highlighted the improvisation that instructors often resort to due to a lack of specialized resources. Laichena et.al (2024) also provided insights on how ICT can be used to teach social studies and specifically targeted History discipline in secondary schools in Kenya. This study examined the specific benefits that advanced ICT tools offer for Social studies learning and advocate for integrating these resources as a standard part of the curriculum. This study found a gap in the above studies since most of them targeted primary and secondary schools and mainly studied the teachers preparedness and their perception towards utilization of ICT. The current study went a notch higher in finding out how ICT was used to teach Geography in colleges and the influence on their trainees.

2.3 The Extent to which Geography Instructors and student are utilizing ICT during instructions

The extent to which ICT resources are utilized by geography students and instructors is heavily influenced by accessibility, training, and institutional support. Research on ICT utilization in education shows that geography students and instructors have varied levels of engagement with digital tools.

Alarabi et al. (2022) conducted a study in secondary schools in the UAE that examined the use of ICT resources by geography instructors. This study was focused on how ICT tools such as GIS software, digital maps, and multimedia resources were incorporated into lessons. This study findings revealed a momentous interest among geography teachers in using ICT resources to enhance spatial understanding and real-world application of geographical concepts. It was also discovered that teachers who utilized these tools reported increased student engagement and improved practical skills related to geography. Despite the interest, the study found that a lack of ongoing training and access to specific geography-focused ICT resources limited effective usage. This study findings further suggested the need for dedicated professional development opportunities to help instructors better integrate ICT into their lessons and the results underscore a pressing need for structured, ongoing ICT training tailored to geography educators, that should address both the technical and pedagogical skills required for effective ICT use in the classroom. Future research should investigate the long-term impact of targeted training on ICT integration in geography instruction and its influence on student outcomes.

Ngo and Tran (2023) conducted a study in Vietnam that analyzed the extent to which ICT resources like digital mapping tools and geospatial applications were utilized in university-level geography instruction. The findings of study revealed that while instructors acknowledged the benefits of ICT tools for engaging students and facilitating complex spatial analysis, only a small fraction regularly implemented these tools in their teaching. Factors such as outdated infrastructure, limited ICT knowledge, and a lack of institutional support were significant barriers. Even though the study emphasised instructors' positive attitudes toward ICT, there was insufficient institutional support to upgrade technology infrastructure, which hindered the consistent use of ICT in classrooms. Nevertheless, the study suggested an urgent need for policy-level interventions that prioritize ICT infrastructure improvements in educational institutions, especially those offering geography programs. The current study explored further on how ICTs' use influenced the trainees academic achievement which is different from the earlier studies carried out.

Chen and Zhang (2023) conducted a study in China that explored the use of ICT resources in high school geography instruction with focus on tools such as GIS, virtual field trips, and interactive maps. This study findings concluded that teachers were moderately familiar with using basic ICT tools but lacked experience with more specialized resources, like GIS. Moreover, virtual field trips were shown to enhance students' understanding of distant and complex geographical phenomena, but adoption rates were low due to a lack of resources and training. Another study done in Kenya by Laichen et.al (2024) to establish the extent of use of virtual trips in instruction of History and Government in secondary schools in Kenya also found that many teachers rarely used it and this was due to limited skills and lack of adequate resources. The

studies suggested a gap in specific ICT skills training for instructors, particularly in the application of advanced tools like GIS. Furthermore, there was limited collaboration between departments and technology providers to support effective resource integration. The findings indicate a significant need for partnerships between educational institutions and technology providers to supply educators with specialized tools and resources.

Oke and Johnson (2024), conducted a study in Nigerian secondary schools to evaluate ICT resources utilization with focus on the role of mobile devices, digital projectors, and basic mapping applications in geography lessons. Oke and Johnson found that while instructors were interested in using ICT, the availability of resources was a limiting factor. The findings indicated that teachers often relied on personal devices or improvised tools, which limited the full potential of ICT for geography instruction. This study suggested a need for government and institutional investment in ICT infrastructure to ensure sustainable integration of technology in geography education. It also pointed out those existing resources did not fully align with the curriculum, which hindered teachers from achieving targeted learning outcomes. This study also highlighte the necessity of aligning ICT resources with curriculum goals to maximize their educational impact. Future research should focus on developing ICT-supported geography curricula that address local contexts and resource availability, potentially enhancing student achievement and engagement in geography.

Osei and Nyarko (2022) conducted a study in Ghanaian colleges to assess the extent to which geography students access and utilize ICT resources. The results of this study indicated that although students recognize the benefits of ICT in geography,

factors such as limited internet access, outdated equipment, and minimal technical support severely limit their usage. The study highlights that despite growing awareness, infrastructure deficiencies prevent students from fully integrating ICT resources into their learning practices. This study lacks a detailed examination of student-led initiatives or alternative resources that might support learning in resource-constrained settings. Osei and Nyarko's study emphasizes the infrastructure limitations that many students face. In addition, this study explored potential low-cost ICT solutions and examining how students' initiatives can complement institutional resources, aiming to find sustainable methods for integrating ICT in geography education even in low-resource settings.

Chen and Liu (2024) carryout a study in China to analyzed how Geographic Information System (GIS) software improves spatial skills among Chinese geography students. Thisstudy concluded that while GIS significantly enhances spatial analysis abilities, its utilization remains inconsistent among students due to a lack of accessibility and insufficient technical training. Students frequently encountered challenges in navigating GIS tools independently; suggesting that integrating these resources requires more structured instructional support. This research does not address the specific role that faculty guidance or curriculum integration might play in facilitating GIS utilization among students. This study underscored the importance of instructor involvement in GIS-based learning by assessing how structured faculty guidance and curriculum integration influence students' effective use of GIS tools, an area that has received little attention but is crucial for optimizing ICT integration in geography education.

Kumari and Sen (2022) conducted a study in India, that investigated how online platforms like Google Earth and various simulation tools aid geography students in Indian colleges. This study findings revealed that students generally benefit from the visual and interactive nature of these platforms, which enhance engagement and conceptual understanding of geographical phenomena. However, the study also notes that frequent issues with internet access and insufficient ICT training impede the widespread utilization of these tools. Although online platforms present a promising avenue for engaging students in geography, these barriers limit their overall effectiveness. The study did not examine the role of hands-on guidance and teacher-driven ICT activities, which could further promote ICT use in geography. While this study highlights the effectiveness of digital learning platforms, the barriers identified underscore the need for institutional policies that address infrastructure issues and provide hands-on support. This research explored these factors more comprehensively by assessing both student engagement and the institutional support systems necessary for sustained ICT use.

Alotaibi and Alshammari (2023) conducted a study on the extent to which college students in Saudi Arabia integrate digital maps and other ICT tools in geography courses. This study findings discovered that while digital maps have been shown to enhance spatial reasoning and visual learning, there is still a limited uptake among students due to a lack of familiarity with these tools and insufficient support from faculty. This gap in effective integration highlights a need for consistent ICT training in geography courses to foster students' proficiency with essential digital resources. Additionally, the study emphasizes that without structured guidance from instructors, students may not fully leverage ICT's potential to support geography learning. The

study does not explore the potential influence of institutional policy or access to advanced geographic information systems (GIS), which could affect broader ICT adoption. This study emphasized the crucial role of instructors and institutional support in promoting the usage of ICT resources like digital maps. However, there is a significant gap in understanding how institutional infrastructure and policy might support or hinder these efforts, a gap this study addressed by examining the role of institutional support on students' ICT use. However, in other contexts, ICT integration remains limited.

Chirwa and Mubita (2021) study conducted a study in Zambia on ICT resources utilization. The findings revealed that geography instructors reported minimal ICT resources use due to inadequate infrastructure and insufficient digital literacy training. Although instructors and students express interest in digital tools, ICT usage in instruction is often irregular and largely dependent on individual initiative rather than institutional policy. This gap points to a need for systemic support for ICT integration, particularly by implementing consistent ICT training and curricular adjustments that would embed ICT tools in college-level geography education.

EMIOLA (2022) conducted a study in Nigeria that utilized mixed-methods approach to evaluate the acceptability of augmented reality (AR) technology among geography teachers and students in higher education and used a descriptive survey designed and a quasi-experimental design which involved 61 students and 22 instructors, collecting data through an achievement exam, a cognitive stress scale, and semi-structured interviews. The findings indicated that AR technology-enhanced student achievement and reduced cognitive load, with students expressing positive attitudes toward its use. This study suggested that AR holds significant potential for transforming geography

education, especially in teaching physical geography. Nonetheless, it is worth noting that while the study presents promising outcomes, it lacks an exploration of the long-term sustainability and scalability of AR technology in different educational contexts. In addition, this study findings, it clear that AR technology can be a powerful educational tool, yet questions remain about its accessibility and cost-effectiveness for widespread adoption, particularly in resource-constrained settings. There is a need for further research to explore how institutions can integrate AR in a sustainable manner that benefits a broader student demographic.

Putra et al. (2021) conducted a study that examined the effects of blended project-based learning (BPjBL) using a STEM approach on students' spatial thinking and geography abilities. Their quasi-experimental study, involving second-year Indonesian high school students, demonstrated that the BPjBL method significantly improved geographic knowledge and spatial thinking. The results highlighted that incorporating STEM into project-based learning reshapes students' understanding of geography and promotes active engagement with ICT resources. Both teachers and students embraced ICT integration, demonstrating its role in enhancing the learning experience. This study provided valuable insights into the benefits of STEM-integrated project-based learning; it primarily focuses on a specific student population. One of the most recent study carried out among the technical colleges in Kenya by Omariba and Miima (2024) on enhancing green learning in education through e-learning revealed the same trend of many instructors and trainees limited skills. There remains a gap in understanding how ICT could be adapted for diverse cultural and socioeconomic settings. Additionally, the studies not address the potential

barriers educators may face in consistently implementing such innovative techniques, especially in under-resourced institutions in developing countries.

2.4 Instructors and Students Perceptions of ICT Utilization during Geography Instructions

Perception encompasses teachers' beliefs, mental images, psychological constructs, and emotional responses related to their professional activities and interactions with students. Their prior knowledge and life experiences deeply influence these perceptions, shaping their approach to teaching and professional behaviors. Essentially, perception is the accumulation of knowledge and ideas developed through repeated encounters with a subject, leading to well-formed views and opinions. This study examined more accessible ICT tools that could provide immersive learning experiences in resource-limited settings, filling a crucial gap in the current research on ICT in geography education.

For instance, teachers may develop specific attitudes or perspectives on a new ICT driven curriculum after implementing it in their classrooms. These perceptions can be multifaceted, including both positive and negative reactions based on the effectiveness of the curriculum and how well it aligns with their teaching style and students' learning needs. Moreover, perceptions are not static; they evolve as teachers gain more experience and reflect on their practices. Understanding the dynamics of teachers' perceptions is crucial for educational reform, as these views often impact the success of new initiatives and the overall teaching and learning environment.

2.4.1 Students' Perceptions of ICT Utilization during Geography Instructions

Fuchs and Meyer (2023) conducted a study on the use of virtual reality (VR) as an ICT resource in college geography education, focusing on student perceptions. This study observed that VR tools could create immersive experiences that deepen students' understanding of geographic landscapes and ecosystems. Though, the adoption of VR is limited by the high cost and lack of VR equipment in many institutions. Moreover, students reported that without proper instruction on using VR technology, its impact on learning was diminished. This study does not explore alternative ICT tools that could provide similar immersive experiences at a lower cost or the potential for blended learning approaches that combine VR with traditional learning. While VR has shown potential to revolutionize geography education, its high costs and accessibility issues limit its widespread use. This study examined more accessible ICT tools that could provide immersive learning experiences in resource-limited settings, filling a crucial gap in the current research on ICT in geography education.

Jan (2019) explored the link between digital literacy and students' attitudes toward ICT use among 344 high school students in Karachi, Pakistan. The study utilized a Google Forms survey with a balanced gender ratio and found that digital literacy skills significantly influenced students' positive perceptions of ICT. Factors such as familiarity with tablets and smartphones, prior computer training, and frequent use of computers were linked to more favorable attitudes toward ICT integration. While this research highlights the importance of digital literacy, it does not address the influence of these attitudes on academic performance, especially in geography. This subject benefits from spatial and visual learning tools. Furthermore, the gap here lies in

understanding how digital literacy impacts academic outcomes in geography education. This research extended this by investigating the correlation between ICT use and student performance in geography, offering practical insights into how digital literacy can enhance spatial reasoning and content mastery.

Moreno and Sánchez (2024) conducted a study in Madrid, Spain, that targeted 150 geography students at a university to examine student perceptions of ICT tools in geography education. The findings revealed that students valued ICT for its interactive learning capabilities, particularly digital mapping and data visualization tools and they expressed concern over the limited technical support available on campus, which restricted their ability to use ICT resources effectively. This study discovered the lack of technical support but did not address whether students possess foundational digital literacy skills to use these resources independently. Furthermore, this study's findings suggested that while students are motivated to use ICT, a lack of support undermines their efforts. This study extended these insights by exploring the relationship between digital literacy training and students' confidence in using ICT resources, with a focus on how technical support can be structured to empower independent learning.

Gupta and Sen (2023) conducted a study in New Delhi, India, which targeted 200 undergraduate geography students, with key focus on students' perceptions of ICT resources utilization in geography learning. It was acknowledged by the students that tools such as GIS, remote sensing software, and online spatial databases contributed to their understanding of complex concepts. Yet, several of the students indicated that a lack of support from faculty in integrating ICT tools created an additional barrier, limiting their confidence and usage of these tools. The study explored the gap in

faculty involvement but did not establish how institutional policies could help promote ICT utilization in the curriculum. This study further revealed that faculty support is essential for effective ICT integration and this study lastly investigated institutional policies and structured ICT support systems that could enable both faculty and students to make better use of technology in geography education.

EMIOLA (2022) studied the acceptance of augmented reality (AR) technology among Nigerian geography professors and students using a mixed-methods approach. The study found that AR reduced cognitive load and boosted student achievement, with participants responding positively to its use, especially in physical geography. Although AR showed promise, the study did not examine the long-term feasibility or accessibility of AR technology for broader implementation. This study findings suggested that AR can revolutionize geography instruction, but practical barriers to its widespread adoption remain unexplored. My research will address these limitations by evaluating the cost-effectiveness and scalability of AR and other advanced ICT tools in different educational settings.

Putra et al. (2021) analyzed the impact of blended project-based learning (BPjBL) using STEM on Indonesian high school students' spatial thinking and geography skills. The quasi-experimental study demonstrated that BPjBL significantly enhanced students' geographic knowledge and spatial reasoning. However, the study did not investigate challenges faced by teachers in implementing such methods, such as resource limitations or training needs. This study reveals the potential of STEM-based project learning but leaves a gap in understanding the practical challenges of integrating such methods in under-resourced classrooms. My research will explore

how BPjBL and similar approaches can be adapted to contexts with limited resources to maximize student engagement and learning outcomes.

Bikar and Sharf (2020) used qualitative methods to explore Malaysian students' attitudes toward minimalist robotic games in geography instruction. Interviews with six students who developed a robotic geography game revealed that using simple robotics increased student interest in geography. However, the small sample size limits the generalizability of these findings, and the study did not consider the scalability of implementing robotics in regular classrooms. While the enthusiasm for robotics in geography education is promising, the study's limited scope underscores the need for broader research. This research investigated the practicality of implementing robotics and other innovative technologies in geography instruction across diverse educational contexts.

Chen and Wei (2023) study conducted in Beijing, China to explored the perceptions of 250 university geography students toward ICT integration in their coursework. The results isclosed positive attitude among students, who valued ICT resources role in enhancing spatial understanding through tools like Google Earth and GIS software. On the contrary, students felt unprepared to use complex ICT resources without additional training and support. Even though this study findings revealed positive perceptions, it fails to address the specific instructional methods or curricula adjustments needed to boost student proficiency in ICT tools. Chen and Wei's research underscores the need for hands-on ICT training to equip students with the

technical skills necessary for geography studies. This study further investigated how curriculum design and tailored ICT training can improve students' comfort and proficiency in using digital tools for geography.

Nyarko and Boateng (2022) conducted a study in Accra, Ghana across three universities that targeted 300 geography. The students findings indicated that students expressed enthusiasm for ICT tools like GPS, GIS, and interactive digital maps and they perceived these tools as valuable for understanding geographical data and spatial concepts. However, the findings also indicated that infrastructure challenges, such as unreliable internet and insufficient ICT facilities, which hindered effective ICT integration into their learning experiences. Furthermore this study revealed that infrastructure issues but does not explore students' adaptive strategies or how institutions might support these efforts. This study findings discovered that students recognize ICT's benefits, they also emphasize the critical issue of infrastructure barriers and this study investigated deeper into potential adaptive strategies that students and institutions can use to optimize ICT resource utilization, even in resource-limited settings.

2.4.2 Instructors' Perceptions of ICT Utilization during Geography Instructions

Travis and Brett (2018) conducted a study in Japan on ICT utilization in teaching and learning. The findings revealed that educators had generally positive attitudes toward using computers in their teaching. More than half of the instructors expressed a desire to improve their computer skills, recognizing the importance of technology in the classroom. The instructors believed that integrating computers could enhance teaching

and make learning more engaging, particularly in language education. In addition, the findings highlighted that while educators are motivated to embrace technology and see its instructional benefits, there is a gap in the practical application, as the study did not address the specific barriers educators face in geography education, such as specialized training or relevant resources. Furthermore, this study emphasized enthusiasm for technology use, it does not explore the unique challenges geography instructors encounter, such as spatial data tools or geographical software. This research will address how such gaps influence ICT integration in geography instruction.

Smith and Hernandez (2023) investigated the attitudes of 80 geography instructors in their study from various colleges in Bogotá, Colombia, regarding digital pedagogy in geography instruction. The study found that even though most instructors viewed ICT positively, many were concerned about the lack of relevant software and felt unprepared to use ICT for interactive learning due to inadequate professional development opportunities. The study revealed that the lack of relevant educational software but fails to investigate the types of digital tools that could better support geography instruction in low-resource settings. Furthermore, this study's findings revealed that geography instructors desire more relevant software and training for digital pedagogy. This research addressed these needs by identifying specific ICT tools suitable for geography instruction and exploring the benefits of targeted professional development programs.

Wang and Xu (2024) conducted qualitative interviews in Beijing and Shanghai, China that targeted 60 college geography instructors from, to examine their experiences with ICT integration. Instructors acknowledged the potential of ICT to facilitate active learning and geographic analysis. Nonetheless, many reported frustration over limited technical support and inadequate resources, which hindered consistent ICT utilization in their classes. The study identifies logistical challenges but does not explore potential solutions or alternative teaching strategies that might assist instructors in overcoming these resource limitations. This study highlighted a recurring issue: inadequate technical support is a barrier to ICT adoption. This research addressed this by exploring cost-effective solutions and alternative instructional models that allow instructors to optimize available ICT resources for geography lessons.

Osei and Boateng (2022) conducted a study in Accra, Ghana, which involved 100 geography instructors to evaluate their acceptance of and attitudes toward ICT tools in geography education. Instructors generally recognized ICT as beneficial for delivering complex spatial information and visual data. Yet, a significant portion of the respondents expressed apprehension about using advanced tools like GIS, due to limited training and a lack of familiarity with digital pedagogy. The study does not address how regular and targeted ICT training could mitigate these fears and boost instructors' confidence in using advanced technologies in their teaching. This study's findings discovered that there is a need for continuous training to build instructor confidence in using sophisticated tools such as GIS. This research investigated the impact of structured and sustained ICT training programs on geography instructors' ability to effectively utilize these tools.

Ahmed and Sattar (2023) conducted a study across three universities in Lahore, Pakistan, which investigated 150 geography instructors to assess their perceptions of ICT integration in teaching. The majority of instructors expressed positive views on ICT as a tool to enhance student engagement and support visual learning. However, many participants cited a lack of advanced technical skills and insufficient institutional support as barriers, which affected their ability to fully utilize ICT in their classrooms. Although the study acknowledges a lack of institutional support, it does not explore specific strategies that could bridge the gap between enthusiasm for ICT use and practical application. Ahmed and Sattar's study underscores that while instructors value ICT, they require targeted professional development and institutional backing to fully leverage these resources. This investigation addressed these needs by examining tailored ICT training programs and institutional policies that could enable geography instructors to utilize technology more effectively.

Chirwa and Mubita (2021) found that ICT usage in geography education remains limited. Teachers were constrained by outdated pedagogical methods, as they had not developed effective strategies for incorporating ICT constructively. Additionally, both teachers and students noted a mismatch between the perceived benefits of ICT and its actual application in classrooms. Factors such as insufficient ICT proficiency among both groups and a lack of specialized ICT resources were significant barriers. Despite understanding ICT's potential benefits, instructors failed to utilize the tools effectively when available. This study highlights a major issue: the disconnect between awareness and application. This study examined why this gap persists and identifies strategies to equip teachers with the necessary skills and resources to integrate ICT in geography effectively.

Saxena (2017) conducted research in Canadian schools, which findings discovered that many teachers felt inadequately prepared to integrate ICT into their curriculum effectively. Although pre-service teachers received training in educational technology, this did not translate into practical ICT skills for classroom instruction. Many educators struggled with digital tools, even after training, due to insufficient technological competence. This suggests a gap between teacher education programs and the real-world demands of ICT-based instruction. The Canadian study underscores the need for more practical, ongoing professional development. This research explored how teacher training programs can be aligned with real classroom needs, particularly in the context of geography education.

Mushimiyimana et al. (2022) study explored the condition at the Rwanda College of Education, where lecturers identified several ICT tools, such as Moodle and Mendeley, which could significantly benefit their students. Nevertheless, despite receiving training, the lecturers did not use these tools due to insufficient infrastructure and the challenge of overcrowded classes. This highlights a disconnect between training and implementation, with systemic issues preventing the effective use of technology. The study revealed that even when teachers are well-trained, logistical barriers can impede progress. This study reveals a critical gap between training and infrastructure. This study investigated how such barriers influence the practical use of ICT in geography instruction and propose solutions to bridge this gap.

Youssef et al. (2022) study demonstrated that innovative and collaborative ICT use positively influences student performance, with digital skills contributing to academic achievement. The study found that teacher experience, training, and readiness significantly affect student outcomes, accounting for 33.3% of the variation in

academic performance. A similar study was carried out by miima (2013) on teachers perception and learners on integration of ICTs in teaching of Kiswahili language in secondary schools in Kenya and the findings were not different from the studies carried out later. Though, the persistent digital divide raises concerns about the effectiveness of educational policies in addressing these gaps. Furthermore, this study showed a clear link between teacher preparedness and student success, but it also emphasized that the ongoing issue of digital inequity and this study focused on how these dynamics specifically affect geography education and student achievement, addressing the structural barriers and training needs that remain unresolved.

2.5 Challenges experienced by geography instructors and students while utilizing ICT resources during instructions

Constance and Musarurwa (2018) identified numerous barriers that impede the integration and effective use of ICT in geography education. The findings of this study revealed that the Seychelles geography curriculum faces challenges such as outdated content, insufficient guidance on web-based and software tools, and unreliable internet access. Teachers struggle to effectively use online resources and repurpose PowerPoint slides, highlighting a gap in 21st-century teaching demands. Enhancing teacher training and infrastructure is needed to support ICT integration. The study highlights the need for structured professional development and curriculum updates to improve ICT use in geography education. Still, it does not address specific support mechanisms for teachers to become more confident and competent in technology.

Villalon Tomaro (2018) explored similar issues in the Philippines, noting the lack of infrastructure, inadequate teacher preparation, and limited technological knowledge.

The research highlighted attractions to the need for a technological leader in schools to promote ICT integration, but lacks specific strategies to overcome barriers and support teachers in adopting ICT tools. The study explores feasible solutions, including leadership and teacher support, to create a more ICT-friendly environment.

Singh and Patel (2022) surveyed 150 geography instructors and 600 students from colleges in New Delhi, India. This study highlighted the importance of institutional support in promoting digital literacy for students and instructors. It highlights the challenges faced by instructors in accessing ICT tools, such as inadequate training, limited digital resources, and lack of support from educational authorities. The research aims to explore specific policies and support mechanisms that can facilitate ICT skill development in geography education, highlighting the need for improved training and support for both students and instructors.

Rana and Rana (2020) conducted a case study on higher education in Nepal, revealing barriers such as poor ICT policy, untrained staff, and unstable electricity. They found that older teachers were hesitant to use ICT, while limited infrastructure and overcrowded classrooms hindered technology use. The study stressed the need for investment in ICT infrastructure and training to modernize Nepal's education system. While the study identifies key challenges, it does not explore how these issues specifically affect geography instruction. This research focused on the unique needs of geography educators and propose strategies to address these systemic barriers.

Chen and Wu (2023) surveyed 95 geography instructors and 500 students in rural regions of Sichuan, China, to explore the technological challenges in geography education. The study highlights the challenges faced by rural geography education

due to insufficient funding, lack of ICT tools, and inadequate teacher training. The lack of access to interactive maps, GIS software, and stable internet hinders the teaching of geography's practical components. The research aims to explore innovative funding models and partnerships with community organizations to improve ICT availability in rural settings, highlighting the impact of funding shortages.

Igbunu (2022) in Nigeria noted that unreliable power supply remains a major challenge, influencing economic development and the education sector. Instructors and students face difficulties utilizing ICT resources effectively due to frequent power outages. Similarly, in Ghana, teachers struggled with poor internet connectivity and limited access to computers, leading to frustration and ineffective teaching practices (Antwi et al., 2018). The consistent theme of unreliable power and connectivity across multiple countries underscores the need for sustainable infrastructure solutions. My research will address this gap by examining alternative strategies, such as solar energy and offline digital resources, to support geography education.

Ridha and Kamil (2021) explored the integration of geospatial technology in Indonesia and found that inadequate infrastructure, teacher training, and GIS software availability were significant hurdles. They stressed the need for government and school collaboration to enhance ICT use in geography education. While the study focuses on geospatial technology, it lacks insights into how these barriers affect broader ICT integration. This research investigated how comprehensive ICT strategies, including both geospatial and general technology tools, can improve geography instruction.

Rajan (2018) highlighted challenges such as poor network connectivity, unreliable energy, and a lack of self-motivation among teachers. The study advocated for improved ICT infrastructure, technical support, and a reward system to encourage ICT integration. However, the study did not explore how these factors specifically influence geography education. The need for motivation and technical support is evident, yet there is a gap in understanding how to tailor these solutions for geography teachers. This study addressed this by proposing specific incentives and support systems for geography educators.

Johnson and Adamu (2024) surveyed 60 geography instructors and 400 students from various colleges in Lagos, Nigeria. The study highlighted the digital divide in Nigerian colleges, affecting students' access to ICT resources due to inadequate infrastructure and unreliable electricity. Instructors report that many colleges lack essential ICT tools, hindering interactive geography lessons. The research suggests exploring alternative, low-cost ICT resources, and infrastructure solutions to make ICT-based geography education more accessible in under-resourced settings, highlighting the ongoing challenge in resource-poor settings.

Al-Mamary (2020) examined ICT use in Yemeni schools, identifying barriers such as insufficient ICT skills, outdated hardware, and lack of training. The study underscored the importance of teacher confidence and access to educational software but did not explore subject-specific ICT needs. This research points to a broader issue of ICT integration in education. This study filled the gap by focusing on geography-specific ICT resources and how they can be effectively implemented to enhance student learning.

Lee and Park (2023) conducted a case study with 85 geography instructors and 250 students from Seoul, South Korea. This study found that despite access to basic ICT tools, geography instructors and students in Seoul, South Korea, face difficulties due to a lack of relevant software, limited digital literacy, and insufficient training programs. Instructors felt unprepared to integrate advanced tools like GIS, citing a lack of resources and training. The study highlights the need for geography-specific training programs and examines the effectiveness of GIS and other specialized ICT tools in enriching geography instruction. Strategies for implementing comprehensive training programs are also discussed. Williams and Garcia (2022) conducted a study on the challenges faced by 120 geography instructors and 300 students in secondary schools in Nairobi, Kenya. This study found that geography instructors and students in Nairobi, Kenya, face challenges with limited access to ICT resources, unstable internet connectivity, and outdated hardware and software. Students also face difficulties accessing computers and lack interactive resources for geography lessons. The absence of an organized ICT curriculum hinders the integration of digital tools in geography education. The study did not find solutions to bridge the technological divide or consider administrative support's role in improving access. The research suggests exploring collaborative programs and administrative support to enhance ICT accessibility for geography instruction.

2.6 Summary of existing Gaps in the Related Literature Reviewed

Information Communication and Technology (ICT) resources are essential for economic, societal, and interpersonal transactions, and it faces challenges for teachers and students in developing countries with different socioeconomic backgrounds. The improvement of geography teachers' ICT proficiency and other social science subjects

depends on the caliber of education they receive from teacher training institutions, colleges, and universities. The substantial proportion of graduate unemployment in developing countries may be lowered if the curriculum focuses on building ICT knowledge and skills that are necessary in the job market.

There are limited studies in the integration and use of ICT resources in the Liberian educational system, such as local studies on digital literacy, policy, students' attitudes, and ICT resource kinds. The majority of research on ICT resources has been undertaken in elementary, junior high, and high schools, with universities, colleges, and other higher education institutions paying minimal attention. ICT, encompassing digital data storage devices, computers, software, communication networks, and audio-visual equipment, has considerably expanded interest in geographical learning in the twenty-first century. ICT is crucial for instructors and students to improve job skills such as creativity, literacy, critical thinking, problem-solving, numeracy, and cognition.

The literature review validates a significant difference in geography education before and after the use of ICT. Geography instructors who employ relevant ICT resources during instructions see an improvement in their students' performance and demonstrate superior technological knowledge and abilities compared to those who use traditional methods. The use of ICT tools that ensure students' complete engagement at all times makes geography more meaningful. To ensure successful integration and usage of ICT resources in instruction, it is essential to resolve issues and factors that obstruct their use. Many studies have focused on how ICT was used and integrated, but they have not considered the amount of ICT teachers and students use in geography classes.

Table 2.1 Review of Related Literature

SN	Objective	Author/ Year	Contribution (s)	Gap (s) Found	Way forward to addressing those gaps found
i	Establish the type of ICT resources available for geography instruction.	Usharani & Nachimuthu (2020)	Discusses the significance of ICT in enhancing student engagement and learning outcomes in geography education.	Insufficient focus on geography-specific ICT resources like GIS and their role in higher education.	This research will emphasize the importance of geography-specific ICT resources and propose strategies for their adoption in college-level geography curricula.
		Antwi et al. (2018)	Found that some high schools in Ghana use ICT tools like projectors and Google Earth, but integration with geography curricula remains weak.	Identified inconsistent ICT resource availability and lack of curricular integration.	This study will investigate the availability and integration of ICT tools in geography instruction at the college level and recommend ways to align ICT use with the curriculum.
ii	Investigate the extent to which geography instructors and students utilize ICT during instruction.	Ndolo (2020); Opeoluwa-Olagbaju et al. (2021)	Discuss significant disparities in ICT resource distribution in developing nations, affecting both primary and secondary education.	Minimal focus on college-level geography education and the impact of ICT tools on advanced spatial skills.	The study will explore the extent to which college-level geography courses are equipped with ICT resources and suggest ways to enhance the teaching and learning experience using specialized technologies.

		Chirwa & Mubita (2021)	Identified low ICT use in Zambian geography education due to insufficient infrastructure and digital literacy training.	Lack of systemic solutions for improving ICT integration and inadequate exploration of long-term institutional support.	This study will propose systemic solutions, including policy recommendations and sustainable ICT training models for geography instructors and students.
iii	Investigate the perceptions of Geography Instructors and students towards the use of ICT in Geography Instructions .	Ngo & Eichelberger (2019)	Investigated ICT use in English learning among Vietnamese college students, finding that technological comfort affected attitudes toward ICT.	Focused solely on language learning, not addressing implications for geography or other content-rich subjects.	The research will extend these findings by analyzing how technological comfort impacts geography instruction, especially in visualizing spatial data.
		Alarabi et al. (2022)	Examined students' perceptions of online physics education in the UAE, noting the benefits of digital learning platforms but highlighting socioeconomic disparities in technology access.	Did not investigate the application of ICT in hands-on or spatial subjects like geography.	This study will explore how online platforms can be tailored for geography education to enhance engagement and overcome socioeconomic barriers.
iv	Explore the challenges experienced while utilizing ICT	Constance & Musarurwa (2018)	Identified barriers like an outdated curriculum, insufficient guidance on web/software tools, and unreliable internet in Seychelles. Raised concerns	Did not propose specific support mechanisms to boost teachers' confidence and competence in using ICT.	This study will explore structured professional development and curriculum updates to empower teachers with relevant ICT skills and resources for geography

resources during geography instructions by: Geography instructors Students	over teachers using pre-made slides, influencing quality.	education.
Igbunu (2022) & Antwi et al. (2018)	Emphasized unreliable power and internet connectivity as major challenges in Nigeria and Ghana, influencing ICT use in education.	Did not offer alternative solutions to mitigate power and connectivity issues.
		This study will explore sustainable alternatives, such as solar energy and offline digital tools, to ensure reliable ICT use in geography instruction.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This segment summarizes the research methodology that was employed in this chapter. It provides information on the following subheadings: research design, research variables, study location, targeted population, sampling procedures, and sample size, and research instruments. It also looks at the pilot study's validity and reliability, data collecting techniques, data processing, and logistical and ethical issues.

3.2 Research Design

A descriptive research design is well-suited for examining the utilization of ICT resources in geography instruction within a college setting. Descriptive research systematically collects data that defines and characterizes a particular phenomenon, event, or population, making it ideal for capturing detailed insights into the current practices, type of ICT resources, the extent to which instructors and students utilize ICT during Geography instruction, instructors and students perceptions during ICT resources utilization, and challenges related to ICT integration in teaching. This design addresses essential "what," "how," and "why" questions, providing a foundational understanding of the ways ICT resources are used in geography classrooms. According to Williams (2007), a descriptive survey design is useful for explaining characteristics, opinions, and perceptions relevant to the research population. It involves gathering data through questionnaires and interviews, as noted by Orodho and Kombo (2002).

This design also allows for using both quantitative and qualitative methods, enabling researchers to observe and measure ICT-related behaviors and gather perspectives directly from instructors and students. Using descriptive surveys, researchers can identify and document the types of ICT resources available, examine the methods and frequency of their use in instruction, and assess perceptions and attitudes toward ICT among educators and learners. Additionally, this design supports the identification of barriers and challenges to effective ICT utilization, yielding critical data that can inform strategic improvements in ICT integration.

Through questionnaires and interviews, descriptive research captures a broad and accurate representation of ICT usage in geography instruction, leading to actionable insights and recommendations. This makes it a suitable approach for studies focused on understanding the role of ICT in enhancing teaching and learning in higher education of which the William V. S. Tubman College of Education is no exception. This design enables this study to achieve all of its intended objectives.

3.3 Study Variables

A variable is a notion that differs in amount, type, or sort, according to Bailey & Bailey (2017). The study looked into the different kinds of ICT resources available, variables that influence ICT use, and the degree to which technology improves geography instruction. It also looked into gender disparity or differences, difficulties instructors and students encounter when using ICT, and teaching methods used in the University of Liberia's college of education. These factors are independent. The dependent variable is student accomplishment in geography, while the independent factors are the government's ICT policy, the college's ICT policy, the college's

curriculum or syllabus, access to ICT, administrative assistance, and the entering behaviours of the students.

3.4 Location of the Study

The study was conducted at the University of Liberia's Fendall Campus, specifically within the William V.S. Tubman College of Education in Montserrado County, one of Liberia's fifteen counties. This college educates approximately 60% of the nation's teachers, serving a large student population across early childhood, primary, junior high, and secondary education in all subject areas. The choice of this location was informed by the low student performance observed in Physical Geography 101, as well as insights from the problem statement that underscore challenges in ICT utilization for geography instruction.

As a key institution for teacher preparation across Liberia's 15 subdivisions, the college is respected for producing capable pre-service and in-service educators. It currently enrolls about 1,262 students. However, despite the commitment and diligence of instructors and students, there is a notable gap in ICT proficiency in instructional practices. This study location, therefore, offers a unique setting to explore and address these ICT challenges in geography education, aiming to enhance teaching outcomes and support improved academic performance.

3.5 Target Population of the Study

The population, according to Mugenda & Mugenda (2019), is a large group of people, things, or circumstances that share some observable features. Bailey and Bailey (2017) go on to say that if the target population is homogeneous, the investigator can generalize with more assurance.

Table 3.1: Targeted Population

Categories	Targeted population	Total
Administrator	10 (6 males & 4females)	10
Geography Instructor	6	6
Part-time Instructor	geography 2	2
Students	1233	1233
Grand Total	1,251	1,251

Source: University of Liberia Portal (2022)

As a result, the respondents to this study were geography teachers, administrators, and students studying geography courses at the institution. The targeted population is the group of people for whom the study aimed to generalize its results. The participants in this study included college students taking geography courses as well as geography professors and administrators. There are 1233 pupils who were intended to be reached, 6 geography instructors, 2 part-time geography teachers, and 10 administrators.

3.6 Sampling Techniques and Sample Size

A small group chosen from the assembled population is referred to as a sample size. Orodho (2005) defined a sample as a subset or a predetermined number of participants chosen to reflect a certain population. Either a probability-based approach or a non-probability-based method can be used to choose the sample. Additionally, the procedures used in sample selection are known as sampling methods. To ensure that a sample correctly represents the population being sampled, there are numerous

sampling procedures. Examples of sampling procedures include random sampling, stratified sampling, snowball sampling, theoretical or intended sampling, and more.

3.6.1 Sampling Techniques

This research employed the purposive sampling technique to select Ten (10) administrators, four (4) geography instructors, and two (2) part-time geography instructors (instructors who are not fully employed with the university) of the college for the purpose of this study because they provided direct responses to the research questionnaires and interview guide. Purposive sampling, also known as judgmental, selective, or subjective sampling, is a sampling approach in which the researcher utilizes their own judgment to pick study participants (Dudovskiy, 2011). A non-probability sampling strategy called purpose sampling involves the researcher selecting the sample items. Purposive sampling is a common strategy among researchers since it is both time- and cost-effective when compared to other sampling methods. The ability of the researchers to select the best-fit respondents for studies is dependent on their knowledge. These enabled researchers to talk about how their results will have a big effect on the population (Formplus Blog, 2021).

This study employed a simple random sampling strategy to pick 202 college geography students using a lottery system. This was accomplished by sketching thumbs up and thumbs down on pieces of paper depending on the number of students, folded them, placing them in boxes, one for males and one for females, and asking each student to pick one at a time. The number of thumbs-ups was equal to the sample size. Students who chose thumbs up were eligible to participate in the study, while those who chose thumbs down were not eligible. This process was repeated until all of the thumbs-up and thumbs-down papers in the two boxes were selected. Simple

random samples are random subsets of populations. This probability sampling strategy is the most straightforward because it only needs one random pick and a minimal amount of demographic information. The probability of being selected is the same for everyone in the population. The randomization of this sample guarantees high levels of internal and external validity (Thomas, 2020).

3.6.2 Sample Size

Kothari (2004) asserts that a sample size of 10% to 30% of the target population is sufficient for generalization. A descriptive survey only requires a representative sample of 10% to 20% of the population, according to Bailey and Bailey (2017). As a consequence, the researcher interviewed a sample of 10–40% of the target population. Table 3.2 below shows the sample composition and the number of administrators, instructors, and students selected for this study. The sampling framework, according to Bryman (2001), is a list of all the population units from which the sample for research is to be drawn.

Table 3.2: Sampling Framework

Population Category	Targeted Population	Total Sample Size	Percentage
Administrator	10	10	100
Geography Instructor	6	4	66.7
Part-time Instructor	2	2	100
Students	1233	202	16.4
Total	1,251	218	17.4

Table 3.2 indicates that the population category and target population were 6 Geography Instructors, 2 Part-time Instructors, 10 administrators, and 1233 students. The sample size was 6 geography instructors, 2 part-time geography instructors, 10

administrators, and 202 students. The respondents to this study were chosen using the William V. S. Tubman College of Education at the University of Liberia. A sample, although small enough to be economically picked, is large enough to reflect the population (Best and Kahn, 2010). The study at the college of education included 1,251 people, or 17.4% of the population. According to Mugenda and Mugenda (2003), generalizations require a sample size of 10% or more of the target population. Therefore, 17.4% of the study's target population reached the cut-off and was used in the sample of respondents.

3.7 Research Instruments

The following methods were used to acquire data for this study: questionnaires for geography instructors and Students, interview guides for administrators and geography instructors and Classroom Observation Checklist..

3.7.1 Questionnaires

According to Gray (2010), questionnaires are quantitative research tools that demand respondents respond to a predetermined sequence of questions. According to the author, one method that is widely utilized for acquiring primary data is the use of questionnaires. Self-administrated questionnaires, on the other hand, ask participants to complete the items on their own after receiving the instruments (Mugenda & Mugenda, 2019). In research, collecting data from respondents is the main goal of a questionnaire. The researcher utilized the questionnaire to gather data, even if the respondents' comprehension and interpretation of a few items varied. This is because the interviewer was impartial. The respondents are also allowed to complete the questionnaire whenever and wherever it is convenient for them, within the timeframe that will be given to them. To assess the use of ICT in geographic education, this

initiative offered geography instructors and students a self-administrated questionnaire. The survey asked both closed- and open-ended questions and gathered demographic information from respondents. (See Appendices C, D, and E.)

3.7.2 Interview Guides

A dialogue between an interviewer and an interviewee is described as an interview by King and Horrocks (2012) in order to elicit information from the interviewee. Interviews can be performed in person, over the phone, or online using Zoom, Google Meet, Telegram, Messenger, or Skype. An in-depth interview, on the other hand, is a qualitative research approach that entails conducting extensive one-on-one interviews with a small number of participants in order to learn more about their perspectives on a certain topic, issue, scenario, or program (Boyce & Neale, 2006). Interviews take time, but an in-depth interview allows the interviewers to clarify, comprehend, and delve into the interviewees' perspectives on the subject. In order to gather information for this study regarding the use of ICT in geography education, in-depth interviews with college administrators and geography professors were conducted. (See Appendix "D").

3.7.3 Classroom Observation Checklist

An observation checklist is a collection of criteria used to assess how well teachers, administrators, students, and other instructional resources are performing and acting in a learning environment (Rog and Bickman, 2009). Regarding the purpose of this research, the ICT Utilization abilities, TPACK proficiency, and attitudes of the geography instructors were assessed using the checklist. This instrument was used to evaluate students' attitudes toward, knowledge about, and skill during the used of ICT in the classroom. (Appendix E).

3.8 Pilot Study

The pilot study aimed to evaluate the validity, reliability, and practicality of the research instruments and procedures, ensuring they were suitable for the main study on ICT utilization in geography instruction. The pilot included two (2) geography instructors, twenty (20) students, and two (2) college administrators from a similar college selected via purposive sampling to align with the main study's demographic and contextual requirements.

Participants tested the instruments, providing feedback on their clarity, relevance, and usability. Data collected through research questions were analyzed using descriptive statistics and thematic analysis. During the piloting process, the strengths and weaknesses questionnaires were identified. The Strengths included alignment with study objectives and generally clear questions. However, some items were ambiguous, leading to misinterpretation, which prompted revisions for better clarity and focus. In Addition, the strengths and weaknesses of the interview guide were also identified. The updated version of the interview guides noted and streamlined some repetitive questions, but they still allowed for open and in-depth discussions. The pilot revealed minor issues with research instruments and data collection methods, which were corrected to enhance the validity and reliability of the main study. These adjustments position the main study to achieve robust and meaningful findings in line with its objectives.

3.8.1 Validity of the Research Instruments

According to Patino and Ferreira (2018), the research's validity is determined by both internal and external validity. According to Patino and Ferreira (2018), validity is the

degree to which study results closely match those of comparable individuals outside the study. According to Cohen et al. (2011), an instrument's validity and accuracy are connected. Through a pilot study, the validity of the research instruments was evaluated. For quantitative validity and triangulation for qualitative validity, this study used content, construct, and face validity. According to Mugenda (2008), the degree to which the data from a tool properly reflects the content of a certain set of indicators or conceptions is referred to as content validity. To make sure the study tools addressed the topic, two academics from the Department of Educational Communication and Technology evaluated them.

The research tools were also examined by research supervisors to ensure that each survey question had a clear objective. When data from each research measuring tool corresponds to theories or beliefs about mental functioning, this is referred to as construct validity (Tolmie et al., 2011). This was carried out numerous times by applying the test, correlating the outcomes, and contrasting the correlation pattern, which allowed the researcher to assess how accurately the observed construct predicted the anticipated study results about the specific objectives.

Face validity is when the research tool's outward appearance reflects the topic in question (Bryman, 2001). To show the face validity of the research instruments, supervisors, who are experts on the subject, were given the study instruments so they could decide if they showed what the concept was about the problem under investigation. They help in arranging the questions on the questionnaires in such a way that there is a logical flow of ideas. This process enhanced proper face validity controls.

3.8.2 Reliability of the Research Instruments

According to Mugenda & Mugenda (2003), a research instrument's reliability is a measure of how consistently it provides results after several trials. The test-retest approach improved the study's dependability. To accomplish this, the same institution that was utilized for the first piloting was visited after two weeks, and the same students, geography instructors, and administrators in Montserrado County were given the modified instruments. The same sample of respondents got the research tools twice, at intervals of two weeks. The study employed the test-retest process to eliminate biases. The Pearson's Product Moment Coefficient was used to compute the correlation coefficient after comparing the results of the first and second pilots. According to Mugenda & Mugenda (2003), a correlation value of 0.5 or greater is necessary.

A correlation coefficient of 0.5 or above is regarded as suitable and thus reliable for data collection, according to Mugenda and Mugenda (2003). Since the Pearson Coefficient correlation resulted in values of 0.79 for the questionnaire of geography instructors, 0.77 for students' questionnaires, 0.76 for the schedule of geography instructors' interviews, and 0.75 for college administrators, it was deemed reliable because it was greater than 0.5. According to these correlation coefficients, the research tools were trustworthy for gathering data.

3.9 Data Collection Technique

Once the study was authorized by the Graduate School Board, the researcher received a proposal authorization letter from the Kenyatta University dean before departing for fieldwork. The researcher requested approval from the University of Liberia Institutional Review Board (UL-IRB) to carry out the study at the university before

distributing the study instrument to the respondents at the William V. S. Tubman College of Education at the University of Liberia. In addition, he got the nod letter from the dean of the college. At the William V. S. College of Education, the researcher gathered data for this study with the aid of a research assistant. As part of this procedure, participants first received questionnaires; interviews were conducted with administrators and geography instructors; and lastly, observations (of classroom and ICT resources) were done. The data collection lasted for a month. This study collected data from administrators, geography instructors, and students.

3.9.1 Geography Instructors' Questionnaires

The researcher presented an overview of the research's objectives and concerns regarding respondents' confidentiality of the information submitted in the questionnaires that serve as instructions. There were both open-ended and closed-ended questions on how much ICT is used in geography classrooms after a section with the instructor's private information. These surveys were used to gather data from six geography professors about how they use ICT in the classroom. In order to clear up respondents' misconceptions of the instructions and improve replies and retrieval rates, the researcher distributed the questionnaires to the participants and instructed them to complete the items on their own. The completed surveys were collected by the investigator. The questionnaire's responses were analysed to address the goals of the study. (See Appendix A.)

3.9.2 Questionnaires for Students

The researcher received surveys from geography students. The primary gainers from the utilization of ICT in geography education are the students. The researcher included introduction remarks on these questionnaires that describe the purpose and

confidentiality of the data that was given to the students. Both closed-ended and open-ended questions were included in these questionnaires that helped researcher to better understand how the integration of ICT in geography lectures had impacted students' performance. Onen and Yuko (2005) noted that questionnaires are useful for variables like opinions, beliefs, and sentiments that cannot be examined directly. The researcher handed out the questionnaires to the participants and taught them to complete the items on their own in order to resolve the respondents' misunderstandings about the instructions and enhance answers and retrieval rates. The completed surveys were then collected by the investigator. The replies to the questionnaire were analysed in order to address the study's goals. (See Appendix B.)

3.9.3 Interview Guides for College Administrators

The investigator obtained authorization from the respondents since he was going to record their voices during the interview. An in-depth interview was administered face-to-face with seven (7) administrators on the utilization of ICT during instruction in the college. The researcher asked in-depth questions of the college directors because they are in charge of directing how ICT is being utilized in geography instruction is implemented. The researcher gathered information from school officials using their interview schedules. They refused to make a written commitment, so the researcher documented their comments as the interview progressed. According to Kerlinger (1973), more individuals are willing to communicate verbally than in writing; hence, data may be gathered more easily during an interview. A recorder was used during the interview to capture both the investigator's questions and the respondents' responses. Due to the time-consuming nature of interviews, the researcher only employed a limited sample size of six participants. According to Creswell (2014), interviews often

consist of a few open-ended, unstructured questions that are intended to elicit replies from the respondents. (See Appendix C.)

3.9.4 Interview Guides for Geography Instructors

The investigator obtained permission from the respondents to record their voices during the interview. An in-depth interview was conducted face-to-face with six (6) geography instructors about the use of ICT during college lectures. This is because they immediately assist in integrating and utilizing ICT into geography instruction. In order to improve the data collected using their surveys on the use of ICT during geography education, the Geography Instructors' interview schedules were used to collect additional information. (See Appendix D.)

3.9.5 Classroom Observation Checklist

This study also employed a checklist for classroom observations that included a list of the fundamental ICT tools that can be used to teach geography. The observation checklist allowed the researcher to learn about the ICT resources' present status as well as their availability, adequacy, relevance, functionality, and non-functionality at the college. This tool was used to assess the teachers' proficiency level and ICT use abilities. (See Appendix E.)

3.10 Data Analysis

Statistical Package for Social Sciences (SPSS) Version 26.0 was used to analyze the study's data. The analysis was carried out in accordance with the study's objectives. Both quantitative and qualitative data from this study demonstrated how administrators, geography teachers, and students performed. On the SPSS Data Editor Window, the researcher first coded responses from respondents (the page for data entry). Second, to ensure correctness, the data in the SPSS files was cleansed. Noels

(2018) claims that SPSS is innovative software that aids in the clear analysis of critical data by research specialists. It can be difficult and time-consuming to work with data, but this program can handle and operate it with simplicity thanks to some strategies. These methods are employed to analyze, transform, and create a recognizable pattern among different data variables. By viewing a graphical representation of the results, a user can also rapidly comprehend the findings.

In order to address the study objectives, descriptive statistics were used to evaluate the quantitative data from closed-end questionnaire questions. Using measures of central tendency, the quantitative data from the interviews was further examined to establish the mode and mean. The standard deviation was calculated using spread measurements. In order to answer the objectives and offer a descriptive account of the perspectives, experiences, and views of the respondents, qualitative data was transcribed, classified, organized into themes, and coded before being placed into the computer's SPSS Software.

Table 3.3: Data Analysis Matrix

NO	Objective	Instrument	Type of Data	Statistics
I	Establish the type of ICT resources available for geography instruction	Self-administered questionnaires and Observation Checklist	Quantitative and Qualitative	Narration and descriptive statistics (frequency, percentages, mean, and standard deviation)
II	Investigate the extent to which Geography Instructors and student are utilizing ICT during instructions.	Self-administered questionnaires (Geography Instructors, administrators and students)	Quantitative and Qualitative	Narration and descriptive statistics (frequency, percentages, mean, and standard deviation)
III	Determine the perceptions of Geography Instructors and students towards the use of ICT in Geography Instructions.	Self-administered questionnaires	Quantitative and Qualitative	Narration and descriptive statistics (frequency, percentages, mean, and standard deviation)
IV	Establish the challenges experienced by geography instructors and students while utilizing ICT resources during geography instructions.	Self-administered questionnaires (Geography Instructors, administrators) interview	Qualitative	Narration and Descriptive statistics (frequencies, percentages, mean, standard deviation)

3.11 Logistical and Ethical Considerations

The general protocols and ethical guidelines established by Kenyatta University were followed in this investigation. Following the Graduate School Board's approval of the

project, the study followed this guideline and asked Kenyatta University for a proposal authorization letter. In order to obtain consent for the study to be carried out in Liberia, the researcher additionally created a letter of permission and submitted a copy to the Ministry of Education along with the authorization letter from Kenyatta University Graduate School. He also requested permission to conduct the study at the university from the University of Liberia Institutional Review Board (ULIRB). The researcher also sent a letter with copies of the letters of authorization from Kenyatta University Graduate School and the Ministry of Education of Liberia to the dean of the William V. S. Tubman College of Education, University of Liberia, asking for permission to conduct the research in the college.

The researcher ensured that the data was solely utilized to further the goals of this study. Among the ethical factors that the researcher kept in mind were confidentiality, anonymity, privacy, and avoiding plagiarism. The researcher briefed the respondents on the aim of the study instruments before distributing them. They were asked to feel free and participate fully in the activities. The researcher also got consent from each participant and informed them that they were free to leave the study at any time. Additionally, respondents were given assurances regarding the study's confidentiality and privacy.

CHAPTER FOUR

PRESENTATION, INTERPRETATIONS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter is a presentation of study findings, interpretations, and discussion. It includes the response rate, background data on the respondents, and conclusions in line with the study's goals. These include: determining the kinds of ICT resources that are available for geography instruction; examining the degree to which geography instructors and students use ICT during instruction; examining the attitudes of geography instructors and students toward the use of ICT in geography instruction; and determining the difficulties encountered by geography instructors and students when using ICT resources during geography instruction.

The following objectives, on which this study is predicated, are reviewed in light of the study's findings, which include, to:

- i. Establish the type of ICT resources available for geography instruction.
- ii. Investigate the extent to which geography instructors and students utilize ICT during instruction.
- iii. Investigate the perceptions of Geography Instructors and students towards the use of ICT in Geography Instructions.
- iv. Explore the challenges experienced while utilizing ICT resources during geography instructions by:
 - a) Geography instructors

b) Students

4.2 Response Rate

The sample of this study included 202 students, 10 administrators, 2 part-time geography instructors, and 4 geography instructors. Table 4.1 displays the response rate results.

Table 4.1 Response Rate

Instrument	Distribute d	Obtained Responses	Percent (%)
Questionnaire for students	202	202	100%
Questionnaire for instructors	6	6	100%
Interview guides for instructors	6	6	100%
Interview guides for administrators	10	7	70%
Total			92.5%

Table 4.1 illustrates the response rate of different data collection instruments used in the study. The researcher successfully collected 202 completed questionnaires from students, representing a 100% response rate. Similarly, all six questionnaires distributed to geography instructors were returned, yielding another 100% response rate. The interview guides for geography instructors also achieved full participation, with all six interviews completed.

However, for the administrators, 7 out of 10 interview guides were completed, equating to a 70% response rate. This lower rate was due to an unforeseen protest on campus, which interrupted the data collection process. Efforts to reach the remaining three administrators through mobile phone and email were unsuccessful, highlighting a limitation in achieving complete participation. Despite this, the overall response rate was 92.5%, considered highly satisfactory for research purposes. The protest posed a

significant challenge, yet proactive measures, such as follow-up calls and emails, were taken to mitigate its impact. Unfortunately, these attempts were unsuccessful, reflecting a potential area for future improvement in data collection strategies. The response rate of 92.5% exceeds the thresholds suggested by various research authorities. According to Saunders et al. (2016), a response rate of 50% is sufficient for statistical analysis, while Mugenda and Mugenda (1999) suggest that a rate above 60% is satisfactory, and one above 70% is exceptional. Therefore, this study's response rate not only meets but also surpasses these standards, reinforcing the robustness of the data collected. This excellent response rate enhances the credibility and generalizability of the study findings. A high response rate minimizes the risk of non-response bias, ensuring that the sample accurately represents the broader population of students, instructors, and administrators involved in geography education.

The high response rate for student and instructor questionnaires suggests a strong engagement and interest in the research topic. This could be attributed to the relevance of the study to the participant's academic and professional contexts. Full participation from geography instructors further indicates the willingness of educators to contribute to research that may inform and improve teaching practices. The 70% response rate from administrators, although lower, is still commendable given the challenges encountered. It highlights the unpredictable nature of field research where external factors, such as campus protests, can disrupt data collection. The researcher's efforts to contact non-responding administrators reflect a dedication to thorough data collection, even though it was not entirely successful.

4.3 Demographic Information

This section presents demographic information for students, instructors, and administrator. Understanding the demographic characteristics of participants is essential in contextualizing the study's findings and ensuring the representation of diverse perspectives. The demographic information of geography students, instructors, and college administrators provides a comprehensive view of the population involved in the study. This data highlights their academic and professional backgrounds and reveals insights into factors such as age, gender, educational qualifications, teaching experience, and geographic location.

For students, the demographic data focuses on aspects such as their year of study, access to ICT resources, and prior exposure to technology-enhanced learning. For instructors, variables such as years of teaching experience, qualifications, and their comfort level with using ICT in teaching are critical. College administrators' demographics emphasize their professional roles, years of experience in educational leadership, and their views on integrating ICT in geography instruction.

This section explores how these demographic variables influence the utilization of ICT resources in geography instruction and learning. By examining these factors, the study provided a nuanced understanding of how individual and institutional characteristics influence the adoption of technology in education, highlighting gaps and opportunities for improvement in policy and practice

4.3.1 Demographic Information for students

Figure 4.1 displays information from students on their gender, ICT resources, and ICT use.

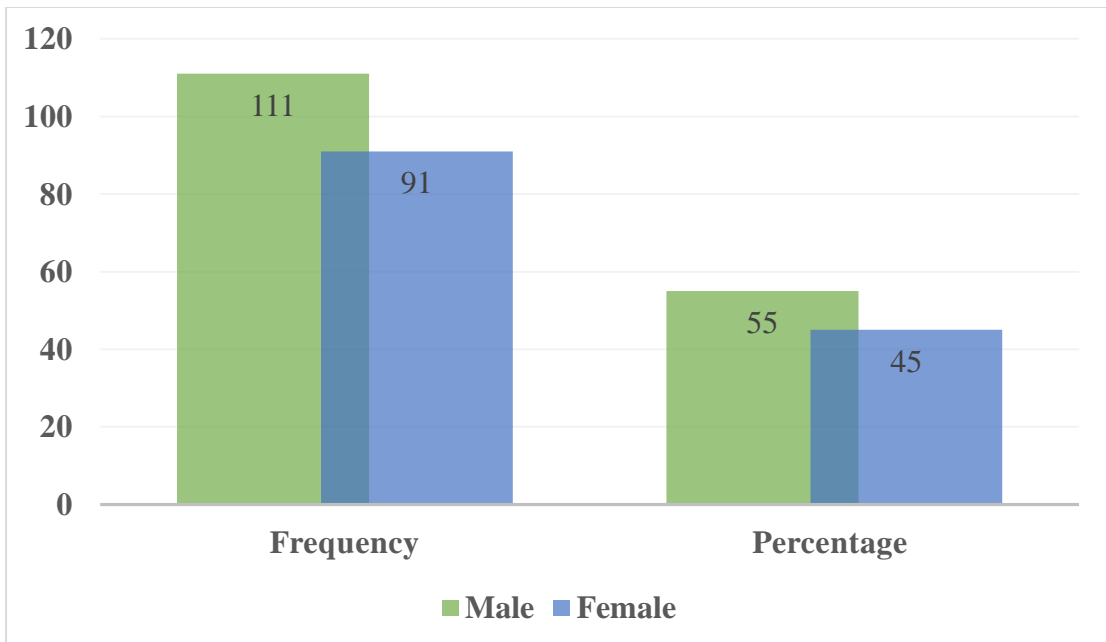


Figure 4.1: Demographic information for geography students

The study findings in figure 4.1 show that there were 111 male students (55%) and 91 female students (45%) who participated. This relatively balanced gender distribution indicates that both male and female perspectives on the influence of ICT on geography education were adequately represented. The minor gender disparity implies that any differences in attitudes or experiences with ICT integration are likely reflective of the broader student population. This balance is important in ensuring the inclusivity and relevance of the research outcomes across genders. The small gender gap suggests that gender-based initiatives to promote ICT literacy and engagement in geography education could be implemented with minimal risk of excluding any particular group. This study findings is in line with Borokhovski et al., (2018) study that revealed that male students have a more positive perception of ICT tools and applications, and higher confidence and motivation to engage with ICT activities in educational contexts. However, the "primary" digital divide, a gender gap in access to

and experience with ICT, is no longer a serious issue. Both genders are compatible in their educational use of computer-based and online technologies, but a gender-based "secondary" digital divide persists due to differences in attitude, confidence, and motivation measures.

4.3.2 Demographic Information for Geography Instructors

Table 4.3 displays the gender, age, education, and professional experience of geography instructors.

Table 4.2: Demographic information of instructors

Variables	Level	Frequency	Percent (%)
Gender	Male	6	100
Age	30-34 years	2	33.3
	35-39 years	3	50
	45-49 years	1	16.7
	Total	6	100
Education level	Degree	4	66.7
	Master	2	33.3
	Total	6	100
Professional Experience	<5 years	1	16.7
	5-9 years	4	66.7
	10-14 years	1	16.7
	Total	6	100

The findings in table 4.2 reveals a striking gender imbalance, with all six geography instructors being male, representing 100% of the sample. This gender disparity raises significant concerns about diversity and inclusivity within the geography department. In addition, the age distribution indicates that 33.3% of instructors are between 30-34 years, 50% are aged 35-39 years, and 16.7% fall within the 45-49 age bracket. Furthermore, the findings in table 4.2 suggests that the majority of the teaching staff are relatively young, with half in their mid-30s. This youthful profile may imply a teaching workforce that is energetic and open to modern teaching techniques, such as

the integration of ICT tools. However, the presence of only one instructor in the older age group (45–49 years) might limit the department's access to more seasoned and potentially wiser instructional strategies that come with extensive teaching experience. The age distribution raises the question of whether these younger instructors have adequate mentorship and support from more experienced colleagues, which could be crucial in successfully implementing innovative teaching practices.

The qualifications of the instructors show that 66.7% hold a bachelor's degree, while 33.3% have a master's degree. The absence of doctoral-level educators may limit the depth of academic and research expertise available in the department. This distribution suggests that while the instructors possess the foundational knowledge necessary for teaching, there is room for academic advancement that could strengthen the department's teaching quality and research output. As I analyze these findings, it is evident that professional development opportunities are necessary to encourage these instructors to pursue higher degrees. This could enhance their capability to integrate advanced concepts and technology into geography instruction effectively.

The professional experience data indicates that 16.7% of instructors have less than 5 years of teaching experience, 66.7% have 5-9 years, and another 16.7% have 10-14 years. The fact that the majority have moderate teaching experience (5–9 years) suggests a balance between new and established teaching practices. However, the limited number of instructors with over a decade of experience could restrict the department's ability to mentor less experienced colleagues effectively. This distribution of professional experience highlights an emerging group of instructors who are likely still developing their pedagogical techniques. Continuous professional training and mentorship could be vital for them to evolve into seasoned educators

capable of leveraging ICT to improve geography instruction. This findings agreed with Lee and Park (2023) study conducted in South Korea which findings showed that, despite having access to basic ICT tools, both instructors and students encountered difficulties due to a lack of relevant software, limited digital literacy skills among instructors, and insufficient training programs tailored to geography. In addition, The study identified a gap in training programs but does not delve into specific ICT tools that could enhance the learning experience for geography students, however, Lee and Park's findings highlight the critical need for geography-specific training programs for insstructors. While Youssef et al. (2022), found that teacher experience, training, and readiness significantly affect student outcomes, accounting for 33.3% of the variation in academic performance.

4.4 Objective One: Type of ICT resources available for geography instruction

The primary objective of the study was to determine whether ICT resources were available in schools for use in teaching geography. In order to determine the ICT resources available in the research schools for teaching geography, the study used checklists, administrator and teacher interview schedules, and student and instructor surveys. This study was interested in whether a well-equipped ICT Resource Centre existed, if people had access to ICT resources, and whether ICT resources were offered in schools for the teaching of geography. This study aimed to identify the types of ICT resources available for geography instruction and evaluate their impact on enhancing the teaching and learning experience. Students were surveyed to list the ICT tools used in geography instruction.

4.4.1 ICT resources available for geography instruction from students' Questionnaire

The students were asked to list the primary ICT tools employed in the college's teaching and study of geography. The findings are presented in Figure 4.2.

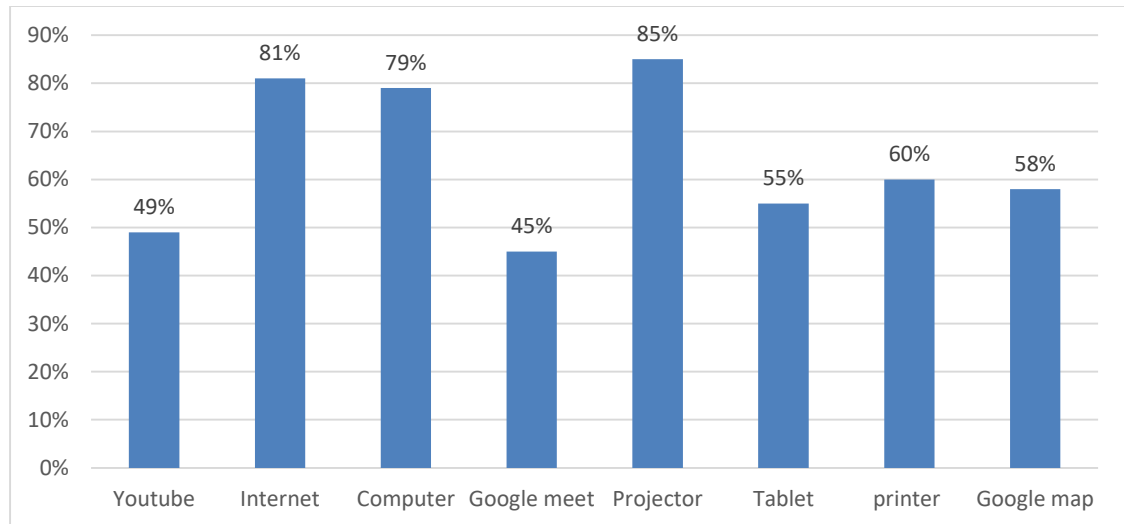


Figure 4.2: Main ICT Tools

The results in figure 4.2 shows that 85% identified projectors, 81% mentioned internet access, 79% mentioned computers, 60% referred to printers, 58% pointed out Google Maps, 55% mentioned tablets, 49% identified YouTube, and 45% listed Google Meet.

The findings indicated that while some ICT resources are present and utilized, they are not fully employed in ways that foster collaborative and critical skills, such as problem-solving, creativity, and invention. These skills are crucial in the 21st century. The absence of interactive and collaborative technologies suggests missed opportunities for engaging students in more innovative and experiential learning activities. The available ICT tools, though limited, remain vital to both students and instructors.

The study's findings align with those of Antwi et al. (2018), who documented the use of slides, projectors, Google Earth, and simulation programs in Ghana for geography

instruction. Similar to the situation in Liberia, ICT resources like smart boards and graphical applications were present but underutilized for collaborative learning. Moreover, Ndolo (2020) found that desktop computers, cell phones, TV screens, and laptops were frequently used ICT tools in Kenya, demonstrating that basic resources are prevalent but often insufficient for advanced educational engagement. Usharani and Nachimuthu (2020) also support these findings, noting that ICT resources such as software, hardware, computers, projectors, and the Internet are standard in educational settings. However, the emphasis often remains on basic functions rather than interactive applications that could better engage students and deepen their geographical understanding. The study underscores the importance of enhancing ICT infrastructure and expanding the use of available tools to promote a richer, more interactive learning experience in geography. Strategic investments in both technology and professional development for instructors are necessary to bridge this gap and make geography education more engaging and effective. This findings are in line with that of Saxena (2017) research conducted in Canadian schools, that reported that many teachers felt inadequately prepared to integrate ICT into their curriculum effectively. Although pre-service teachers received training in educational technology, this did not translate into practical ICT skills for classroom instruction. Many educators struggled with digital tools, even after training, due to insufficient technological competence. This suggests a gap between teacher education programs and the real-world demands of ICT-based instruction.

4.4.2 ICT resources available for geography instruction from Instructors' Questionnaire

The Instructors were asked to list the primary ICT tools employed in the college's teaching and study of geography. The findings are presented in Figure 4.3.

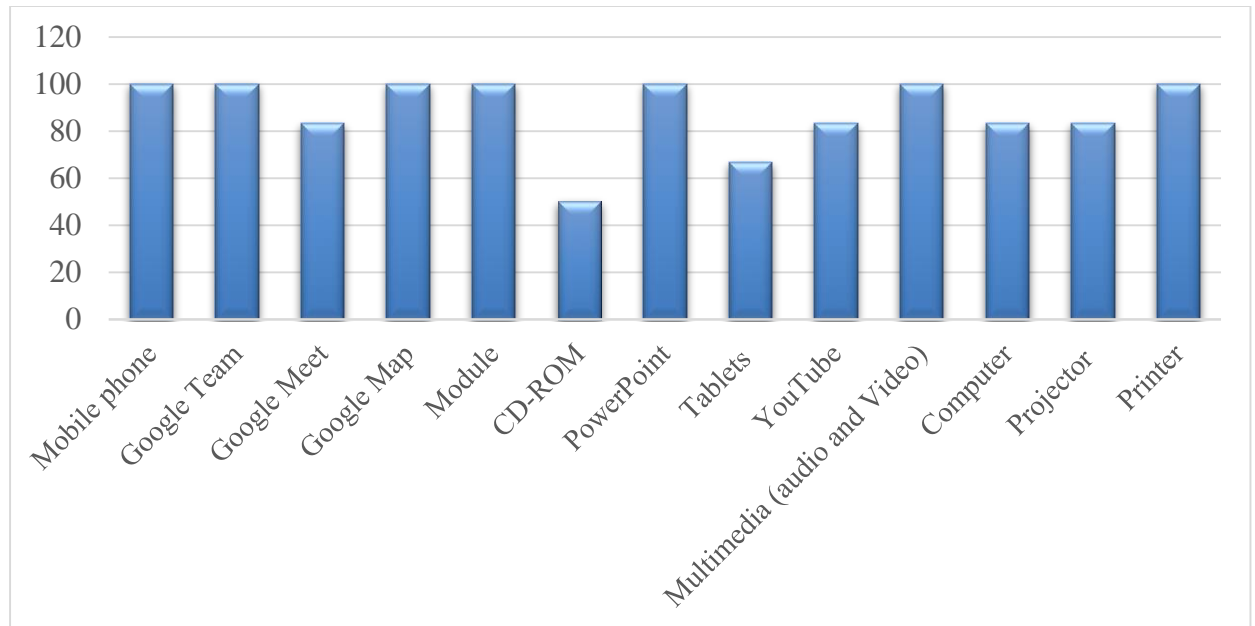


Figure 4.3: Main ICT Tools

The results in figure 4.3 shows that all six (100%) geography instructors identified mobile phones, Google Teams, Google Maps, Moodle, PowerPoint, multimedia tools (audio and video), and printers as essential ICT resources used in the college for geography instruction. Furthermore, five instructors (83.3%) reported incorporating Google Meet, YouTube, computers, and projectors into their teaching practices. Additionally, three instructors (50%) mentioned using CD-ROMs, while four (66.7%) stated that they integrate tablets into their instructional activities.

This distribution of ICT resource usage indicates that instructors rely heavily on general-purpose tools such as mobile devices, Google applications, and multimedia resources rather than specialized digital tools tailored specifically to geography

education. While these resources certainly contribute to basic digital engagement, they may not provide the robust capabilities needed for in-depth geography instruction, such as spatial data analysis and geospatial visualization, which are essential for fostering advanced geographical skills as mentioned by one of the respondent during the interview. As one geography lecturer metaphorically stated during the interview, "*In the absence of a hunting dog, we use a Billy Goat,*" *emphasizing the adaptive use of available resources even when ideal technologies are lacking*". The findings of this study are consistent with those of Antwi et al. (2018), who reported the use of ICT tools such as slides, projectors, Google Earth, and simulation programs in Ghana for geography instruction. As in Liberia, advanced resources like smart boards and specialized graphical applications were available but underutilized for fostering collaborative learning. Ndolo (2020) also highlighted that, in Kenya, commonly used ICT tools in education included desktop computers, cell phones, TV screens, and laptops. However, these basic resources alone often fall short of enabling in-depth, interactive learning experiences. Similarly, Usharani and Nachimuthu (2020) found that standard ICT resources—such as software, hardware, computers, projectors, and the internet—are common in educational institutions but are often limited in their application for advanced, subject-specific learning. These studies underscore a recurring pattern across different educational contexts: while foundational ICT tools are accessible, their full potential remains untapped, particularly for specialized subjects like geography that benefit from interactive, geospatial technologies. This gap in resource utilization highlights the need for not only improved access to advanced ICT tools but also strategic integration to support collaborative and higher-order learning outcomes.

The reliance on widely accessible but limited tools reflects both a strength in adaptability and a significant gap in dedicated ICT resources. Addressing this gap by incorporating specialized geospatial technology and training would enable instructors to transform their instructional approach, moving from basic content delivery to more interactive, data-driven learning experiences. This adjustment would not only deepen students' understanding of geographical concepts but also enhance their digital literacy and analytical skills, preparing them for future academic and professional pursuits.

4.4.3 Use of ICT from College's administrator Interview schedule

When college administrators were asked about the ICT resources available for teaching and learning geography, the findings painted a stark picture: there are no geography-specific ICT tools. The only resources available are a few desktop computers in the lab, which are inadequate for comprehensive ICT integration. The challenges do not end there. Many faculty members struggle with basic ICT skills, such as operating standard Microsoft software, let alone advanced geographical tools. Furthermore, there is no stable internet facility for either faculty or students, and electricity issues further complicate effective ICT use. As the administrators noted, successful ICT integration requires reliable internet and power, both of which are severely lacking. This inadequate infrastructure has a direct impact on students' geography achievement.

From an academic standpoint, the limited and often irrelevant ICT resources available hinder students from developing essential geographic and technological skills. The administrators' observations resonate deeply with this research. It is clear that without appropriate and accessible ICT tools, students' learning experiences are

diminished, limiting their ability to perform well in geography. This gap not only affects academic outcomes but also hampers the development of skills that are critical for future employment, where ICT proficiency is increasingly a requirement.

Moreover, while some creative and knowledgeable geography instructors make do with the limited resources—such as computers, projectors, slow internet, Google Maps, smartphones, and YouTube—the impact remains insufficient for meaningful education. This echoes Kennedy’s (2020) findings, which identified the lack of ICT infrastructure and resources, insufficient faculty training, and a lack of institutional support as significant barriers to ICT integration in teacher education.

These findings underscore the urgency of investing in appropriate and functional ICT resources for geography instruction. To truly influence student achievement, comprehensive training for instructors and the development of a robust infrastructure are essential. Without these measures, the promise of ICT to transform geography education and enhance student outcomes will remain unfulfilled.

4.5 Objective Two: The extent to which geography instructors and students utilize ICT during instruction

The purpose of the study was to find out how often geography instructors and students use ICT during class. The results of several respondents are shown in Table 4.3.

4.5.1 Use ICT in Learning Geography from Students' Questionnaire

The students were asked to state the extent to which they utilized ICT in learning or during Geography lesson. The findings are shown in table 4.3.

Table 4.3 Extent to which student utilize ICT resources during Geography Instruction

Variables	Levels	Frequency	Percent (%)
Extent ICT resources are Use during geography instruction	Almost everyday	6	3
	1-2 times per week	122	60.4
	1-2times per month	74	36.7
	Total	202	100

The data from the student questionnaire in table 4.3 indicate that a majority of students—60.4%—reported that ICT resources are utilized only 1-2 times per week in geography classes, while 36.7% noted even less frequent use, only 1-2 times per month. Only a small minority, 3%, experienced daily ICT use, and no students reported that ICT was completely neglected. In this context, there is a critical need for consistent integration of ICT in geography education to harness its full potential. The infrequent use observed suggests an underutilization of tools that could greatly enhance student engagement and understanding. Geographic Information Systems (GIS) and other digital resources could make geography lessons more interactive, visually engaging, and relevant to real-world applications.

There is indeed a need to advocate for targeted professional development for educators, equipping them with the skills to integrate ICT meaningfully into their teaching practices and there need for administrative support in providing the necessary infrastructure and resources. Addressing these gaps could lead to a

transformative impact on the geography curriculum, offering students a richer, more practical understanding of geography.

Several studies have documented the infrequent use of ICT resources in geography instruction, highlighting its significant impact on students' academic performance. For example, Antwi, Mensah, and Owusu (2018) found that despite the potential of ICT to enhance spatial thinking and engagement, many geography instructors use ICT tools sparingly. This underutilization often stems from inadequate infrastructure, high costs, and a lack of professional training, which collectively hinder the effective integration of technology in teaching.

The influence of limited ICT use on student achievement is substantial. According to Bikar and Sharf (2020), geography requires interactive and visual tools, such as GIS and remote sensing, to help students comprehend complex spatial data. When these tools are not regularly employed, students lack experiential learning opportunities critical for developing problem-solving and analytical skills. Consequently, the infrequent use of ICT resources in geography instruction can lead to lower student engagement and poorer academic outcomes.

Ndolo (2020) further supports this view, emphasizing that irregular ICT integration leads to a theoretical approach to teaching geography that fails to captivate students or make the subject matter relevant to real-world contexts. The lack of frequent and meaningful ICT use diminishes the potential for geography lessons to be immersive and impactful, ultimately affecting students' ability to retain and apply what they have learned. As a researcher, I find these insights particularly revealing. They underscore the need for strategic interventions that promote the regular and effective use of ICT in geography education. This includes investing in the necessary technology and

providing ongoing professional development for instructors to integrate these tools seamlessly into their pedagogy.

4.5.2 Teacher ICT resources experience and self-assessment

Instructors were also asked to rate the frequency with which they used ICT resources.

Table 4.13 displays the results.

Table 4.4: Teacher ICT resources experience and self-assessment

	Almost everyda		1-2 times per week		3-4 times per week		Rarely		Never	
	f	%	f	%	f	%	f	%	f	%
Info-maps GIS (Mapit, Locus, Arc-collector & etc.)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
CD-ROM	0	0.0%	1	16.7%	0	0.0%	3	50.0%	2	33.3%
SW Map	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Mappt	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Internet	6	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Smartboard	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Projectors	1	16.7%	5	83.3%	0	0.0%	0	0.0%	0	0.0%
Television	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Computers	1	16.7%	5	83.3%	0	0.0%	0	0.0%	0	0.0%
Google Map	0	0.0%	6	100.0%	0	0.0%	0	0.0%	0	0.0%
Tablet	2	33.3%	4	66.7%	0	0.0%	0	0.0%	0	0.0%
Mobile phone	3	50.0%	3	50.0%	0	0.0%	0	0.0%	0	0.0%
PowerPoint	0	0.0%	6	100.0%	0	0.0%	0	0.0%	0	0.0%
YouTube	1	16.7%	5	83.3%	0	0.0%	0	0.0%	0	0.0%
Team Simulation	0	0.0%	6	100.0%	0	0.0%	0	0.0%	0	0.0%
Programs	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Games	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%

		16.7		83.3						
Emails	1	%	5	%	0	0.0%	0	0.0%	0	0.0%
Fluffy map	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Field trip	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	100.0%
Multimedia (audio, video)	0	0.0%	6	%	0	0.0%	0	0.0%	0	0.0%
				100.0						
Spreadsheet	0	0.0%	5	%	0	0.0%	1	%	0	0.0%
				83.3				16.7		
Social networking	0	0.0%	0	0.0%	0	0.0%	2	%	4	66.7%
Online Discussion										
(zoom, Google meet, skype)	0	0.0%	6	%	0	0.0%	0	0.0%	0	0.0%
				100.0						
Module	0	0.0%	6	%	0	0.0%	0	0.0%	0	0.0%
				100.0						
Flipp-Classroom	0	0.0%	1	%	0	0.0%	0	0.0%	5	83.3%
Video				16.7				16.7		
Conferencing	0	0.0%	1	%	0	0.0%	1	%	4	66.7%

The findings in table 4.4 suggests that the extent of ICT resource utilization in geography instruction is quite limited. Many essential ICT tools, such as Geographic Information Systems (GIS), flipped classroom technology, SW Maps, Mappt, Smart Boards, televisions, simulation programs, and educational games, have never been used by instructors. The main reasons for this underutilization include the unavailability of these resources at the college, their high costs, and a lack of knowledge and skills among instructors to effectively implement them.

Moreover, being inherently practical and often requiring fieldwork, geography suffers from a complete lack of field-based activities. All geography instructors (100%) reported not engaging in fieldwork, primarily because of financial constraints. The findings reveal that ICT resources such as the Internet are widely utilized, with all respondents (100%) indicating daily use. Half of the respondents (50%) reported using mobile phones almost daily, while the remaining 50% indicated usage once or twice a week. Additionally, 83.3% of respondents stated that they employ resources

like projectors, computers, tablets, YouTube, and email for instruction purposes at least once or twice weekly. Furthermore, all respondents (100%) use tools like Google Maps, Google Teams, multimedia resources (videos and audio), and online discussion platforms such as Zoom, Google Meet, and Skype. These insights emphasize the frequency and reliance on specific ICT tools in enhancing geography instruction, highlighting the potential impact on student engagement and learning outcomes. This insufficient application of more advanced and relevant ICT resources could negatively influence students' achievement in geography. The lack of experiential learning opportunities, such as fieldwork or the use of interactive and spatial technologies, may hinder students' understanding and engagement with geographic concepts. As a result, their performance could be significantly undermined, highlighting the need for investments in ICT infrastructure and instructor training to enhance educational outcomes.

The use of irrelevant ICT resources in geography instruction can negatively impact students' academic achievement in several ways. First, when ICT tools that are not well-suited to the subject matter are used, the learning experience may become fragmented and confusing, preventing students from effectively grasping complex geographic concepts. Geography often involves the analysis of spatial and environmental data, which requires specific technologies like Geographic Information Systems (GIS) and remote sensing tools. Using non-specialized or irrelevant ICT resources fails to provide students with the practical, hands-on experience they need, reducing the effectiveness of instruction (Antwi, Mensah, & Owusu, 2018).

Additionally, irrelevant ICT tools may limit opportunities for active engagement and critical thinking. Geography education benefits greatly from interactive technologies

that allow students to explore and manipulate data. When these are substituted with generic or unsuitable ICT tools, students miss out on valuable learning experiences, which can hinder their ability to apply geographic knowledge in real-world contexts. According to Ndolo (2020), this can lead to poorer retention of information and lower performance in assessments, as students are not given the chance to develop essential spatial thinking skills. Furthermore, ineffective use of ICT can result in wasted instructional time and resources, which could have been better allocated to more impactful teaching methods (Bikar & Sharf, 2020). In summary, using irrelevant ICT resources in geography instruction undermines students' academic performance by failing to provide appropriate tools for spatial analysis, limiting engagement, and wasting instructional opportunities. To maximize student achievement, it is crucial to align ICT resources with the specific demands of geography education.

The instructors were asked to explain how college administrators assist teachers and students of geography in using ICT. According to the responses, the college's administration makes minimal effort to assist students and instructors in efficiently utilizing the ICT resource. Geography instructors and students are not permitted to use the limited desktop computers and other equipment. Furthermore, despite knowing that geography is a practical subject and that students should explore their natural environments and participate in other activities that encourage teamwork and engagement while learning about and solving some environmental problems, administrators oppose field trips.

One instructor remarked as follows;

In my opinion, the administrators are trying their best to support us within their capacities. However, they are not geographers, and they might not know about the necessary ICT resources that are currently

needed for geography instruction, which are very costly, and they are not willing to buy them for this reason. Furthermore, they are not providing basic ICT skills training for us or the students(T1).

Even though the college administration has been assisting us in various ways, the most crucial supports for the integration of ICT into geography instruction are still limited. The majority of instructors do have pedagogical and subject expertise but still lack technological understanding, which is a significant barrier to using ICT resources during instruction. As a result, all teachers, staff, and students should receive basic ICT skills training from the college administrators in their capacity. The administration should also construct a well-equipped ICT resource, develop a strategic framework for ICT policy, and offer pertinent resources for all topics.

Another instructor observed that:

In my opinion, college authorities are trying their best to support geography instructors and students who are using ICT but their support are decimals. The creation of an ICT resource centre, the creation of an ICT policy framework, and the provision of pertinent ICT resources (GIS, RS, laptops, projectors, digital cameras, GPS, internet services, reliable electric power, and many more) have all been requested by us, but nothing has been done. Even for field trips, we have requested cooperation from the administrators via the Geography Department, but nothing has been done in response. The college does provide basics ICT skills training for us for professional development purposes(T4).

This data innlstrate that the autjorities are trying their best to support ans promote the utilization of ICT resources during instruction regardless of the numerous challenges the college is faced with. In addition, geography instructors have requested the college authorities to develop ICT framework, ICT resources (GIS, RS, laptops, projectors, digital cameras, GPS, and inter services) as well as stable electric power, but these requests have not been redressed. However, thses challenges have served as the barrie to ICt utilization in the college.

4.5.3 Classroom Observation Checklist

From the observation checklist, several key skills and areas of knowledge were noted among instructors for effective ICT utilization in geography instruction. These include content knowledge, pedagogical understanding, basic computer skills, internet navigation skills, technological expertise, and familiarity with Technological Pedagogical Content Knowledge (TPACK). These skills are critical for integrating ICT effectively into teaching and providing meaningful learning experiences for students.

It was also observed that students frequently use personal devices, such as smartphones and laptops, during geography lessons. The organization of students while using ICT resources varies, with the instructor structuring activities either individually or for the entire class. ICT resources are utilized in multiple formats, including individualized instruction, hands-on practice sessions, and collaborative group activities. Despite these efforts, instructors predominantly rely on teacher-centered teaching strategies.

Observing these dynamics in the classroom was eye-opening. While it is encouraging to see that some instructors possess the foundational knowledge necessary for ICT integration, the reliance on teacher-centered methods limits the potential of these tools to engage students fully. This study believe that a shift toward more student-centered, inquiry-based approaches would significantly enhance student full participation and learning outcomes. Additionally, the varied use of ICT resources for individual and group activities shows promise, but there is a clear need for more professional

development focused on leveraging ICT for active, learner-centered experiences in geography education.

4.6 Objective three: Geography instructors' and students' perceptions about the use of ICT in geography instruction.

The study aimed to explore Geography Instructors' and Students' perceptions of the use of ICT in Geography instruction. The results of several respondents are shown below.

4.6.1 Perceptions of ICT use in Geography Instruction from students' Questionnaire

The students were asked to state their perceptions towards the use of ICT in Geography Instructions. The scale used is as follows: Strongly disagree (1), disagree (2), agree (3) and strongly agree (4). Descriptive results are presented in Table 4.5

Table 4.5: Students' Perceptions of ICT use in Geography Instruction

Statement	SD(1)		D(2)		A(3)		SA(4)		Mean	SD
	f	%	F	%	F	%	f	%		
I think learning Geography with ICT requires highly developed skills and strategies. Even though it is difficult, I would like to learn geography using a computer and other ICT tools.	1	1%	2	1%	95	47.0%	10	51.5%	3.5	0.6
I think audio materials can improve the learning of geography.	8	4%	3	19%	48	23.8%	10	53.5%	3.1	1.1
I think video materials can improve geography learning and make it so motivating.	32	16%	8	4%	42	20.8%	12	59.4%	3.4	0.9
Learning via the internet make me to be very creative and think critically and it is acceptable to me.	10	5%	3	2%	57	28.2%	13	65.3%	3.6	0.7
I think ICT can improve my learning by exploring the changes in natural vegetation, climate change, flood and make rational decision on how they can be managed.	19	9%	1	6%	66	32.7%	10	51.5%	3.3	0.9
I enjoy studying using ICT because it integrates reality into the classroom and makes geography learning extremely practical, since I am totally engaged in the learning activities.	9	5%	3	2%	63	31.3%	12	62.7%	3.6	0.7
I think the use of ICT in geography instruction allows effective sharing of information.	7	4%	2	1%	64	31.7%	12	63.9%	3.6	0.6
Information that I find on internet is irrelevant to learning geography and it expose me to learning new things.	88	44%	2	11%	27	13.4%	65	32.2%	2.7	1.0
In general, availability and access to ICT provide me more	23	11%	2	12%	51	25.2%	10	51.5%	3.2	1.0

opportunities to explore difference geographical features and lessons that enhance my learning.											
I like to follow up on geography lessons on YouTube that are relevant to my lessons.	10	5	3	2%	52	25.7	13	67.8			
		%				%	7	%	3.6	0.7	
In general, I find learning geography with the aid of ICT very interesting.	17	8	9	5%	55	27.2	12	59.9			
		%				%	1	%	3.4	0.8	

The findings in table 4.5 indicates that students strongly agree on the importance of advanced skills and strategies for learning geography through ICT (mean = 3.5, std dev = 0.6). They recognize that audio materials can enhance geography learning (mean = 3.5, std dev = 0.5), and that learning via the internet fosters creativity and critical thinking (mean = 3.6, std dev = 0.7). Additionally, students feel that ICT tools make geography more practical and bring a sense of realism into the classroom (mean = 3.6, std dev = 0.7). Effective information sharing (mean = 3.6, std dev = 0.6) and accessing relevant lessons on platforms like YouTube (mean = 3.6, std dev = 0.7) are also seen as beneficial. These findings suggest a strong student belief in the transformative impact of ICT in enhancing geography instruction, potentially leading to improved performance. This aligns with Jan (2019), who highlighted the role of digital literacy and frequent ICT use in shaping student attitudes, and with Bikar and Sharf (2020), who found that innovative technologies like robotics positively influence student engagement and attitudes toward learning geography.

4.6.2 Perceptions of ICT use in Geography Instruction from instructors’ Questionnaire

Instructors were allowed to express their thoughts on the use of ICT in geography instruction. The following is the scale that was used: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. Table 4.15 displays descriptive results.

Table 4.6: Instructors' Perceptions of ICT Utilization during Geography Instructions

Statement	SA(1)		D(2)		A(3)		SA(4)		Mean	SD
	f	%	f	%	F	%	f	%		
I think using ICT for teaching Geography in the college is a very good idea.	0	0.0%	0	0.0%	3	50.0%	3	50.0%	3.5	0.5
I believe that using ICT in Geography Instruction may help students become more engaged, collaborative, critical thinkers, and problem solvers.	1	16.7%	0	0.0%	0	0.0%	5	83.3%	2.7	0.8
I feel that utilizing ICT resources aids in the improvement of geography teaching and learning.	0	0.0%	0	0.0%	1	16.7%	5	83.3%	3.2	0.4
I think ICT resources are easy to use for teaching Geography.	0	0.0%	0	0.0%	4	66.7%	2	33.3%	3.7	0.5
I believe that geography may be taught successfully and efficiently by utilizing ICT.	0	0.0%	0	0.0%	1	16.7%	5	83.3%	3.2	0.4

The findings in table 4.6 indicate that instructors highly support the integration of ICT in geography instruction, agreeing that it is a valuable addition to the teaching process (mean = 3.5, std dev = 0.5). They also believe that ICT enhances the quality of geography teaching and learning (mean = 3.2, std dev = 0.4) and find ICT resources relatively easy to use for instructional purposes (mean = 3.7, std dev = 0.5). Additionally, teachers acknowledge that ICT can facilitate effective and efficient geography instruction (mean = 3.2, std dev = 0.4). These results suggest that teachers view ICT as a critical tool for enhancing student engagement and performance in geography, aligning with research that demonstrates the benefits of technology in enriching educational experiences.

The positive attitudes observed here reflect findings by Travis and Brett (2018), who demonstrated that using computers in instruction could significantly enhance teaching effectiveness and make learning more engaging. The teachers' perspectives

underscore ICT's potential to transform geography instruction from a passive learning experience to a dynamic, interactive process that fosters deeper student understanding and engagement. However, for these benefits to be fully realized, instructors must receive adequate training and access to specialized ICT tools tailored to geography education, a gap that still exists within the current infrastructure. This study reinforces the need for targeted investments in ICT resources and professional development to empower teachers and maximize the potential of ICT in advancing student outcomes in geography.

4.6.3 Perceptions of ICT use in Geography Instruction from instructors'

Interview schedule

Instructors were asked about the impact of ICT usage in geography instruction, and responses indicated that integrating technology into geography significantly enhances student performance. From both professional experience and various studies, it is clear that ICT in the classroom transforms geography education, making learning more interactive and impactful for students. ICT tools allow students to explore real-world geographical phenomena, identify issues, and propose solutions, all of which equip them with critical skills for the 21st century.

By enabling students to interact with digital tools, ICT fosters essential skills and knowledge aligned with modern demands for environmental sustainability and global awareness. This is consistent with UNESCO's Sustainable Development Goal 4, which emphasizes digitizing educational systems to ensure students are equipped with the skills needed for sustainable development. Effective ICT use in geography can

prepare students not only to excel academically but also to become proactive global citizens who understand environmental issues and engage in problem-solving.

To fully realize these benefits, educational stakeholders and NGOs must collaborate on a strategic ICT policy framework. Such a framework would support the consistent integration of ICT resources into geography and other subjects, enabling education systems worldwide to achieve comprehensive digital transformation. This study underscores the urgent need for institutional commitment to developing infrastructure, training, and policies that support ICT's meaningful use in geography, ultimately enhancing student learning outcomes and supporting global sustainability goals.

One instructor observed that:

Even though I am not technology-friendly but I believe that the desirable use of technology or ICT in geography instruction does influence students' performance. This is a reality proven by many studies and professional experience. Some of my colleagues are trying their best to include or use ICT in teaching geography in their sessions, students are far exposed to different learning activities than me, and their performance is very good. Those instructors are doing this with their resources and finances (T2)

The integration of ICT in geography education greatly enhances students' learning experiences by granting access to diverse information about global cultures, environments, and locations. ICT tools allow students to explore geographic data, analyze trends, and identify patterns within specific contexts, deepening their understanding of how various elements interconnect across landscapes. Furthermore, ICT use in geography education introduces innovative teaching methods, transforming traditional practices and fostering a more engaging classroom environment.

By using digital tools, students are not only immersed in the content but also build valuable technological competencies. This dual benefit of content mastery and skill development aligns with the demands of modern education, preparing students for the digital world they will encounter in their professional lives. For instructors, ICT provides the means to modernize instructional approaches, making geography education more relevant and interactive. This shift promotes a learning culture that emphasizes exploration, critical thinking, and technology integration—essential skills for navigating both geographic and digital landscapes.

Another instructor reiterated as follows:

Methods such as transitioning from chalkboards to interactive digital whiteboards, using students' cell phones or other devices for studying during class time, and the "flipped classroom" approach in which students watch lectures are extremely motivating and inspirational. ICT has also become increasingly important in teaching-learning interaction, allowing students to take active roles in their learning activities by exploring the digital world, recognizing problems and providing solutions, and making the environment a better place. (T4)

Extensive research and professional insights consistently affirm that integrating ICT into geography education significantly enhances student achievement. For instance, Kadhim (2020) found that ICT, when applied through Geography Pedagogical Content Knowledge (GPCK), enables students to gain a deeper understanding of geographic content, thereby advancing their knowledge and skills. ICT resources like Geographic Information Systems (GIS) empower students to address critical environmental issues, such as managing vegetation, mitigating floods, combating droughts, and tackling erosion and waste management. Additionally, these tools support students in forecasting the implications of global climate change (UNESCO, 2021).

Moreover, ICT fosters productivity by preparing students to be engaged citizens and lifelong learners who contribute actively to knowledge creation and innovation (UNESCO, 2022). The role of ICT in geography is transformative, not only enhancing academic learning but also motivating students to take an active role in their education. Through hands-on engagement with digital tools, students can explore their environments, identify pressing issues, and develop practical solutions aimed at sustainable development. This interactive, ICT-supported approach empowers students with the critical thinking and problem-solving skills necessary for responsible, impactful engagement in environmental stewardship. Building on these insights, this study emphasizes the essential role of ICT in equipping students with the competencies needed to address both current and future geographic and environmental challenges.

4.7 Objective Four: Challenges experienced while utilizing ICT resources during geography instructions by Geography instructors and students

The instructors and students challenges in using ICT to learn was crucial for this study since their opinion was to help the study come up with recommendations and suggestions to improve the use.

4.7.1 ICT Resources Utilization during Geography Instruction

The study investigated to identify the challenges encountered while employing ICT tools in geography education. The results of several respondents are shown in figure 4.4.

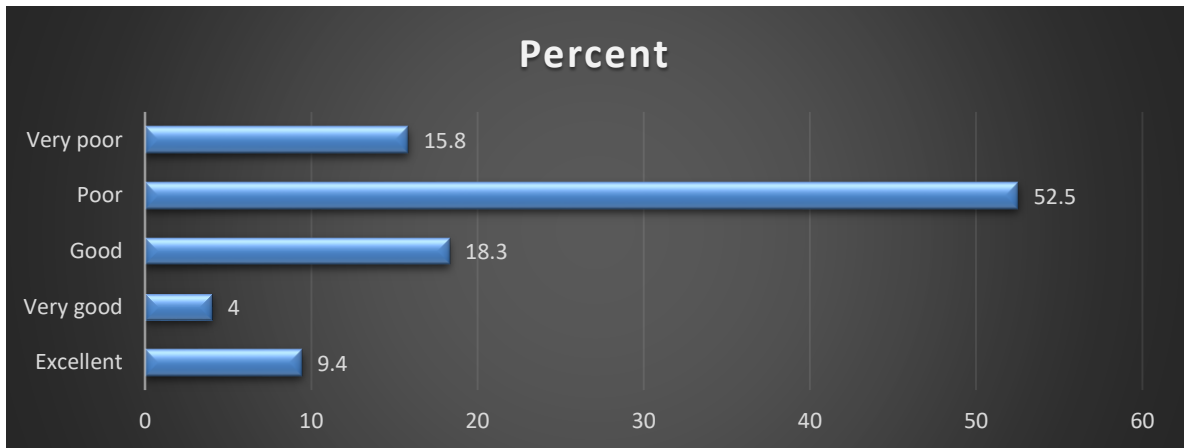


Figure 4.4: Use of ICT for Geography Instruction

The findings in figure 4.4 revealed that a majority of students (52.5%) rated the college's use of ICT in geography instruction as poor, with 15.8% rating it as very poor. Only 18.3% rated it as good, 9.4% as outstanding, and a mere 4% as very good. These results indicate a clear gap in the effective integration of ICT resources within geography instruction, suggesting that the current level of ICT utilization is insufficient to foster meaningful student engagement and learning outcomes in geography.

This limited ICT use likely constrains instructors to rely on teacher-centered or heuristic methods rather than active, student-centered approaches. The lack of fundamental ICT skills among geography instructors may also contribute to the infrequent use of digital tools in lessons, resulting in a classroom environment where students are passive listeners rather than active participants in their learning.

Consequently, geography education remains largely abstract, denying students the benefits of interactive, practical applications that ICT can provide.

The study's findings align with Chirwa and Mubita (2021), who observed similarly low levels of ICT resource use in geography teaching, with teachers still adhering to traditional pedagogies. Instructors often lack the pedagogical framework required to support constructivist learning through ICT integration. The results also echo Ndolo (2020), who found that limited ICT resources in biology education hindered active learning and student engagement. Together, these studies highlight a critical need for improved ICT access, teacher training, and instructional support to foster a more interactive and engaging geography-learning experience that can significantly boost student achievement.

4.7.2 ICT resources available for geography instruction from instructors' Questionnaire

The teachers were asked to rate the college's infrastructure readiness to complement Geography instructors. The scale used is as follows: Strongly disagree (1), disagree (2), agree (3) and strongly agree (4). Results are presented in Table 4.7. Table 4.7: College's Infrastructure Readiness to Complement Geography Instructors.

Table 4.7: College's Infrastructure Readiness

Statement	SD (1)		D(2)		A(3)		SA(4)		Mean	SD
	f	%	f	%	f	%	f	%		
I believe that the College has the resources necessary to use ICT in the classroom when teaching geography.	4	66.7%	2	33.3%	0	0.0%	0	0.0%	1.3	0.5
My college offers ICT workshops and trainings to give instructors the specialized ICT knowledge they need.	3	50.0%	3	50.0%	0	0.0%	0	0.0%	1.5	0.5
My college can provide technical support for e-learning while utilizing ICT.	0	0.0%	4	66.7%	2	33.3%	0	0.0%	2.7	1.0
My college has a good Internet connection.	2	33.3%	4	66.7%	0	0.0%	0	0.0%	1.7	0.5
My college has infrastructure that can support e-learning using ICT resources.	0	0.0%	1	16.7%	3	50.0%	2	33.3%	3.3	0.8
My college, I think, has adequate computer laboratories to facilitate geography e-learning using ICT resources.	2	33.3%	4	66.7%	0	0.0%	0	0.0%	1.7	0.5
My college's computer labs are equipped with cutting-edge technology for implementing e-learning with ICT resources for geography instructions.	1	16.7%	5	83.3%	0	0.0%	0	0.0%	1.8	0.4

The findings in table 4.7 reveal a significant lack of ICT resources at the college, as evidenced by 66.7% of instructors strongly disagreeing that the college is equipped with the necessary ICT tools for teaching geography. Similarly, only a minority of instructors agreed that the college offers relevant ICT workshops and training sessions to develop specialized digital skills.

Half of the instructors strongly opposed the idea that the college could provide technical support for e-learning, while the remaining 50% agreed. The lack of adequate internet connection, as noted by 66.7% of respondents who disagreed, further underscores the infrastructural limitations. Furthermore, all instructors agreed that the computer labs lack the advanced technology required for implementing ICT in geography classes.

These results point to critical gaps in the college's infrastructure, which hinder the effective integration of ICT in geography education, leaving geography largely as an abstract subject for students. Without adequate ICT infrastructure, students are denied opportunities to explore geographic concepts in depth, affecting their engagement and learning outcomes. Consequently, the college must collaborate closely with educational stakeholders to upgrade its infrastructure, provide regular ICT training, and ensure the availability of necessary digital tools.

This study's findings are consistent with Antwi et al. (2018), who highlighted the lack of access to essential ICT tools for geography instruction. Similarly, Al-Mamary (2020) identified significant barriers in ICT access, such as limited infrastructure, lack of technical support, time constraints, and insufficient training, all of which impact teachers' ICT skills, confidence, and their ability to adapt to modern, technology-driven educational methods. Addressing these infrastructures and training gaps is essential to enable geography instructors to create an engaging, practical, and exploratory learning environment that benefits all students.

4.7.3 ICT resources available for geography instruction from instructors' Questionnaire

The teachers also rated the equipment preparedness of the college. Strongly disagree (1), disagree (2), agree (3), and strongly agree (4) are the values utilized for the scale.

The outcomes are shown in Table 4.7.

Table 4.8 : College's ICT Equipment Readiness

Statement	SD(1)		D(2)		A(3)		SA(4)		Mean	SD
	f	%	F	%	f	%	f	%		
My college has different ICT resources such as GIS CD-ROM drives that work well for teaching Geography.	2	33.3%	3	50.0%	0	0.0%	1	16.7%	1.8	0.8
In my opinion, the college has printers that work well.	0	0.0%	0	0.0%	4	66.7%	2	33.3%	3.7	0.5
My college has stable electricity (12hours) for ICT utilization	2	33.3%	4	66.7%	0	0.0%	0	0.0%	1.7	0.5
My college has computer projectors and screens that work well.	1	16.7%	4	66.7%	1	16.7%	0	0.0%	2.2	1.0

The findings in table 4.8 revealed that while instructors generally agree that the college has functioning printers (mean = 3.7, std dev = 0.5), there is significant disagreement regarding the availability of other essential ICT resources. Key ICT components, such as GIS CD-ROMs, reliable computers, projectors, screens, and stable electricity, scored lower, with means of 1.8, 2.2, and 1.7, respectively. These ratings suggest that the college lacks the necessary technology infrastructure to effectively support ICT integration in geography education. Additionally, reliable power supply and internet connectivity critical for leveraging most ICT resources are

insufficient, limiting the college's capacity to support an ICT-enriched learning environment.

This lack of readiness for ICT use in geography instruction restricts students' ability to engage independently with digital tools, hampering their development of essential geographical skills. The absence of adequate ICT resources and stable infrastructure negatively influences students' performance, as they are unable to fully benefit from interactive, technology-supported learning experiences. This study underscores the urgent need for college administrators to collaborate with stakeholders to secure a 24-hour power supply and stable internet access, ensuring that both instructors and students can benefit from ICT tools in geography learning.

These findings align with Rana and Rana's (2020) study, which identified insufficient ICT infrastructure, unstable power supply, and limited administrative support as primary barriers to effective ICT integration in teacher education. They found that without adequate investment in infrastructure and support, teachers and students struggled to utilize ICT resources effectively. Addressing these challenges through strategic investment and partnership could transform the teaching and learning environment, equipping students with vital skills for the digital age.

4.7.4 College's ICT Equipment Readiness: Geography Instructor Questionnaires

The equipment preparedness of the college was also rated by the teachers. strongly disagree (1), disagree (2), agree (3), and strongly agree (4) are the values utilized for the scale. The outcomes are shown in Table 4.8.

Table 4.9: College's ICT Equipment Readiness

Statement	SD(1)		D(2)		A(3)		SA(4)		Mean	SD
	f	%	F	%	f	%	f	%		
My college has different ICT resources such as GIS CD-ROM drives that work well for teaching Geography.	2	33.3%	3	50.0%	0	0.0%	1	16.7%	1.8	0.8
In my opinion, the college has printers that work well.	0	0.0%	0	0.0%	4	66.7%	2	33.3%	3.7	0.5
My college has stable electricity (12hours) for ICT utilization	2	33.3%	4	66.7%	0	0.0%	0	0.0%	1.7	0.5
My college has computer projectors and screens that work well.	1	16.7%	4	66.7%	1	16.7%	0	0.0%	2.2	1.0

The findings in table 4.9 showed that teachers agreed with the statement that the college has printers that work well (mean = 3.7, std dev=0.5). However, there was considerable disagreement, though, regarding the college's availability of various ICT resources, including GIS CD-ROM drives that function well for teaching (mean = 1.8, std dev = 0.8), stable electricity (12 hours) for ICT use (mean = 1.7, std dev = 0.5), and functional computers, projectors, and screens (mean = 2.2, std dev = 1.0). The findings show that the college's technology is not ready to enable the use of ICT in geography education. Additionally, steady, appropriate energy or power supply and internet connectivity, which are crucial for the usage of the majority of ICT resources, are absolutely necessary for the optimal exploitation of ICT resources in teaching and learning geography in the classroom. This suggests that the absence of college readiness for ICT use in the teaching and learning of geography, which enables students to independently research and acquire those essential geographical abilities, has a detrimental influence on a student's performance. On this note, the college administrators have to work closely with the potential stakeholders for electric power

supply and internet installation to make sure that the college has 24-hour power supply and internet connectivity to complement the instructors and students while learning geography with the aid of ICT resources. The results of this study are consistent with those of Rana and Rana's (2020) study, which found that the main barriers to effectively integrating information, communication, and technology into teacher education were low university investment in ICT infrastructure, reluctance on the part of teaching and non-teaching staff to learn ICT, unstable electricity, and a lack of administrative support for teachers and students to make effective use of the resources that were available. Insufficient internet connectivity made digital material more difficult to access.

4.7.5 Geography Instructors' ICT/Literacy Skills and Readiness From the Instructor Questionnaires

The ICT/literacy preparedness and abilities of the instructors were rated. Strongly disagree (1), disagree (2), agree (3), and strongly agree (4) are the values utilized for the scale. Table 4.9 lists the results descriptively.

Table 4.10: Geography Instructors' ICT/Literacy Skills and Readiness

Statement	SA(1)		D(2)		A(1)		SA(4)		Mean	SD
	f	%	F	%	F	%	f	%		
I have enough technical skills to use ICT in Teaching Geography in the college.	0	0.0%	4	66.7%	1	16.7%	1	16.7%	2.5	0.8
To access the internet is not a problem to me.	0	0.0%	0	0.0%	3	50.0%	3	50.0%	3.5	0.5
I am equipped with the fundamental technological expertise to address e-learning related issues.	2	33.3%	2	33.3%	1	16.7%	1	16.7%	2.2	1.2
I am technically capable enough to produce ICT materials for college geography instruction.	0	0.0%	3	50.0%	2	33.3%	1	16.7%	2.8	1.0
I know information Communication and technology (ICT).	1	16.7%	0	0.0%	3	50.0%	2	33.3%	3.2	1.2
I am fully aware of how to use ICT and GIS in the classroom.	0	0.0%	4	66.7%	2	33.3%	0	0.0%	2.7	1.0
It is simple to learn how to use ICT in geography instruction.	0	0.0%	1	16.7%	4	66.7%	1	16.7%	3.5	0.8
I am prepared to use and incorporate ICT in teaching geography in college.	0	0.0%	3	50.0%	2	33.3%	1	16.7%	2.8	1.0

The findings in table 4.10 reveal that half of the instructors surveyed (50.0% agree, 50.0% strongly agree) reported that accessing the internet is not an issue for them (mean = 3.5, std dev = 0.5). Similarly, instructors expressed a moderate level of confidence regarding their knowledge of information and technology (mean = 3.2, std dev = 1.2) and the ease of acquiring ICT skills for geography instruction (mean = 3.5, std dev = 0.8). These responses indicate that instructors possess some basic ICT skills relevant to geography education. However, a significant gap emerges in the area of technical proficiency, with the majority of instructors (66.7%) disagreeing that they

have the required technical skills to use ICT effectively in teaching geography (mean = 2.5, std dev = 0.8). Only a small percentage (16.7%) felt they were fully prepared to create ICT resources or apply ICT and GIS tools in the classroom (mean = 2.7, std dev = 1.0).

These results highlight a concerning shortfall in specialized ICT skills among geography instructors, suggesting that current proficiency levels are insufficient to leverage digital tools in ways that could enhance student success in geography. Without targeted improvements, the use of ICT in geography education at this institution may remain minimal, potentially limiting students' preparedness for a 21st-century workforce. This finding underscores the urgency for college administrators to collaborate with government agencies, educational stakeholders, and external partners to bridge these critical skill gaps.

The study aligns with findings by Tomaro (2018), who noted that in the Philippines, inadequate infrastructure, poor teacher training, low motivation, and limited technical knowledge were major barriers to effective ICT integration in education. The lack of essential infrastructure and skilled human resources poses similar challenges for geography education. Additionally, the work of Rana and Rana (2020) in Nepal echoed these concerns, identifying systemic issues such as insufficient ICT policies, unskilled personnel, and an unreliable power supply as barriers to ICT integration. The parallels between these contexts suggest a broader, international need for strategic investments in ICT training, infrastructure, and supportive policies to empower teachers and modernize geography instruction.

4.7.6 Use of ICT from Instructors' Interview Schedule

The instructors were asked about their preparedness to use ICT to teach geography. The instructors expressed mixed reactions to their preparedness to use ICT to teach geography, with some noting that they were not ready while others expressed confidence about their readiness. One instructor noted the following:

For now, I'm not completely ready to use ICT to teach geography. However, the shortage of relevant ICT resources and the absence of an ICT lab in the college has prevented me from fully utilizing ICT resources during instruction, despite the fact that I have some basic ICT skills that I believe are very relevant to the utilization of ICT resources during geography instruction (T1).

Another instructor observed that:

I am well-prepared to teach geography using ICT resources, but I still lack the knowledge and abilities to effectively use other special ICT tools or applications, such as GIS, GPS, and RS, which would make teaching geography to students much more engaging and practical (T3)

Additionally, another instructor stated as follows:

No, I am not prepared with the essential skills and knowledge to utilize ICT resources during geography instruction because I am not computer literate. Moreover, I am completely addicted to conventional techniques of teaching and learning of geography and my age doesn't permit me to easily adopt and embrace the use of ICT in instruction. Furthermore, I don't have the necessary equipment and supports from the college that might inspire me to shift the paradigm(T4)

The data above from the interview indicate that, three geography instructors expressed their perceptions of ICT resource utilization during instruction. Respondent (T1) had positive perceptions but was not prepared due to a shortage of resources and infrastructure. He had basic ICT skills but struggled to effectively use other special ICT resources like GIS, GPS, and RS. Respondent (T3) was fully prepared but lacked the knowledge and skills to effectively use these resources. Respondent (T4) was not prepared with the necessary knowledge and skills to use ICT resources effectively and

was addicted to traditional teaching techniques. He also mentioned the shortage of resources and the lack of ICT professional development skills training for college instructors. Despite these concerns, most geography instructors are willing to use ICT resources, but the lack of relevant resources, infrastructure, and skill training opportunities contributes to under- or no utilization of ICT resources during instruction.

4.7.7 Instructors Self-assessment on ICT/Digital Literacy Skills from Geography Instructor Questionnaire

The findings of the teachers' assessment of their ICT and digital literacy abilities are displayed in Table 4.11.

Table 4.11: Instructors Self-assessment on ICT/Digital Literacy Skills

	<u>Poor</u>		<u>Adequate</u>		<u>Good</u>		<u>Excellent</u>	
	f	%	f	%	f	%	f	%
Computer literacy skills	0	0.0%	4	66.7%	2	33.3%	0	0.0%
Internet literacy skills	0	0.0%	5	83.3%	1	16.7%	0	0.0%
GIS skills	5	83.3%	1	16.7%	0	0.0%	0	0.0%
Typing speed	1	16.7%	3	50.0%	2	33.3%	0	0.0%

The findings in table 4.11 showed that 66.7% of instructors rated their computer literacy as adequate, with 33.3% assessing it as good. Similarly, 83.3% considered their internet literacy skills adequate, while 16.7% rated them as good. However, GIS skills presented a significant gap, with 83.3% of instructors rating them as poor and only 16.7% as adequate. In typing skills, half rated themselves as adequate, 33.3% as good, and 16.7% as poor.

These findings indicate substantial gaps in digital literacy among geography instructors, particularly in specialized areas such as GIS. This deficit can hinder the effective use of ICT in geography classes, subsequently influencing students' engagement and performance. The results echo the findings of Antwi et al. (2018), who highlighted that limited ICT skills among instructors contributed to minimal use of digital technologies in geography instruction, often reducing technology use to simple slide projections. Additionally, Ridha and Kamil (2021) found that inadequate learning facilities, lack of ICT infrastructure, and limited GIS software training in computer labs further restricted instructors' ability to incorporate advanced geospatial technology into their teaching.

Establishing digital literacy training for instructors, especially in GIS and other geospatial tools, would not only empower educators but also create a richer, more engaging learning environment for students in geography. This study underscores the importance of comprehensive ICT training and support, advocating for systematic initiatives to improve digital skills and, ultimately, student achievement in geography.

4.7.8 ICT resources from Instructors' Interview schedule

Geography instructors were asked whether the college possesses the necessary ICT resources for effective geography instruction, the instructors highlighted several limitations. The geography instructors noted that the college lacks a sufficient array of ICT tools essential for fully implementing technology-enhanced geography lessons. The geography department faces numerous obstacles, such as the absence of an ICT resource center, an inconsistent electricity supply, a lack of a comprehensive ICT policy framework, and insufficient access to ICT tools that are directly relevant to

geography education. Additionally, poor internet connectivity further complicates the integration of digital resources into the curriculum.

These challenges reveal a gap in the college's capacity to support modern, technology-driven instructional practices. The lack of dedicated ICT infrastructure and policies not only limits instructors' ability to deliver engaging, interactive geography lessons but also affects students' opportunity to develop essential digital skills. Addressing these issues would require targeted investments in ICT facilities, consistent internet access, and a strategic framework that aligns technology use with geography education needs. This study underscores the pressing need for institutional support and resources to create an environment where ICT can meaningfully enhance geography instruction and improve student-learning outcomes. The finding of this study is in full support of those of Youssef et al. (2022), which demonstrated that innovative and collaborative ICT use positively influences student performance, with digital skills contributing to academic achievement. The study found that teacher experience, training, and readiness significantly affect student outcomes, accounting for 33.3% of the variation in academic performance. However, the persistent digital divide raises concerns about the effectiveness of educational policies in addressing these gaps. In addition, Villalon Tomaro (2018) explored similar issues in the Philippines, noting the lack of infrastructure, inadequate teacher preparation, and limited technological knowledge. The research emphasized the need for a technological leader within schools to champion ICT integration. Furthermore, Singh and Patel (2022) conducted a study in New Delhi, India. The findings revealed that instructors acknowledged that ICT tools could significantly enhance student engagement; however, challenges like inadequate training, limited access to digital

resources, and a lack of support from educational authorities were prevalent. To support this argument, Rana and Rana (2020) conducted a case study on higher education in Nepal, revealing barriers such as poor ICT policy, untrained staff, and unstable electricity. They found that older teachers were hesitant to use ICT, while limited infrastructure and overcrowded classrooms hindered technology use. The study stressed the need for investment in ICT infrastructure and training to modernize Nepal's education system and called for key educational stakeholders' collaborative support.

One teacher remarked:

No, the institution lacks some of the ICT resources required to teach geography in the twenty-first century. Additionally, that college lacks an ICT resource center or lab that would aid in completing the geography instruction. As a result, we geography instructors are doing our best to navigate the resources (such as Google Map, YouTube, Google Meet, a projector, computer, tablet, smart phone, etc.) that are currently available to make the teaching and learning activities motivating and get our students fully involved and engaged in the learning process(T2).

Another teacher reiterated:

The college lacks some essential ICT instructional materials required for geography teaching and learning. a lack of adequate internet services, a lack of ICT resources that are pertinent to teaching geography, and a lack of an ICT policy framework. The college currently has poor internet connectivity, a broken projector, and inoperable desktop computers. The majority of educators who at least attempt to use minimal ICT resources during instruction must use their own devices and offer their internet access. Moreover, geography instructors and students do not have access to the mini-computer lab because it is us for other purposes and instructors are students are permitted to use it (T3).

The interview revealed that the college lacks adequate ICT resources for geography instruction in the 21st century. One respondent (T2) mentioned that the institution lacks an ICT resource center and is struggling to navigate available resources such as Google Maps, YouTube, Google Meet, projectors, computers, tablets, and

smartphones. However, T3 mentioned that the college lacks adequate internet service, ICT resources, and an ICT policy framework. Some of the available resources are inoperable, and some instructors are using personal devices instead of ICT resources. Most geography instructors are willing to embrace ICT resources during instruction, even purchasing personal devices. However, the lack of an ICT policy framework does not indicate how ICT resources should be utilized. Additionally, the lack of ICT resources, poor internet connectivity, inadequate internet services, ICT lab, and professional ICT skill training for instructors hinders the effective utilization of ICT resources.

4.7.9 ICT Resources from College's administrator' Interview schedule

When administrators were asked about the college's capacity for providing professional development in ICT for instructors, seven out of ten respondents shared similar concerns. They revealed that the college has very limited professional development opportunities specifically focused on using ICT resources in geography instruction. The computer lab contains only a few desktop computers, and once these are damaged, repair options are minimal due to budget constraints. Additionally, classrooms lack ICT tools, making it challenging for instructors to integrate technology into their teaching.

6 (100%) of geography instructors determined to incorporate ICT into their lessons, resort to bringing their personal devices (laptops, projectors, smartphones, tablets, and routers) to support their instruction. Most of these instructors acquire ICT skills informally, learning from colleagues, social media, or family members rather than through structured training. Furthermore, the institution lacks a specialized ICT framework or dedicated professional development initiatives to support instructors in

subject-specific technology use, and geography instructors have no exception to this lack of support.

Students also face limitations, as they have no access to internet connectivity on campus, further hindering effective ICT integration. These significant gaps in ICT resources and training directly influence students' performance in geography, restricting their exposure to digital tools that could enhance spatial learning and analytical skills. These insights highlight the urgent need for institutional investment in both ICT infrastructure and specialized professional development to support teachers in delivering an engaging, technology-enhanced geography curriculum.

4.7.10 Classroom Observation Checklist

The Classroom Observation Checklist serves as a comprehensive tool designed to assess the range and effectiveness of ICT resources employed by geography instructors during classroom activities. It evaluates instructors' qualifications and their proficiency in using ICT to support instructional goals, providing insights into their practical knowledge and expertise. Additionally, the checklist examines the types of ICT resources utilized by students, the structure and organization of teaching and learning activities, and the methods through which students engage with ICT tools.

Furthermore, this checklist assesses the instructional strategies adopted by geography teachers, identifying whether approaches are interactive, student-centered, or reliant on methods that are more traditional. By observing these elements, the checklist not only highlights the resources available and how they are applied but also explores the direct impact of ICT usage on student performance. This data is invaluable in understanding the alignment of current ICT practices with educational objectives,

guiding future professional development needs, and potential enhancements to support effective, technology-integrated geography instruction.

4.7.11 Knowledge and skills Instructor possesses for ICT utilization

The study was interested in finding further the knowledge and skills instructors possess. An observation checklist was used and the results are summarized in Table 4.9.

Table 4.12: Knowledge and skills Instructor possess for ICT utilization during geography instruction

	Yes	No
Basic Computer Skills	2	4
Content Knowledge	6	0
Pedagogy knowledge	6	0
Technological Knowledge	2	4
Internet Navigation Skills	3	3
Networking Skills	3	3
Classroom management Skills	6	0
Presentation Skills	5	1

The findings in table 4.12 showed that 6 out of 6 geography instructors have content knowledge, pedagogical expertise, and classroom management skills, while 5 have presentation skills. However, 2 out of 6 instructors lack adequate technological knowledge. 3 out of 6 have internet navigation and networking skills, while 2 out of 6 have basic computer proficiency. This disparity highlights significant gaps in ICT knowledge and skills, which must be addressed to effectively support students' geography achievement. The lack of digital competencies may limit the capacity for interactive, technology-enhanced learning.

This finding underscores the urgent need for a comprehensive professional development program focused on equipping teachers with essential ICT skills for geography education. Such a program could close these skill gaps by providing

targeted training in digital tools, internet research, and classroom technology management, which are crucial for making geography instruction more dynamic and relevant to today's digital learners.

These results are consistent with Ghavifekr et al. (2015), who found that effective ICT integration yields significant benefits for both instructors and students, particularly when educators are well-trained and supported in using digital tools. Ghavifekr et al. emphasized that teacher training programs in ICT are vital for improving the quality of student learning outcomes. This study reinforces the need for strategic planning and policy-making from institutional leadership to ensure that teachers receive ongoing support and resources for ICT integration, ultimately enhancing student learning experiences and outcomes in geography.

This research advocated for institutional commitment to professional development, aligning with broader educational goals to prepare teachers not only in pedagogical content knowledge but also in digital literacy a critical component for 21st-century geography education. This findings is in line with those of Ridha and Kamil (2021) conducted a study in Indonesia and found that inadequate infrastructure, teacher training, and GIS software availability were significant hurdles. This study stressed the need for government and school collaboration to enhance ICT use in geography education. While the study focuses on geospatial technology, it lacks insights into how these barriers affect broader ICT integration. This research investigated how comprehensive ICT strategies, including both geospatial and general technology tools, can improve geography instruction. In addition, Lee and Park (2023) conducted a case study in Seoul, South Korea and findings showed that, despite having access to basic ICT tools, both instructors and students encountered difficulties due to a lack of

relevant software, limited digital literacy skills among instructors, and insufficient training programs tailored to geography. Instructors reported feeling unprepared to integrate advanced tools like GIS, citing both a lack of resources and training.

4.7.12 Ways ICT resources are Utilized During Geography Instruction From Observation Checklist

Additionally, the study looked at how students used ICT tools for geography instruction. The findings are presented in Table 4.13.

Table 4.13: Ways ICT resources are used by students during geography instruction

	Yes	No
Individually	5	1
In pairs	4	2
In group activities	2	4
The whole class	3	3

The findings in Table 4.13 revealed that 5 of the students employ ICT resources individually, 4 mentioned that they use ICT resources in pairs, and occasionally as a whole class. However, the traditional classroom setting largely restricts full ICT integration in geography lessons, leading to an inconsistent and often limited utilization of digital tools. Notably, the ICT resources utilized in these learning activities were entirely student-owned, underscoring a gap in institutional provision of ICT tools. In response, some students displayed commendable selflessness by sharing their devices with peers to support collaborative learning.

This lack of accessible ICT resources significantly hampers students' engagement and performance in geography, as they are unable to fully benefit from digital tools that facilitate spatial learning and data analysis. The findings align with Youssef et al. (2022), who demonstrated that innovative and collaborative ICT use could enhance

academic performance. Their research highlights that fostering digital skills positively influences students' learning outcomes. However, the persistence of a digital divide, especially in classrooms lacking institutional support for ICT integration, challenges the effectiveness of educational policies intended to bridge this gap.

The implications are clear: for ICT to truly benefit geography instruction, schools must prioritize the provision of ICT resources and create environments that support innovative, collaborative digital learning. This study emphasizes the need for policies that ensure equitable access to digital tools, promoting a more inclusive approach to geography education and closing the digital divide that affects student achievement. The findings of this study are in line with those of Gottschalk and Weise, (2025) that indicated that to promote a more inclusive approach to geography education and close the digital divide impacting student achievement, educators can: prioritize access to technology and digital literacy training, incorporate diverse perspectives and local contexts into curriculum, utilize accessible digital tools, collaborate with community partners, and advocate for policies supporting equitable access to technology; ensuring all students can actively engage with geographic concepts regardless of their digital access or background.

4.7.13 Teaching and Learning Strategies Employed by Geography Instructors From the Observation Checklist

Additionally, the study observed the instructors' usage of teaching and learning tactics. The results are displayed in Table 4.14.

Table 4.14: Teaching and Learning Strategies used by the instructors

Teaching and Learning Strategies used by the instructors	Yes	No
Teacher-Centered	6	0
Student-Centered	3	3

The findings in table 4.14 reveal that all instructors predominantly rely on teacher-centered instructional approaches, with some incorporating student-centered methods and only 3 instructors blended both strategies during geography instruction. Research and professional experience strongly suggest that for ICT to be effectively integrated into the learning process, student-centered strategies should be the primary approach. Such strategies allow for more interactive, exploratory learning experiences, fostering engagement and promoting students' independent inquiry. When instructors rely solely on teacher-centered approaches, geography instruction risks becoming abstract rather than experiential, which can negatively influence students' grasp of geographical concepts and hinder their overall performance.

This study's findings align with Majumdar (2002), who emphasized that effective ICT integration prioritizes pedagogy over technology itself. The success of ICT-enhanced learning lies not merely in technical proficiency but in its strategic use to enrich learning, inspire curiosity, promote collaborative learning, and encourage critical thinking. A shift from traditional, reproductive teaching to a learner-centered model would support the development of a classroom culture that promotes creativity and independent problem-solving, essential skills for modern geography learners.

By examining these instructional trends, this study highlights a critical gap: the need for professional development and institutional support to help instructors effectively employ student-centered, ICT-enriched pedagogical approaches. Implementing such practices could enhance geography learning, making it more practical, engaging, and relevant to students' academic success. The finding of this study supported those of Singh and Patel (2022) that was conducted in colleges in New Delhi, India. Instructors acknowledged that ICT tools could significantly enhance student

engagement; however, challenges like inadequate training, limited access to digital resources, and a lack of support from educational authorities were prevalent. The findings also agreed with that Rana and Rana (2020) conducted higher education in Nepal which stressed the need for investment in ICT infrastructure and training to modernize Nepal's education system. While the study identifies key challenges, it does not explore how these issues specifically affect geography instruction.

4.7.1 Challenges experienced while utilizing ICT resources during geography instructions from students' Questionnaire

The students were asked to describe the challenges they face while utilizing ICT tools to learn geography at college. The difficulties were summarized and displayed in Figure 4.5.

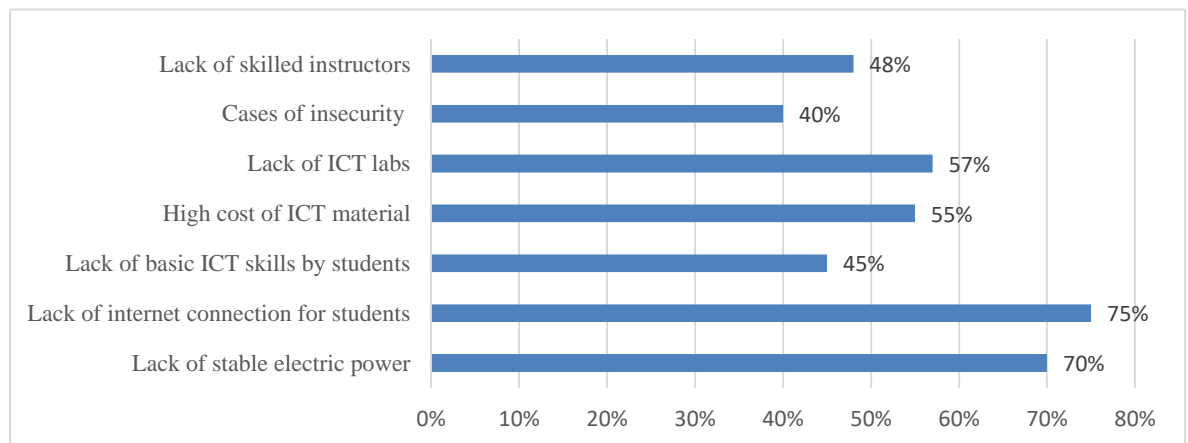


Figure 4.5: Students' challenges when using ICT resources to learn geography

The results in figure 4.5 indicate that the following issues prevent students from using ICT resources to learn geography: a lack of student internet access, unstable electric power, a lack of ICT labs, the high cost of ICT textbooks, a shortage of qualified instructors, a lack of fundamental ICT skills among students, and insecurity. The

results show that using ICT resources to learn geography poses a number of difficulties for students.

The findings corroborate those of Pearl Villalon Tomaro (2018), who noted that there were a number of physical and facility-related, human resource-related, and technological issues associated with the use of ICT. A technology leader will be necessary to successfully integrate ICT into the curriculum. Similarly, Rana and Rana (2020) identified barriers to implementing higher education as poor ICT policy, unskilled employees, insufficient ICT training for lecturers, and inconsistent electrical supply.

4.7.13 Students Suggestions On Addressing ICT Resource Challenges

The students were then asked to make suggestions for how to overcome these problems, and the results are displayed in Table 4.15.

Table 4.15: Students suggestions on how to address ICT challenges

Solutions	Percent
Provide stable electricity	65%
Provide internet connection for students	80%
Provide ICT skills training for students	68%
Provide for the college ICT resources center or lab	77%
Installing CCTV for security purposes	55%
Employing more skilled instructors	72%
The government should provide ICT materials	85%

According to the findings in table 4.15 a majority of students highlighted key improvements necessary to enhance ICT integration in geography instruction. Specifically, 65% of students recommended establishing a stable electricity supply, while 80% emphasized the need for accessible internet for students. Additionally, 68% advocated for ICT skills training for students, and 77% suggested creating a dedicated ICT resource center or lab within the college. Security was also a concern,

with 55% recommending the installation of CCTV for safety purposes. To further support effective ICT-based learning, 72% of students proposed hiring more skilled instructors, and 85% expressed that government support is essential in providing necessary ICT materials. These recommendations reflect students' recognition of the infrastructural and resource challenges that currently limit their access to effective geography instruction using ICT. This feedback highlights a need for collaboration between college administrators, educational stakeholders, and government entities to create an environment conducive to digital learning, which could significantly improve geography achievement outcomes. The findings of this study agreed with those of Chen and Wu (2023), which was conducted in rural regions of Sichuan, China, to explore the technological challenges in geography education. Findings indicated that insufficient funding, lack of ICT tools, and inadequate teacher training were significant obstacles. Both instructors and students expressed frustration with the lack of access to interactive maps, GIS software, and stable internet, which hindered the teaching of geography's practical components. In addition, the study provided a thorough assessment of resource constraints; it does not examine how rural areas could leverage community partnerships or alternative funding sources to improve ICT availability. In addition, Rana and Rana (2020) conducted a case study on higher education in Nepal, revealing barriers such as poor ICT policy, untrained staff, and unstable electricity. This study found that older teachers were hesitant to use ICT, while limited infrastructure and overcrowded classrooms hindered technology use. The study stressed the need for investment in ICT infrastructure and training to modernize Nepal's education system. Furthermore, Singh and Patel (2022) conducted a study including colleges in New Delhi, India. Instructors acknowledged that ICT tools could significantly enhance student engagement; however, challenges like

inadequate training, limited access to digital resources, and a lack of support from educational authorities were prevalent.

4.7.14 Challenges experienced while utilizing ICT resources during geography instructions from instructors' Questionnaire

The instructors were asked to specify challenges faced while using ICT in teaching Geography. Based on the feedback, the following challenges were fronted by the instructors. The study identified several challenges associated with using ICT in geography instruction, as highlighted in the table below. These challenges are presented along with the percentage of respondents who indicated each as a significant obstacle in table 4.16.

Table 4.16: Challenges of using ICT in teaching Geography

Challenges	Percent
Shortage of electricity	68%
Lack of effective internet service or facility	70%
Lack of ICT resources for geography instruction in the college	59%
Lack of adequate budget to support the geography department	79%
Lack of regular ICT skills training	72%
Lack of ICT program in the curriculum	66%

The findings in table 4.16 emphasize that the most pressing challenge is the lack of adequate budgetary support, as 79% of the respondents reported. This financial constraint limits the department's capacity to invest in essential ICT resources and infrastructure. Additionally, 72% of respondents identified the absence of regular ICT skills training as a significant barrier, underscoring the need for professional development programs to enhance instructors' competencies. The lack of effective internet services (70%) and reliable electricity supply (68%) further complicates the integration of ICT into geography instruction, hindering the consistent use of online tools and resources. Moreover, 66% of respondents pointed to the absence of an ICT

program in the curriculum, indicating a gap in institutional priorities and policy frameworks. Lastly, the scarcity of ICT resources (59%) highlights the material and logistical deficiencies that impede effective teaching practices.

These challenges collectively suggest that geography instruction at the college is constrained by systemic and infrastructural shortcomings, which adversely affect student outcomes. Addressing these issues through increased funding, enhanced training, and curriculum integration of ICT will be crucial in overcoming these barriers and improving geography education.

The challenges can be ranked as follows by the findings: a dearth of funding to support the geography department; a lack of regular ICT skill training; a lack of reliable internet access or facilities; a lack of electricity; a dearth of ICT programs in the curriculum; and a dearth of ICT resources for geography instruction in the college. Further, Igbunu (2022) revealed that the absence of consistent power constitutes a significant barrier that has hampered the expansion and development of the nation's economy.

4.7.15 Classroom Observation Checklist

This study was also interested in exploring the challenges geography instructors and students encounter while utilizing ICT resources during geography instruction. This intervention was carried out with the aid of observation checklist instructors.

Table 4.17: Other important observations on challenges during the lesson

	Yes	No
Is there a stable electric power supply?	0	6
Is there internet access for students	0	6
Internet access for instructors	6	0
Are Students eager to use ICT resources during instruction?	6	0
Does every student have at least a smartphone or a laptop?	0	6

The findings in table 4.17 reveal that while internet access was available for instructors 6 (100%) of the instructors mentioned. On the other hand, 6 (100%) of the instructors mentioned that students faced significant barriers in accessing ICT resources during geography instruction. Specifically, the researcher observed that students lacked reliable internet access, and faced an unstable power supply was highly considered as 6 (100%) of the instructors mentioned, and many did not own a smartphone or laptop. These limitations hinder students' ability to engage fully with digital tools, ultimately influencing their performance in geography.

To address these challenges, it is crucial for college administrators to work collaboratively with government bodies, educational stakeholders, and relevant partners to improve infrastructure and resource accessibility. Without such support, the full potential of ICT in enhancing geography education remains unrealized, compromising students' academic progress.

These findings align with Chirwa and Mubita's (2021) observations that ICT resources are often underutilized in geography education. Furthermore, they echo Saxena's (2017) conclusions that instructors frequently lack the technological skills necessary for effective ICT integration within the curriculum. This underscores a dual need: both improved infrastructure and targeted training for instructors to bridge the gap in ICT utilization in geography education. Expanding internet access, ensuring stable electricity, and providing students with adequate devices would allow geography instruction to become more interactive and meaningful, fostering better educational outcomes. The findings of this study agreed with Igbunu (2022) in Nigeria noted that unreliable power supply remains a major challenge, influencing economic development and the education sector. Instructors and students face

difficulties utilizing ICT resources effectively due to frequent power outages. Similarly, in Ghana, teachers struggled with poor internet connectivity and limited access to computers, leading to frustration and ineffective teaching practices (Antwi et al., 2018).

4.7.15 Instructors' Suggestions On How To Address ICT Challenges

This study was concerned about soliciting suggestions from geography instructors regarding the way forward to help in mitigating ICT resources challenges during geography instruction in the college.

Table 4.18: Instructors' suggestions on how to address ICT challenges

Suggestions	Percent
Establish an equipped ICT resources centre or lab in the college	89%
Provide internet services for staff and the students	72%
Develop comprehensive ICT policy framework that will help in promoting the use of ICT	75%
The college should conduct regular ICT workshop or training for all staff and the students	69%
Stable electric power in the college	78%

The findings in table 4.18 revealed that 89% of instructors recommended the establishment of an equipped ICT resource center or lab to facilitate the integration and utilization of relevant ICT resources for geography instruction. In addition, 72% of instructors suggested internet connectivity as a key priority, allowing students and instructors to explore digital learning platforms and real-time information and collaborate effectively on academic projects. Moreover, a comprehensive ICT policy framework was suggested by 75% of the instructors that will help to promote the systematic adoption of ICT instructional resources, highlighting key stakeholders' roles and support. Furthermore, 69% of the instructors suggested regular ICT professional development training for instructors and students to enhance their ICT literacy skills and ensure they are proficient in utilizing technology for geography

instruction. Lastly, 78% of instructors suggested the provision of a stable electric power supply to sustain the functionality of ICT resources and minimize disruptions during geography instruction. These recommendations serve as motivational factors for constantly exploring relevant ICT resources for geography instruction.

The data reveals a clear consensus among instructors regarding the fundamental requirements for effective ICT integration. The high percentages (69% to 89%) across all suggestions indicate a shared understanding of the infrastructural and capacity-building needs. This study advocates for a multi-stakeholder approach to address these recommendations, emphasizing partnerships with government bodies, NGOs, and private sectors to pool resources for implementation. Prioritizing these measures will not only resolve current challenges but also pave the way for sustainable ICT practices in the institution, ultimately enhancing student outcomes in geography. This study finding is in line with Lee, Park (2023) conducted in South Korea revealed that, despite having access to basic ICT tools, both instructors, and students encountered difficulties due to a lack of relevant software, limited digital literacy skills among instructors, and insufficient training programs tailored to geography. Instructors reported feeling unprepared to integrate advanced tools like GIS, citing a lack of resources and training. In addition, a study conducted by Johnson and Adamu (2024) in various colleges in Lagos, Nigeria, identified a pervasive digital divide that affects students' ability to access ICT resources, mainly due to inadequate infrastructure and unreliable electricity. Instructors noted that many colleges lack essential ICT tools like projectors and computers, which hinders their ability to deliver interactive geography lessons. Furthermore, a study conducted by Rajan (2018) highlighted challenges such as poor network connectivity, unreliable energy, and a lack of self-

motivation among teachers. The study advocated for improved ICT infrastructure, technical support, and a reward system to encourage ICT integration.

4.7.16 Challenges experienced while utilizing ICT resources during geography instructions from Instructors' interview schedule.

This study was interested in exploring the challenges experienced by geography instructors while utilizing ICT resources during geography instruction and it explored by interviewing instructors whose findings are presented in table 4.19.

Table 4.19: Challenges when using ICT resources to teach geography

Challenges	Frequenc y	Percentage (%)
Inadequacy of ICT resources for geography instruction	6	85.7
Limited knowledge of faculty about the available ICT resources	5	71.4
Lack of stable electricity,	5	71.4
Lack of institutional internet	6	85.7
Lack of ICT skills training for faculty	5	71.4
Lack of support for faculty	4	57.1

The findings in table 4.19 indicate that the administrators of the college were requested to talk about the problems the institution is having with ICT usage and how much the geography instructors use ICT instructional tools in their instruction. The responders elaborated on a number of important issues using ICT resources. As 6 (85.7%) mentioned the inadequacy of ICT resources for geography instruction, 5 (71.4%) mentioned faculty's limited knowledge of available ICT resources and devices, 5 (71.4%) mentioned a lack of stable electricity, 6 (85.7%) mentioned a lack of institutional internet, 5 (71.4%) stated a lack of ICT skills training for faculty, and 4 (57.1%) mentioned a lack of faculty support. Because of these multiple hurdles, most geography instructors are hesitant to integrate ICT in their classrooms. The results unmistakably show that there are ICT utilization gaps during college

geography instruction that demand immediate attention from the appropriate authorities; otherwise, Liberia will lag further behind in digitalizing its educational system and fall short of achieving Sustainable Development Goal 4 of the Vision 2030 agenda. The outcomes of this study line up with those of Ghavifekr *et al.*, (2016) study, which found that limited accessibility and network connection, limited technical support, a lack of effective training, a lack of time, and a lack of teachers' competency were the major issues and challenges found to be significant in using ICT tools by teachers. Additionally, Omwenga and Meremo (2019) are relevant here. Inadequate staff training, insufficient computer gear and software, computer failures, and administrative responsibilities were the main difficulties teachers faced that may have hampered the usage of ICT.

Further questions on how the college supports the Ministry of Education's information and communications technology policy were directed to the administrators. The respondents were also asked to describe the manner in which the government assisted the college in implementing this ITC policy. The findings show that the college, in partnership with UNESCO, twice held faculty training sessions on using ICT to teach their various courses, aiding the institution in promoting the MoE's information and communication technology strategy. In addition, the administrators further revealed that there is no direct assistance from the government in implementing this policy. In conjunction with this, the college does not have the capacity to support field trips that are very meaningful to geography instruction. The government of Liberia needs to call for an educational reform symposium that will enable all educational stakeholders to reinforce digitalizing Liberia's Education system. The major target of digitalizing Liberia's education should start with teacher training and colleges because they are the

foundation. Secondly, the government, through its partners and potential educational stakeholders, should work with those institutions and colleges of teacher training to develop a comprehensive They will be able to completely incorporate ICT into the national curriculum and curricula for teacher training programs thanks to the ICT policy framework.

4.7.17 Administrators' suggestions on how to address ICT challenges from the college's administrators' interview schedule

The administrators of the college were asked for ideas on how to address the issues the institution was having with the use of ICT in geography instruction. The seven (7) administrators out of the 10 administrators sampled who participated revealed that the only way ICT can be fully integrated and utilized in the college is by collaborating with the government, with the help of its partners, in establishing an ICT resource center in the college, providing relevant ICT resources that are needed for teaching all subjects, and providing a stable internet connection and electricity. The college should have a monitoring arm to make sure that ICT resources are proactively used. Lastly, the government should provide ICT resources (laptops, smartphones, and tablets) to all of the teachers in training. On the other hand, the administrators should provide professional development training for all their instructors or lecturers at least once or twice every semester.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the key findings as well as the conclusion and suggestions. Investigating the usage of ICT and its effects on students' success in geography was the aim of the study. The objectives of the study were to identify the kinds of ICT resources available for geography instruction, investigate the extent to which geography instructors and students use ICT during instruction, examine the perceptions of geography instructors and students toward the use of ICT in geography instruction, and explore the challenges encountered by geography instructors and students when utilizing ICT resources during geography instruction. With 212 participants, the study used a descriptive research approach. Students and instructors were given surveys to complete, while administrators and teachers were given interview guides. Additionally, observations were made. Both quantitative and qualitative data were produced by the investigation. Descriptive statistics were used to assess the quantitative data, while thematic analysis was used to study the qualitative data.

5.2 Summary of the findings

5.2.1 Establish the type of ICT resources available for geography instruction

This study explored the availability and utilization of ICT resources in teaching geography, focusing on their accessibility, relevance, and contribution to the learning experience. Using a combination of checklists, interviews, and surveys targeting students, instructors, and administrators, the research sought to evaluate existing

resources and their impact on educational outcomes. The findings revealed a significant disparity between the potential of ICT in enhancing geography education and its current application in the study context.

Survey results indicated that 85% of students identified projectors as available, while 81% reported access to the internet. Other resources such as computers (79%), printers (60%), Google Maps (58%), tablets (55%), YouTube (49%), and Google Meet (45%) were also noted. However, these tools were underutilized for fostering collaborative and critical thinking skills, such as problem-solving and creativity, which are essential for 21st-century education. This observation aligns with Antwi et al. (2018), who reported similar underutilization of advanced ICT tools in Ghana. The findings emphasize the importance of not just providing ICT tools but also integrating them effectively to create a richer, more interactive geography learning experience. All six instructors highlighted the use of mobile phones, multimedia tools, and platforms like Google Teams and Moodle. While 83.3% incorporated projectors, computers, and YouTube into their teaching, only 50% reported using specialized tools like CD-ROMs, and 66.7% mentioned tablets. These findings illustrate a reliance on general-purpose ICT tools, limiting the potential for in-depth, interactive instruction. This resonates with Kennedy (2020), who identified a lack of advanced ICT tools and institutional support as barriers to effective integration. To address this, professional development and the adoption of geospatial technologies are necessary to enhance instructional approaches and student engagement. Interviews with college administrators painted a grim picture of the infrastructure. There were no geography-specific ICT tools, and the few resources, such as desktop computers, were inadequate. Challenges included limited faculty ICT skills, unstable

internet access, and frequent power outages. These inadequacies hinder the ability of both instructors and students to fully leverage ICT fully, negatively impacting students' performance. This echoes the findings of Usharani and Nachimuthu (2020), who noted that while basic ICT tools are available in many institutions, their application remains insufficient for advanced subject-specific learning.

The study underscores the urgent need for investment in ICT infrastructure and specialized tools tailored for geography instruction. Instructor training programs should emphasize the effective use of geospatial technologies, enabling them to transition from basic content delivery to interactive, data-driven learning experiences. Furthermore, addressing systemic challenges such as unreliable power supply and internet connectivity is critical. Without these interventions, the promise of ICT to transform geography education will remain unmet.

The findings call for strategic collaborations between educational institutions, government agencies, and development partners to ensure that geography students and instructors are equipped with the resources and skills necessary for modern educational demands. By bridging these gaps, the education sector can better prepare students for future challenges, fostering critical thinking, creativity, and technological literacy.

5.2.2 Extent to which geography instructors and students utilize ICT during instruction

This study evaluated the extent to which geography instructors and students utilize ICT resources in teaching and learning, as well as the associated challenges, administrative support, and implications for practice. The findings were derived from

student questionnaires, instructor interviews, classroom observations, and administrative insights.

Survey results revealed that 60.4% of students reported using ICT resources only 1–2 times per week, while 36.7% noted usage only 1–2 times per month. A mere 3% of students experienced daily ICT integration in geography lessons. These findings highlight a significant underutilization of ICT tools, despite their potential to enhance engagement and foster critical 21st-century skills like problem solving and creativity. Advanced tools such as Geographic Information Systems (GIS) and geospatial visualization remain largely absent, reflecting a gap in the pedagogical application of ICT resources.

Aligned with Antwi et al. (2018), this study underscores the challenges of integrating ICT in geography instruction due to limited infrastructure and lack of training. Ndolo (2020) and Bikar & Sharf (2020) similarly emphasize the importance of using advanced, interactive tools for spatial analysis, which are currently underutilized in educational settings.

Instructors primarily relied on general-purpose ICT tools, including mobile phones, Google applications, multimedia resources, and projectors. However, advanced geography-specific tools like GIS and simulation programs were rarely, if ever, used due to high costs, unavailability, and limited instructor training. Fieldwork, a cornerstone of practical geography, was completely absent, with 100% of instructors citing financial constraints as the primary barrier.

The lack of advanced tools and field-based activities reflects a reliance on teacher-centered approaches, limiting students' opportunities for experiential learning and

critical engagement with geographic concepts. As highlighted by Kennedy (2020), insufficient training and limited resources hinder the effective integration of ICT in geography instruction.

Administrators acknowledged significant gaps in infrastructure and resource availability, including the absence of a dedicated ICT resource center, limited desktop computers, unstable internet, and inconsistent electricity supply. They also admitted to providing minimal professional development opportunities for instructors. Instructors expressed frustration over the lack of support for field trips and specialized ICT resources, highlighting a disconnect between administrative priorities and instructional needs.

Classroom observations revealed that while instructors possessed basic ICT skills, they predominantly used teacher-centered methods, limiting the potential for active, student-driven learning. Students frequently relied on personal devices such as smartphones and laptops, often in structured, instructor-led activities. The limited use of collaborative or inquiry-based strategies highlights the need for professional development focused on leveraging ICT for student-centered learning.

5.2.3 Investigate the Preception of Geography Instructors and Students Toward ICT Resources Utilization during Geography Instruction

This study summarized the findings on the perceptions of both geography instructors and students regarding the use of ICT in teaching and learning geography.

The study reveals a generally positive perception of ICT use among both students and instructors, emphasizing its potential to enhance geography instruction significantly.

From the students' perspective, ICT fosters creativity and critical thinking, with tools like YouTube and Google Maps adding practicality and realism to lessons. The majority strongly agreed that ICT enables effective information sharing and supports independent exploration of geographic concepts. These findings align with research by Jan (2019) and Bikar and Sharf (2020), which highlight the transformative impact of ICT on student engagement and critical thinking.

Similarly, instructors view ICT as a valuable addition to geography instruction, enhancing teaching quality and making lessons more efficient. However, challenges such as inadequate resources and limited specialized tools were noted, hindering the full realization of ICT's potential. As observed in the study, instructors adapted by utilizing basic tools like projectors and mobile devices. The findings echo those of Kadhim (2020), who emphasized the role of ICT in advancing geographic knowledge through innovative tools like GIS.

These findings underscore a pressing need for targeted investments in ICT infrastructure and professional development. Students and instructors alike recognize the value of ICT, yet resource limitations and lack of training hinder its effective integration. By addressing these gaps, geography education can shift from a theoretical approach to a dynamic, interactive learning experience, better preparing students for academic success and real-world challenges.

Strategic collaboration among educational stakeholders, coupled with a robust ICT policy framework, will be essential in leveraging ICT's full potential in geography instruction.

5.2.4 Challenges experienced while utilizing ICT resources during geography instructions by Geography instructors and students

This section explored the challenges faced by geography instructors and students in utilizing ICT resources effectively during instruction. The research focused on understanding the frequency, quality, and barriers to ICT use, as well as the readiness of institutional infrastructure to support ICT integration in geography education. The study reveals that 52.5% of students and 9.4% of instructors rate ICT use in geography instruction as poor, indicating limited integration and constraining active student engagement. Instructors also report underutilization of ICT tools like GIS, interactive simulations, and advanced software due to resource unavailability and lack of expertise. The college lacks essential ICT resources like GIS CD-ROMs, functional projectors, and reliable computers, with ratings for critical components like stable electricity and internet being particularly low. This hampers geography instruction, making it abstract and limiting opportunities for experiential learning.

Additionally, administrators provide minimal support, with no significant investment in ICT training or infrastructure. Instructors reported reliance on personal resources to incorporate ICT, indicating a systemic lack of administrative assistance. Instructors also lack technical training, absence of ICT-specific policies, and insufficient funding for field-based activities. Students have poor internet access, high costs of ICT tools, and a lack of collaborative ICT-enabled learning opportunities.

The study revealed significant disparities in the ICT readiness of geography instructors. While 50% of instructors reported no difficulty accessing the internet, some demonstrated confidence in basic ICT skills, critical gaps remain in technical

proficiency. Two-thirds of the instructors (66.7%) lacked the skills to effectively use advanced ICT tools like GIS and GPS, which are essential for interactive geography instruction.

Interviews highlighted varying levels of ICT readiness, with some instructors demonstrating basic ICT skills but lacked access to resources or training in specialized tools like GIS. Others were hindered by traditional teaching approaches, age-related adaptability issues, and limited institutional support.

Self-assessment results further underscored these gaps: computer literacy (66.7%), internet literacy (83.3%), GIS skills (83.3%), and typing skills (half). These findings align with prior research, such as Antwi et al. (2018) and Ridha and Kamil (2021), which highlight that inadequate ICT infrastructure, lack of training, and limited GIS software access impede effective geography instruction.

Institutional investment in ICT infrastructure, consistent internet, and targeted professional development is critical to address these challenges. Establishing a specialized ICT framework and equipping geography instructors with advanced tools and training will ensure that ICT becomes a transformative component of geography education, enhancing student engagement and outcomes.

5.3 Conclusion

The findings of this study highlight a complex landscape regarding the integration and utilization of ICT resources in geography education. A variety of ICT tools, including YouTube, the internet, computers, Google Meet, projectors, tablets, printers, Google

Maps, mobile phones, Zoom, and spreadsheets, are employed in teaching geography. However, the study concludes that the college lacks the requisite infrastructure and support systems to fully leverage these tools. Challenges include the absence of ICT workshops, limited technical support for e-learning, poor internet connectivity, inadequately equipped computer labs, and insufficient ICT-specific training. These deficits negatively influence the effective integration of ICT into geography instruction, consequently hindering students' academic achievement.

Additionally, while some ICT resources are used regularly, the study reveals a need for more consistent and innovative application of these tools. Instructors often learn ICT usage informally, highlighting gaps in formal training. Students frequently rely on the internet for information but lack structured opportunities to maximize the benefits of ICT in their learning. Expanding e-learning sessions and enhancing instructor competencies are critical for fostering a more dynamic geography curriculum.

Despite these challenges, both students and instructors demonstrated positive perceptions of ICT's role in geography education. They recognize the transformative potential of ICT in fostering creativity, enhancing engagement, and making geography lessons more practical and relevant. The study affirms that integrating ICT into geography instruction significantly improves student success, emphasizing the necessity of strategic investments in infrastructure, training, and support systems to overcome barriers like unreliable electricity, limited internet access, and a lack of specialized tools.

Ultimately, the findings underscore the urgent need for a comprehensive framework to address the systemic challenges impeding effective ICT utilization. Collaborative efforts among stakeholders, including college administrators, the Ministry of Education, and external partners, are essential to creating an environment where technology can thrive as a driver of academic and professional success in geography education.

5.4 Recommendations

The study suggests several recommendations to improve the use of Information and Communication Technology (ICT) resources in geography instruction. These include strengthening ICT infrastructure, developing a comprehensive ICT policy framework, implementing targeted professional development, increasing financial and administrative support, and leveraging partnerships with organizations like UNESCO and potential government initiatives based on the findings:

- a. First, colleges should establish ICT resource centers equipped with tools like GIS software, GPS devices, reliable computers, stable internet access, and consistent electricity supply. Collaborating with government bodies, NGOs, and educational partners can secure funding and resources.
- b. Secondly, the Ministry of Education should develop a robust ICT policy framework that guides the integration of digital tools in geography curricula. This framework should ensure access to relevant technologies and effective application in teaching and learning.
- c. Thirdly, regular ICT training sessions should be instituted by the college administrators for instructors and students, focusing on advanced digital tools

like GIS and GPS. Increased financial and administrative support should be allocated to ICT maintenance, repair, and procurement.

- d. Lastly, partnerships with organizations like UNESCO and potential government initiatives can provide professional development opportunities, secure funding, and implement ICT-focused reforms in teacher training colleges.

5.5 Suggestion for further investigation

The study primarily focused on examining the role of ICT and its influence on students' achievement in geography. While the findings offer valuable insights, the descriptive research approach used in this study presents opportunities for more in-depth exploration of related areas. Based on the outcomes, the following suggestions are proposed for further research:

- i. Investigate the use of GIS in teaching and learning geography in different levels of education.
- ii. Use of other technologies like AI in instruction of other concepts in Geography.
- iii. Similar study to be replicated in other different environments/regions and other related disciplines in social studies like History and Religious studies.

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APPENDICES

APPENDIX A: Consent to Participants of this study

To whom it may concern

LETTER OF CONSENT TO THE DEAN OF THE COLLEGE

Dear Madam/ Sir:

It gives me great pleasure to inform you that the College of Education has been selected for a research project named "Use of Information, Communication, and Technology in Instruction and Their Influence on Students' Geography Achievement." Some of your administrators, instructors (part-time and full-time), and students will be picked to participate as respondents, and they will provide their frank opinions on the inquiries in the research instruments. Each participant will spend an hour and a half responding to the questions throughout the course of the two-month study.

We will select a small number of your administrators, instructors (both part-time and full-time), and students to serve as respondents, and they will offer their forthright thoughts on the questions asked in the research instruments. Each participant will spend an hour and a half answering the questions during the course of the two-month study. Responses from participants in this college will be kept anonymous, and data from this survey will be used purely for educational purposes at no cost to the participants. Most crucially, participants have the option of refusing to answer any questions and leaving the program at any moment. All replies and feedback from research participants will be kept strictly confidential.

Madam/Sir, I seek your kind acceptance and collaboration in helping me to complete this study.

Sincerely yours,

P. Emmanuel Toll, Jr.
Contact: +254-798-179-650
Email: emmanuel.toll@yahoo.com
Whatsapp: +231886595638/+254798179650

APPENDIX B: Geography Instructors Questionnaire

My name is P. Emmanuel Toll, Jr. As a post-graduate student at Kenyatta University, I am conducting a study titled Use of Information, Communication, and Technology (ICT) in Geography Instruction, which is the main topic of my research. This study seeks to understand the opinions of geography instructors on the use of ICT in the classroom. The details you'll need for this study's objectives. Your confidentiality and anonymity are guaranteed. As a result, you are urged to feel free and offer your sincere responses to the problems raised by this tool. Please feel free to meet me if I can clarify anything.

Please tick the correct responses for each question below, Kindly tick () **the option**.

Session-A Question 1-6

1. Kindly select the sex that best suit you.

Male Female

2. What is your age in years?

< 25 years 25-29 years 30-34years 35-39years

40-44years 45-49years 50 years and above

3. Your Higher Academic Level: Bachelor's Degree/PGD Master

PHD

If others, specify:

4. Professional Experience in Year:: <5yrs 5-9yrs 10-14yrs

15-19yrs 20-24yrs 25-29yrs 30yrs and above

Session-B F1-F4**KEY: A (Agree), SA (Strongly Agree), SD (Strongly Disagree), D (Disagree)****Table: F1 Kindly tick (☐) the portion.**

Geography Instructors' ICT/Literacy Skills and readiness					
NO	Statements/Opinions	SA	A	D	SD
5	I have enough technical skills to use ICT in Teaching Geography in the college.				
6	To access the internet is not a problem to me.				
7	I have the basic technical knowledge to fix technical e-learning problems.				
8	I have enough technical competencies to prepare ICT resources in Teaching Geography in the college.				
9	I know information Communication and technology (ICT).				
10	I am fully aware of how to use ICT and GIS in the classroom.				
11	It is easy to acquire the skills to use ICT in teaching and learning geography.				
12	I am prepared to use and incorporate ICT in teaching geography in college.				
Geography Instructors' Perceptions of ICT Utilization during Geography Instructions					
13	I think using ICT for teaching Geography in the college is a very good idea.				
14	I think the use of ICT in Geography Instruction can help students to be more active, collaborative, think critically and become more creative as well as problem solvers.				
15	I believe that using ICT resources helps to improve geography teaching and learning.				
16	I think ICT resources are easy to use for teaching Geography.				
17	I believe that geography may be taught successfully and				

	efficiently by utilizing ICT.				
College's Infrastructure Readiness to Complement Geography instructors					
18	I believe that the College has the resources necessary to use ICT in the classroom when teaching geography.				
19	My college offers ICT workshops and trainings to give instructors the specialized ICT knowledge they need.				
20	My college can provide technical support for e-learning while utilizing ICT.				
21	My college has a good Internet connection.				
22	My college has infrastructure that can support e-learning using ICT resources.				
23	My college, I believe, has enough computer labs to support e-learning of geography through the use of ICT resources.				
24	My college's computer labs are equipped with cutting-edge technology for implementing e-learning with ICT resources for geography instructions.				
College's Equipment Readiness					
25	My college has different ICT resources such as GIS CD-ROM drives that work well for teaching Geography.				
26	In my opinion, the college has printers that work well.				
27	My college has stable electricity (12hours) for ICT utilization				
28	My college has computer projectors and screens that work well.				

Table: F2 Teacher ICT resources experience and self-assessment (ICT resources application and frequency). Kindly tick (☐) the option.

NO	Program	Almost everyday	1-2 times per week	3-4 times per week	Rarely	Never/I don't know
29	Info-maps					
30	GIS (Mapit, Locus, Arc-collector & etc.)					
31	CD-ROM					
32	SW Map					
33	Mappt					
34	Internet					
35	Smartboard					
36	Projectors					
37	Television					
38	Computers					
39	Google Map					
40	Tablet					
41	Mobile phone					
42	PowerPoint					
43	YouTube					
44	Team					
45	Simulation Programs					
46	Games					
47	Emails					
48	Fluffy map					
49	Field trip					
50	Multimedia (audio, viideo)					
51	Spredsheet					

52	Social networking					
53	Online Discussion (zoom, Google meet, skyp					
54	Module					
55	Flipp-Classroom					
56	Video Conferencing					

57 Table: F3 Geography Instructors Self-assessment on ICT/Digital Literacy Skills. Kindly tick (☐) the option that suit you.

NO	Option	Poor	Adequate	Good (3)	Excellent
a	Computer Literacy Skills				
b	Internet Literacy Skills				
c	GIS Skills				
d	Typing Speed				

58. Table: F4 How did you become acquainted with the use of computers in teaching and learning activities? Kindly Tick (☐) the option that suit you best.

NO	Learning Sources	Responses
a	Yourself	
b	Colleagues	
c	Trainings or workshop	
d	Formal education	
e	Books or journals	
f	Friends	
g	Family members	
h	YouTube	

59. What are the challenges you encounter while using ICT in geography instruction?

- a) _____

- b) _____

- c) _____

- d) _____

- e) _____

60. What are your proposed solutions to those challenges mentioned?

- a) _____

- b) _____

- c) _____

- d) _____

- e) _____

Thanks for your honest participation and collaboration!

APPENDIX C: Students Questionnaire

My name is P. Emmanuel Toll, Jr. As a post-graduate student at Kenyatta University, I am conducting a study titled Use of Information, Communication, and Technology (ICT) in Geography Instruction, which is the main topic of my research. This study seeks to understand the opinions of geography instructors on the use of ICT in the classroom. This survey is designed to collect information from 200 students. As a result, we respectfully request that you answer each question truthfully. Only this study will make use of the data, which will be kept strictly confidential. Please tick the necessary boxes with (□) where appropriate.

Kindly tick (□) where appropriate option that best suit your opinion:

1. Gender: Male Female

2. There is a furnished ICT resource centre in your college: Yes No

3. How frequently is ICT do you used in Geography Instructions? Almost everyday

1-2 times per week 1-2times per month Never

Please tick (☐) the option that suit each statement. **Instruction: D (Disagree), SD (Strongly Disagree), A (Agree), SA (Strongly Agree), and**

No	Statements	SD	D	A	SA
Students' Perceptions of ICT use in Geography Instruction					
4	I think learning Geography with ICT requires highly developed skills and strategies.				
5	I would like to learn geography with a computer and other ICT resources even if it is complicated.				
6	I think audio materials can improve the learning of geography.				
7	I think video materials can improve geography learning and make it so motivating.				
8	Learning via the internet make me to be very creative and think critically and it is acceptable to me.				
9	I think ICT can improve my learning by exploring the changes in natural vegetation, climate change, flood and make rational decision on how they can be managed.				
10	I like to learn with ICT because it brings reality in the classroom and make learning geography very practical where I am fully involved in the learning activities.				
11.	I think the use of ICT in geography instruction allows effective sharing of information.				
12.	Information that I find on internet is irrelevant to learning geography and it expose me to learning new things.				
13.	In general, availability and access to ICT provide me more opportunities to explore difference geographical features and lessons that enhance my learning.				
14.	I like to follow up on geography lessons on YouTube that are relevant to my lessons.				
15.	In general, I find learning geography with the aid of ICT very interesting.				

Extent to which students use ICT in Learning Geography					
16.	I would like for my instructor to always use ICT while teaching Geography Lessons.				
17.	I always use ICT software (google, YouTube, internet explorer, google scholar and etc.) to do my assignments and personal study.				
18.	I would like for our e-learning session to increase from once a week to three times a week.				
19.	I spend most of my free time exploring the internet for new information.				
20.	I would like for my instructor to always use ICT while teaching Geography Lessons.				
21.	I am always engaged with Google Map and GIS developing maps.				

22. List the primary ICT tools employed in the college's teaching and study of geography:

- i) _____
- ii) _____
- iii) _____
- iv) _____
- v) _____

23. List the difficulties students have encountered when using ICT resources to learn geography in the college:

- i) _____
- ii) _____
- iii) _____
- iv) _____
- v) _____

24. Provide suggestions about ways to solve these difficulties:

- i)
- ii)
- iii)
- iv)

25. How do you feel about the college's use of ICT in geography instruction? (Tick (□) where appropriate)

Excellent Very Good Good Poor Very Poor

Thanks for your honest participation and collaboration!

APPENDIX D: Interview schedule for College's administrator

My name is P. Emmanuel Toll, Jr. As a post-graduate student at Kenyatta University, I am conducting a study titled Use of Information, Communication, and Technology (ICT) in Geography Instruction, which is the main topic of my research. The goal of this interview schedule is to collect information about the subject from school administrators. As a result, I respectfully request that you answer all of the questions truthfully. Your privacy and anonymity are guaranteed, and your data will only be used for the purposes of the academic study.

1. What do you think of the ICT resources your college uses to teach and learn geography?
2. What are the problems the college faces in terms of ICT utilization, and how much do geography instructors use ICT resources in teaching and learning activities?
3. How does the college, in your opinion, promote the Ministry of Education's Information and Communications Technology Policy? And from your point of view, how does the government help you implement this ITC policy?
4. Does the college have the resources for the professional development of instructors in the use of ICT, in your opinion?

Thanks so much for your honest participation and collaboration!

APPENDIX E: Interview for Geography Instructors

My name is P. Emmanuel Toll, Jr. As a post-graduate student at Kenyatta University, I am conducting a study titled Use of Information, Communication, and Technology (ICT) in Geography Instruction, which is the main topic of my research. As a result, you are kindly requested to answer all of the questions truthfully. I fully guarantee that any information I obtain from you will be kept strictly confidential and used only for the purposes of this study.

1. Are you prepared, in your opinion, to use ICT to teach geography?
2. Based on your knowledge, is the college equipped with the necessary ICT resources to teach geography?
3. How do college administrators assist teachers and students of geography in using ICT?
4. Do you believe that students' performance is impacted by the usage of ICT in geography?
5. What difficulties do you run across while using ICT to teach geography?

Thanks so much for your honest participation and collaboration!

APPENDIX F: CLASSROOM OBSERVATION CHECKLIST

List of ICT resources the instructors use during geography instruction

NO	ICT Resources	YES	NO
1	Phone		
2	Computer		
3	Youtube		
4	Projector		
5	GIS Software		
6	Google Map		
7	Internet Router		
8	Tablet		
9	CD rom		
10	Multimedia (audio or video)		

List of ICT resources the students use during geography instruction

NO	ICT Resources	YES	NO
11	Phone		
12	Laptop		
13	Tablet		
14	GIS Software		
15	Google Map		
16	Internet Router		
17	YouTube		

List of knowledge and skills Instructor possess for ICT utilization during geography instruction

NO	Statement	YES	NO
18	Basic Computer Skills		
19	Content Knowledge		
20	Pedagogy knowledge		
21	Technological Knowledge		
22	Internet Navigation Skills		
23	Networking Skills		
24	Classroom management Skills		
25	Presentation Skills		

The way ICT resources are used by students during geography instruction

NO	ICT Resources	YES	NO
26	Individually		
27	In pairs		
28	In group activities		
29	The whole class		

Teaching and Learning Strategies use by the instructors

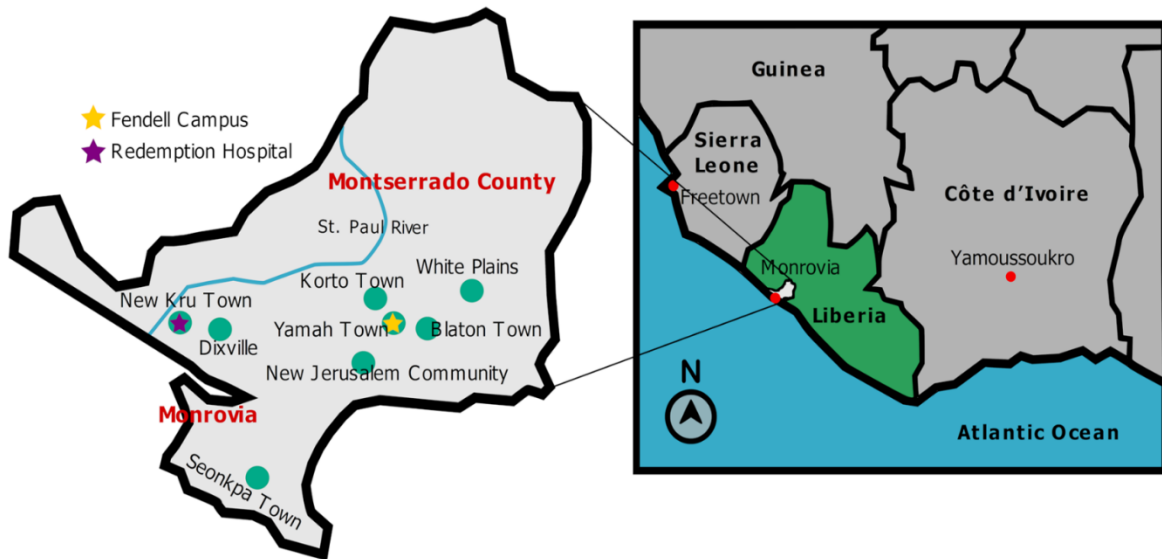
NO	Statement	YES	NO
30	Teacher-Centered		
31	Student-Centered		

Other important observation during the lesson

NO	Statement	YES	NO
32	Is there a stable electric power supply?		
33	Is there internet access for students		
34	Internet access for instructors		
35	Are Students eager to use ICT resources during instruction?		
36	Does every student has at least a smart phone or a laptop?		

APPENDIX G: MAP OF MONTSERRADO COUNTY

This map captured some parts of Montserrado County, which is the study local, but it captured the main local.



Sources: <https://doi.org/10.1371/journal.pntd.0007614.g001>

APPENDIX H: APPROVAL OF RESEARCH PROPOSAL



KENYATTA UNIVERSITY GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

P.O. Box 43844, 00100

NAIROBI, KENYA

Tel. 020-8704150

Website: www.ku.ac.ke

Internal Memo

FROM: Executive Dean, Graduate School **DATE:** 28th February 2023
TO: Fewa Emmanuel Toll, JR **REF:** E55F/20456/2021
C/O Ed. Comm.Tech

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

=====

This is to inform you that Graduate School Board, at its meeting on 15th February 2023, approved your Research Proposal for the M.Ed. Degree entitled, "Information Communication and Technology in Instruction and Influence on Students' Achievement in Geography: Case of William Vacanrat Shadrach Tubman College, Liberia."

You may now proceed with your Data collection, subject to clearance with the Dean, William V.S Tubman College; University of Liberia.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The Forms are available at the University's Website under Graduate School webpage downloads.

Also, please ensure that you publish article(s) from your thesis before submitting it to Graduate School for examination as per the Commission for University Education and Kenyatta University guidelines.

Thank you 01 MAR 2023

JOHN ODONGI
FOR: EXECUTIVE DEAN, GRADUATE SCHOOL

CC. Chairman, Ed. Comm.Tech

Supervisors:

1. Prof. Samson Ondigi
C/o Ed. Comm.Tech
Kenyatta University
2. Dr. Florence Miiima
C/o Ed. Comm.Tech
Kenyatta University

APPENDIX I: RESEARCH AUTHORIZATION



KENYATTA UNIVERSITY GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: E55F/20456/2021

DATE: 28th February 2023

Dr. Cecelia Cassell
Dean, William V.S. Tubman College of Education
University of Liberia
Monteserrado County
LIBERIA

Dear Sir/Madam,

**RE: RESEARCH AUTHORIZATION FOR MR. PEWU EMMANUEL TOLL, JR – REG.
NO. E55F/20456/2021**

I write to introduce Mr. Pewu Emmanuel Toll, JR who is a Postgraduate Student of this University. He is registered for M.Ed. degree programme in the **Department of Educational Communication and Technology.**

Mr. Pewu Emmanuel intends to conduct research for a M.Ed. Thesis Proposal entitled, **“Information Communication and Technology in Instruction and Influence on Students’ Achievement in Geography: Case of William Vacanrat Shadrach Tubman College, Liberia.”**

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
EXECUTIVE DEAN, GRADUATE SCHOOL



APPENDIX J: INSTITUTIONAL REVIEW BOARD (IRB) CLEARANCE



University of Liberia

Institutional Review Board (IRB)

Capitol Hill, Monrovia, Liberia

Tel: +221-775348744/775953914/776615408

Email: taylorjc@ul.edu.lr / sayleegs@ul.edu.lr / jebbonek@ul.edu.lr

UL-IRB/JCT-CH/76/23

ULIRB IORG-IRB Number: **IRB00013730**

FWA number: **FWA00032958**.

March 17, 2023

Mr. Pewu Emmanuel Toll, Jr.
Department of Education Communication and Technology
Kenyatta University
Nairobi, Kenya

Subject: "Information Communication and Technology in Instruction and Influence on Students' Geography Achievement: Case of William Vacanarat Shadrach Tubman College, Liberia."

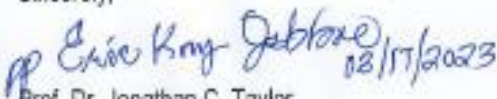
Dear Mr. Toll:

Per the Policies and Procedures Handbook of the University of Liberia Institutional Review Board (UL-IRB), I am pleased to inform you that the UL-IRB has approved your research as described above through an expedited review on March 17, 2023. As part of its responsibility, the UL-IRB will evaluate the research throughout to ensure adherence to human subject practices. The approval for the research ends March 16, 2024.

During this research, please inform the UL-IRB immediately of any changes or occurrences in the procedures relating to human subjects. Apart from the protection of human subjects, you are prohibited from changes in the protocol that has been approved of the IRB. All changes must be communicated to the IRB without delay.

Kindest regards,

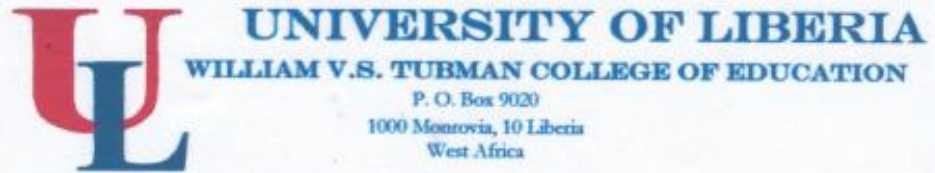
Sincerely,

Handwritten signature of Prof. Dr. Jonathan C. Taylor, dated 03/17/2023.

Prof. Dr. Jonathan C. Taylor

Vice President for Graduate Studies and Research & Chair, ULIRB

APPENDIX K: PERMISSION LETTER FROM THE DEAN OFFICE



OFFICE OF THE DEAN

Voice: (231) 886-407-120/ (231) 777-876-252
Email: ceceliace@ul.edu.lr/ ceceliacassell@gmail.com

February 17, 2023

P. Emmanuel Toll, Jr.
Student, Kenyatta University
Republic of Kenya

Dear Mr. Toll,

I received your communication requesting for permission to collect data on **Information Communication and Technology and Influence on Students' Geography Achievement** from the Department of Secondary Education, William V. S. Tubman College of Education, University of Liberia. I write to inform you that the permission is granted. You can use this communication to work with the coordinator, faculty and students of the Geography Education Program. Thanks for choosing our college for your research and wish you all the best.

Sincerely yours,

Cecelia Cassell, PhD

