Examining Experiences of teaching and learning of selected geography topics in terms of ease or difficulty in Mzuzu city Secondary schools

By

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DECLARATION

I, Kerby Mndondomeka Mtawali, attest that my master's thesis entitled "Examining the Experiences of Teaching and Learning of Selected Geography Topics in terms of Ease or Difficulty in Mzuzu City Secondary Schools" is entirely original and has not been submitted in part or in whole for any other academic degree or diploma. Throughout the thesis, I have appropriately cited and referenced any information obtained from external sources.

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My heart is full, but my pen is limited.

DEDICATION

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ABSTRACT

Effective teaching and learning experiences are significant in geography education. When teachers create a supportive and engaging learning environment, learners enjoy and master the subject content. Unfortunately, geography is considered a challenging subject in various parts of the world. In Malawi, anecdotal evidence suggests that MSCE students perform poorly in geography. Therefore, this study aimed to examine the experiences of teaching and learning selected geography topics in terms of ease and difficulty in secondary schools in Mzuzu city. The study achieved this by analysing the experiences of teachers in teaching selected geography topics, examining the experiences of learners in learning selected topics, and evaluating the challenges teachers and learners face in teaching and learning of selected topics. The study was guided by the Theory of Experience derived from the Experiential Learning Theories of John Dewey. The topics covered in the study encompassed map reading, statistical methods in geography, Plate Tectonics and Continental Drift Theory, riverine and coastline features, and Geographic Information Systems (GIS). The study used a mixed-method approach, gathering quantitative and qualitative data from seven purposively chosen community secondary schools in Mzuzu City in the Northern Education Division (NED). The sample consisted of 23 geography teachers and 198 geography learners. Quantitative data was obtained through a questionnaire and analysed using descriptive statistics, specifically frequencies and percentages. Qualitative data was acquired through interviews and analysed using content analysis. The research findings indicate that a majority of teachers find teaching the selected topics straightforward. In contrast, other teachers face challenges with specific components within the topics, for example, components with mathematical calculations like gradients in map reading, and calculations in statistical methods in geography. The topic of GIS is found to be technology-demanding and lacks resources for teaching. On the other hand, learners find it challenging to gain concepts from the selected topics. The study recommends that the government, policymakers and educators should invest in up-to-date and diverse teaching and learning materials and that schools ought to prioritise practical sessions.

Keywords: geography education, teachers' experiences, learners' experiences, challenging topics

MEANINGS OF ABBREVIATIONS

CK	Content Knowledge
CPD	Continuous Professional Development
DEM	District Education Manager
EDM	Education Division Manager
GCK	Geographical Content Knowledge
GIS	Geographic Information Systems
GISAS	Geographic Information Application for Schools
HODS	Head of Department
ICT	Information Communication Technology
INSET	In Service Training
IT	Information Technology
LCD	Liquid Crystal Display
MANEB	Malawi National Examinations Board
MoE	Ministry of Education
MSCE	Malawi School Certificate of Education
MZUNIREC	Mzuzu University Research Ethical Committee
NED	Northern Education Division
PCK	Pedagogical Content Knowledge
SADC	Southern African Development Community
SPSS	Statistical Package for Social Science
TALULAR	Teaching and Learning Using Locally Available Resources
TPCK	Technological Pedagogical Content Knowledge

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CHAPTER 1: INTRODUCTION

1.1 Chapter Overview

This chapter offers a comprehensive summary of the study including an in-depth discussion of the background, problem statement, research objectives and purpose of the study. It also presents the theory that underpins the research and narrates its significance.

1.2 Background of the Study

Good teaching and learning experiences in geography education involve creating an engaging and interactive learning environment that allows learners to explore the world around them. According to Chirwa et al (2014) and Nkochi (2021), geography is a fundamental subject in secondary schools in Malawi. In agreement to this assertion, Korvasová (2022) underscores that geography is a fascinating field as it allows learners to explore the world, including its topography and formation. Anunti et al. (2020) concur by highlighting that geography encompasses the study of the earth's features, the atmosphere and human activities.

1.2.1 *Justification of geography education in Malawi*

Nkochi (2021) reveals that the discipline of geography has been a formal part of Malawi's academic curriculum since the inception of formal education in 1941 in Blantyre. Despite several education reforms, the study of geography has persisted (Nkochi, 2021). Based on MoE (2013), the teaching of geography in Malawi is grounded in the belief that through this natural science, students can acquire the knowledge, skills, attitudes, and values necessary to appreciate and comprehend the world as well as sustainably manage its resources. According to MoE (2013), the onset of the 21st century has brought about a multitude of challenges, such as environmental degradation, dwindling natural resources, unpredictable global climate, intensified economic competition and heightened inter-connectivity. Addressing these issues necessitates the contribution of innovative and analytical minds, which geography serves to foster.

In Malawi, the secondary education system is designed to equip learners with seven essential skill sets so as to facilitate their productivity upon graduation. These skills include citizenship, ethical and social-cultural awareness, economic development, environmental management, occupational and entrepreneurial skills, practical know-how, critical thinking and resourcefulness as well as scientific and technological proficiency. These competencies are integral to achieving the goals of Malawi 2063 which align with global sustainable development objectives, local

growth and development strategies, and the continental Africa Agenda 2063 that define the desired future of Malawi and Africa by 2063 (Nkochi, 2021).

1.2.2 *Perception of geography in other parts of the world*

While geography can be fascinating, not all learners around the world perceive it in the same way. According to Korvasová (2022), some learners may find some geography topics particularly difficult. Edwin (2022) also emphasises the importance of developing instructional learning resources such as books, learning modules and localised materials that address learners' weakest areas and academic performance. However, it is also vital to consider learners' performance on challenging topics so as to create effective instructional materials.

Perceptions of learners may encompass their thoughts, beliefs and emotions towards individuals or anything. Agreeing within Edwin (2022), in the realm of education, perceived difficulty pertains to one's perception of the level of ease or challenge in completing a specific task or activity. It is imperative to address topics that are perceived as challenging so as to adequately cater for the needs of learners which will, in turn, enhance learners' confidence, facilitate more learning and enable them to achieve their educational objectives (Çimer, 2012; Edwin, 2022; Korvasová, 2022).

1.2.3 *Characteristics that make topics to be difficult*

Anlimachie (2019), Etobro & Fabinu (2017), Kufakunesu et al. (2019) and Ogunkola & Samuel (2011) have identified characteristics that make some topics more difficult than others. These include concepts requiring hands-on or real-world experience, topics involving complex calculations, abstract terms not commonly encountered in daily life, situations in which teachers do not provide sufficient practical learning opportunities and subjects that introduce numerous unfamiliar terms and symbols.

It has also been suggested that teaching approaches can affect how learners perceive the difficulty level of a subject or topic, particularly if the methods used do not encourage sufficient engagement in learning activities (Korvasová, 2022; Ogunkola & Samuel, 2011).

In certain instances, it has also been discovered that a variety of factors can contribute to a student's perception of the difficulty level of certain concepts, topics or subjects. These factors may include factors such as time constraints, attitudes of teachers and students, a lack of educational resources, misunderstandings about the subject matter, complexity of the material at

hand or even poor study habits (Etobro & Fabinu, 2017; Korvasová, 2022; Tomal, 2010). All together or singularly, these factors can have a significant impact on a student's ability to grasp and understand new information.

The Malawian geography syllabus encompasses a range of topics, some of which require practical and fieldwork experiences while others involve mathematical computations and abstract concepts. Additionally, several topics feature symbols and terminology that may be unfamiliar to learners. Unfortunately, due to resource constraints, many Malawian schools lack sufficient teaching and learning materials for certain topics, such as map reading and interpretation, statistical methods in geography, land-forms (including riverine and coastline features), continental drift theory, plate tectonics theory and Geographical Information Systems (GIS) (MoE, 2013). The choice of topics like map reading, statistical methods in geography, riverine and coastline features, Continental Drift and Plate Tectonics Theory, and GIS in this study was based on the fact that, as elsewhere, they demand practical or fieldwork, mathematical computations, have many symbols and terminologies, and therefore, it was essential to examine the teaching and learning experiences in Malawian schools.

1.3 Statement of the Problem

Regrettably, Geography is often viewed as a difficult subject, based on experiences from other parts of the world (Edwin, 2022; Kaberia, 2020; Opoku 2021). This negative perception is believed to be caused by certain specific topics in the syllabus, which mostly belong to physical geography and involve scientific concepts. These topics include map reading and interpretation, statistical methods in geography, riverine and coastline features, continental drift theory and plate tectonics theory and geographic information systems (GIS). Learners in Malawi secondary schools have also reported about finding these topics challenging, and anecdotal evidence suggests that MSCE students do not perform well in geography. Please refer to Appendix 1 for further details. In addition to anecdotal evidence, Geography chief examiners' reports MANEB (2020-2024) indicate that students failed specific questions related to continental drift, plate tectonics, and map reading skills, riverine and coastline features.

Learning Geography is crucial for comprehending the functioning of the world we inhabit and for ensuring its sustainability for the well-being of current and future generations. Though not compulsory, Geography is a core subject that provides valuable knowledge for becoming an informed and responsible citizen beyond fulfilling academic requirements. Many aspiring

students pursuing Geography at MSCE level struggle to pass the subject during national examinations. Achieving a Pass (7 and 8) is not considered favourable for selection into tertiary institutions, as it is considered a subpar result. It is a concern that a significant percentage of students, namely 35% and 36%, performed poorly, with a further 7% and 13% completely failing in schools X and Y respectively. Please refer to Appendix 1 for more details.

The urgency of addressing this issue cannot be overstated, as failure to do so will impede meaningful learning of Geography and continue to cause concern for learners, guardians and education authorities regarding exam performance. To this end, this study aimed at analysing learners' experiences in order to gain insight into their perceptions of some geography topics.

1.4 General Objective

The objective of the study was to analyse the different experiences of teachers and learners in teaching and learning the selected geography topics which are deemed difficult in Malawi secondary schools with the aim of improving how such topics are taught.

1.5 Specific Objectives

This study was guided by the following specific objectives

i. Analyse the experiences of teachers in teaching selected geography topics in Mzuzu City Secondary Schools

ii. Examine the experiences of learners in learning selected geography topics in Mzuzu City Secondary Schools

iii. Evaluate the challenges teachers and learners face in teaching and learning selected geography topics in Mzuzu City Secondary Schools

1.6 Significance of the Study

Given the anecdotal evidence from Malawi secondary school students expressing the difficulty they face with geography education, this study holds significant potential for practical applications. Teachers, heads of department, school administrators, guardians and education authorities can use these findings to pinpoint areas that require additional attention in the teaching and learning process of these selected topics. It is imperative to explore more effective

teaching methods that can help students remain motivated and prevent negative attitudes and failure during the Malawi School Certificate of Education (MSCE) examinations.

1.7 Theoretical Framework

The research draws on the Theory of Experience (Morris 2020; Roth & Jornet, 2014), which is derived from the experiential learning theories of John Dewey (Kolb, 1984) and Vygotsky (Zhou & Brown, 2015). This theory emphasises the interactive nature of learning from experience (Hutchinson 2015; Roth & Jornet 2014). According to Dewey and Vygotsky learning is not solely a cognitive process, as suggested by Piaget (Baken, 2014), nor is it merely a result of stimulation and behavioural change, as proposed by Pavlov (Zhou & Brown, 2015). Instead, it involves cognitive and behavioural changes occurring in a physical environment that is influenced by other individuals. Genuine learning arises from actively engaging with the environment and reflecting on those experiences, leading to the accumulation of positive or negative experiences. Therefore, experience profoundly modifies us by ensuring that we are forever changed after going through it (Romano, 1998). Dewey and Vygotsky argue that experience forms the basis of knowledge. They advocate for an educational approach centred around learners' experiences and active participation in the learning process (Roth & Jornet, 2014; Sikandar, 2016).

Dewey maintains that experiences are intricately connected with emotions thereby suggesting that experiences are inherently emotional. This belief stems from his recognition of the powerful effect of emotions and feelings on shaping an individual's experiences. Dewey posits that affect and emotion are crucial in an individual's perception and response to life situations. In essence, an individual's emotional reactions are intricately tied to cognitive processes which ultimately contribute to the significance of our experiences (Kolb, 1984; Roth & Jornet, 2014; Seaman et al., 2017).

Based on Roth and Jornet (2014), the Theory of Experience comprises four fundamental aspects, which are delineated as follows:

i. Experience manifests itself in/as passions (affect or emotion)
ii. Experience integrates over space and time
iii. Experience is a moving force
iv. Experience is transformation

For the purpose of this study, the aspect of Experience integration over space and time will not be included because it is less relevant to the study.

1.7.1 *How experience manifests itself in/as passions (affect or emotion)*

Dewey suggests that experience becomes evident through an individual's emotional involvement with a situation or activity. Similarly, passions emerge from the interplay between an individual and the environment, or in the context of learners, their interaction with the learning environment as they are influenced and engage with their surroundings (Roth & Jornet, 2014). In other words, the passions of the teacher or learner can be positive or negative depending on the type of experience they would have encountered.

1.7.2 *Experience is a driving force/moving force*

If experience is a moving force, it must entail change because force exerts on matter and the latter is moved. Therefore, for experience to be influential, it must encompass change (Seaman et al., 2017). In terms of education, a teacher's experiences can either motivate or discourage them. Similarly, a learner's experiences can shape their inclination towards a subject, fostering a liking or aversion. Therefore, it is possible to conclude that experiences represent movement or change, providing a holistic way to conceptualise the situated nature of cognition (Roth & Jornet, 2014).

1.7.3 *Experience is transformation*

This aspect of Theory of Experience emphasises that experience entails exploring one's inner self. It posits that experience is in a constant state of evolution, leading to significant personal growth, learning and development of new perspectives. Romano (1998:197) contends that experience involves a traversal of the self into the self, representing the emergence of the self in its absolute difference with itself. It is important to note that experience is not just a passive collection of events but a dynamic process which is capable of transforming an individual (Pugh et al., 2017; Roth & Jornet, 2014). Therefore, experience involves a process of transformation. In the context of education, a positive or negative experience is likely to result in a shift from the original position to a new position which potentially leads to the encouragement or discouragement of a teacher in teaching Geography. Similarly, the learner may feel encouraged or discouraged in their liking of the subject (Seaman et al., 2017).

1.7.4 *Relevance of the Theoretical Framework to this study*

The study focuses on the experiences of the teachers and learners in the teaching of the selected geography topics in Mzuzu City Secondary Schools. The Theory of Experience suggests that affect and emotion play an essential role in how individuals perceive and respond to life situations and that an individual's emotional responses are intricately linked with cognitive processes thereby contributing to the meaningfulness of our experiences. The Theory also postulates that passions emerge from the interplay between an individual and the environment. In the context of learners, their interaction with the learning environment as they are influenced and engage with their surroundings.

Stated differently, the experiences of teachers as they teach certain geography topics can be either positive or negative depending on the learning environment and the character of the learners. Similarly, the experiences of the learners are shaped by the learning environment and the nature of the teachers. Consequently, learners' attitudes towards topics may be influenced by their experiences. Positive experiences often lead to successful learning and desired outcomes while negative experiences can result in unfavourable attitudes, making the topic seem challenging or uninteresting. This theoretical framework serves as a valuable guide for the study by benchmarking and concretely relating various phenomena and relationships.

1.8 Scope of the Study

The study will employ quantitative and qualitative approaches to come up with its finding. The study will concentrate on Mzuzu City Secondary schools, specifically those that belong to the government. Geography teachers and learners only will be used to provide data for this study.

1.9 Chapter Summary

This chapter has given a comprehensive overview of the study's background, statement of the problem, purpose, and objectives. It has also delved into the significance, scope, and theoretical framework that informed the study. The next chapter will provide a detailed examination of the key studies and gaps in the literature that have impacted this research.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Overview

This chapter presents the literature review relevant to the study which is guided by the study's objectives. The literature is reviewed under the following headings:

i. Analyse the experiences of teachers in teaching selected geography topics in Mzuzu Secondary Schools

ii. Examine experiences of learners in learning selected geography topics in Mzuzu City Secondary Schools

iii. Evaluate the challenges of teachers and learners in teaching and learning selected geography topics Mzuzu City Secondary Schools

The selected geography topics to be reviewed in this chapter include: map reading and map interpretation, statistical methods in geography, the Continental and Plate Tectonics Theory, landforms (riverine and coastline features), and geographic information systems (GIS).

2.2 Experiences in Teaching and Learning of Map Reading

Grounded on Arthurs et al. (2023), map reading refers to accurately assessing positions on a small-scale representation of a large-scale representation, such as topographic maps used in educational institutions. Havelková and Hanus (2019) describe map reading as the ability to extract information from a map and identify map features while taking note of their attributes or characteristics. Therefore, map reading can be concluded as the capability to comprehend and interpret geographical information shown on a topographic map. Based on Ory et al. (2015) perspective, maps are abstract representations of features, and understanding them requires cognitive abilities like perception and visual analysis. The visual design and specific variables applied to cartographic data are also essential. Maps cannot be understood by key or legend alone.

Based on Havelková & Hanus (2019), "map reading," "map interpretation" and "map use" are often used interchangeably but have different meanings. Map interpretation involves solving problems or making decisions based on the information displayed on a map. To interpret a map, learners need to know symbols, distance, scales, direction, forms and relief features, as listed by Schuit (2011). Recognising and understanding the symbols in a map legend is also important

when reading a map (Ory et al., 2015). It is important to understand the language of cartography, which involves form, layout and meaning of the distribution displayed on a map. Understanding maps depends on abstract and spatial thinking (Mládek et al., 2017).

Mastering the art of reading maps is a vital skill as it empowers people to confidently navigate through familiar and unfamiliar areas (Arthurs et al., 2023; Havelková and Hanus, 2019; Mládek et al., 2017; Ory et al., 2015; Schuit, 2011). Moreover, it cultivates a deeper comprehension of geographical and spatial connections, proving beneficial in numerous academic, career and leisure pursuits (Mládek et al., 2017; Ory et al., 2015; Schuit, 2011). But it seems that teaching and learning about maps in other parts of the world is challenging (Amosun, 2016; Atiso Ahiaku et al., 2019; Hošková-Mayerová et al., 2017; Naxweka & Wilmot, 2019). The subsequent paragraphs of this section explain the teaching and learning experiences in other parts of the world.

2.2.1 *Poor performance in map reading*

This section describes the experiences teachers and learners face in the teaching and learning of map reading that lead to poor performance of learners.

2.2.1.1 Teacher Experiences

The poor performance of learners in map reading and interpretation has raised concerns among stakeholders, including geography teachers, guardians, and the Department of Basic Education (Atiso Ahiaku et al., 2019). Teachers need to approach the teaching of map reading with care to ensure that learners gain the necessary skills. Specifically, students can expect to develop skills such as visual literacy, selection and location, mathematics, manipulation, analysis, and interpretation through structured experiences with map reading and interpretation. This approach is in line with the Theory of Experience, which emphasises the importance of meaningful experiences set by the teacher for effective learning. Meaningful experiences created by teachers can foster student interest hence leading to a better understanding of the subject matter (Amosun, 2016; Atiso Ahiaku et al., 2019; Bello, 2020; Morris, 2020).

(a) *Teacher knowledge and skills*

When it comes to educators, they need to have a strong grasp of both content knowledge (CK) and pedagogical content knowledge (PCK). Content knowledge refers to understanding the subject matter, while pedagogical content knowledge is about the methods of delivering that

content to students. Teachers who possess both CK and PCK are better equipped to tailor their teaching to suit the diverse needs of their students. They can effectively integrate various map properties into their teaching, lesson plans and assessments (Anlimachie, 2019; Kin & Podolsky, 2016; Kufakunesu et al., 2019; Larangeira & van der Merwe, 2016; Naxweka & Wilmot, 2019). Additionally, these teachers excel at connecting new ideas to their students' existing knowledge, which aligns with the learning Theory of Experience (Hutchingson, 2015).

The general notion that teaching and learning should go hand-in-hand is widely accepted. However, educators face challenges that sometimes hinder this ideal. According to a study by Amosun (2016), map reading is rarely taught in Nigerian secondary schools due to unqualified teachers, inappropriate teaching methods and a lack of teaching materials. Similarly, Atiso Ahiaku et al. (2019) highlight that the inadequate development of map-reading skills in South African learners may stem from teachers' qualifications, preparedness and access to teaching resources. Shyiramunda and Bavugirije (2020) further underscore the adverse effects of unqualified teachers on student performance.

Inadequate teacher qualifications, ineffective teaching methods and limited resources run counter to the principles of Theory of Experience. When teachers lack proper qualifications and resources are scarce, students may not have sufficient opportunities to engage with maps. This can make learners lose interest in the subject due to uninspiring learning experiences. Ultimately, this may impede their ability to comprehend map reading hence leading to poor performance in examinations and an inability to apply these skills in real-world situations.

Many secondary school teachers favour teacher-centred approaches when teaching map reading and interpretation, possibly neglecting learner-centred methods. It may be due to the time-consuming nature and challenges of addressing individual needs. Alternatively, learners can practice with simplified map exercise cards in a more interactive approach outside the traditional classroom setting (Gredler, 2012; Kolb, 1984; Mtitu, 2014). Another method of improving map reading skills is "thinking aloud" where learners verbalise their thoughts while performing the task. Educators should move away from traditional methods and adapt learner-centred methodologies for better results (Aslan & Reigeluth, 2015; Krahenbuhl, 2016; Schuit, 2011).

Learner-centred teaching methods seem ideal for providing experiences tailored to individual learners, focusing on their specific needs and learning styles. Moreover, they boost learners' motivation and engagement, resulting in a deeper understanding of the subject matter. This

concept aligns with the Theory of Experience, which underscores that learning is an ongoing process which is rooted in experience. Approaches that focus on the learner foster emotional connections with the material, igniting enthusiasm and driving a genuine interest in the subject, thus ensuring a grasp of the content more solidly.

Some teachers fail to teach map reading and simple surveys in their classes. It is simply because they are lacking in it. The lack seems not to originate from a lack of content matter but because they do not thoroughly prepare by reading and understanding the content. In addition, they fail to find diverse experiences for the learner's comprehension (Atiso Ahiaku et al., 2019; Amosun, 2016; Asli & Zsoldos-Marchis, 2021).

The topic of map reading is practical, and mastering it requires access to diverse teaching and learning materials. These materials can include topographical map sheets, mathematical sets, long rulers, plain papers, past paper questions, map reading textbooks, national geographic atlases and world atlases. Many educational institutions face difficulties due to the lack of topographical maps, which hinders the development of valuable learning opportunities in this field. This lack of resources can lead to poor performance by learners during examinations (Amosun, 2016; Prathoshni et al., 2018).

(b) *Poor teacher's mathematical background*

It has been observed that many geography teachers in Nigerian secondary schools lack sufficient mathematical background, leading to poor student performance in mathematically related concepts in geography, for example, in map work. Similar struggles have been reported in Namibia and South Africa (Amosun, 2016; Larangeira & van der Merwe, 2016; Naxweka & Wilmot, 2019). Chapman (2010) noted that geographers have varied mathematical backgrounds, which can be a hurdle for geography education. Asli and Zsoldos-Malchis (2021) and Chapman (2010) emphasized the need for training and hands-on experiences for teachers to overcome this obstacle and enhance student learning. It can be posited that geography teachers need to have sufficient mathematical skills to perform calculations. This challenge with teaching map reading may not be unique to Malawi.

(c) *Lack of commitment to excellence*

Commitment is a crucial attribute that any successful organisation must possess. It appears to hold sense, especially true for the field of education. Teachers who exhibit a strong sense of

commitment are determined to continuously improve their craft and never settle for the status quo. They consistently seek out fresh ideas and innovative methods to enhance the learning experiences for their students (Yildiz & Celik, 2017). Amosun (2016) argues that a significant number of teachers in Nigerian schools lack commitment to their jobs. Among them are geography teachers who neglect their primary duties when salaries and allowances are delayed or unpaid. This unfortunate reality has negative implications on the academic performance of their students and, ultimately, the students' prospects.

Moreover, geography teachers cannot improvise their teaching methods, select appropriate materials or hold classes outside their regular working hours and holidays. Additionally, they cannot call upon a resource person for assistance in challenging areas. This lack of commitment on the part of geography teachers significantly contributes to students' negative motivation in this field, making learners to dislike the subject and, hence, poor performance in map reading and interpretation (Amosun, 2016; Roth & Jornet, 2014; Yildiz & Celik, 2017).

(d) *Lack of geography room*

While subjects like physics, chemistry and biology often have access to laboratory facilities, geography classes are typically not accorded the same luxury. A dedicated geography room can provide students with the necessary tables and chairs to comfortably spread out topographical maps, while featuring a variety of other maps displayed on the walls for easy reference and study. It is a common practice in many American schools (Cain, 2015). This situation is well-aligned with the Theory of Experience. A well-equipped geography room can provide an ideal setting for students to gain valuable experiences in map reading.

A well-equipped geography classroom can enhance both teaching and learning experiences. As the saying goes, "We remember not words but objects. We recall not descriptions, but the images derived from descriptions." This is precisely why the learning environment and tools for instruction are often referred to as the "third teacher". Unfortunately, it appears many schools lack such facilities, making it challenging to distribute maps and other related materials for map reading and interpretation (Amosun, 2016; Lescesen et al., 2021).

(e) *Lack of adequate in-service teacher training*

Empirical evidence suggests that many Nigerian school teachers, particularly geography teachers, may not have attended in-service training on map reading. This inadequacy can lead to

ineffective teaching and learning experiences in map reading and interpretation. Such teachers may lack a driving force as they may be lacking in some other areas. Due to such inexperience, they may fail to move their learners towards liking the subject, resulting in poor performance by learners during examinations (Amosun, 2016). This idea is contrary to the theory guiding this study.

2.2.1.2 Learning experience

Just like the teaching experiences in map reading, it seems there are various learner experiences globally that seem to be attributed to poor performance in map reading which are described in this section as follows:

(a) *The nature of topographical maps*

Presenting all topographical map sheets to learners at once can be overwhelming. Many individuals struggle to interpret the complexity of these maps when they are overloaded with information. To alleviate this issue, it is recommended that maps be introduced to learners in smaller sections, allowing for a more digestible learning experience as this would create a positive "affect" in both the teacher and the learner as per the theory guiding this study. Ideally, schools would have access to map sheets that contain varying levels of detail to facilitate an effective learning process (Amosun, 2016; Roth & Jornet, 2014).

As an illustration, maps should vary in detail level, following Arthurs et al.'s (2023) theory of map reading skill development, which highlights three domains that increase in complexity and require different skill sets. The theory suggests that instruction on map reading and interpretation should progress from basic to intricate, starting with surrogate maps, then moving on to planimetric maps, and ultimately, topographic maps. This approach aids learners in comprehending the conventional symbols on the maps and acquiring abilities gradually (Amosun, 2016; Arthurs et al., 2023).

(b) *Lack of dedication to excellence*

The absence of dedication to excellence among students can manifest in forms of laziness, procrastination and truancy. To perform well academically, a high level of commitment to excellence is expected of the learners. When students lack this commitment, it can result in poor marks during exams and even failure in national exams, as noted by Amosun (2016).

(c) *Lack of motivation and negative attitude of learners*

Again, based on Amosun's study in Nigerian schools, it was discovered that most learners lacked motivation in map reading. Motivation is a crucial element for academic success. It is the drive to accomplish something. Grounded on Borah (2021), motivation is at the heart of learning, a key to education's success, and a powerful force in learning, especially external motivation, such as rewards. Research and theory support this claim. Especially in subjects where students struggle, motivation is necessary to help them see the benefits of a particular course. Additionally, motivating students to attend class, listen actively, ask questions, complete exercises individually or in groups and ensure they complete their assignments is crucial (Amosun, 2016; Falode et al., 2016; Gurlek Kisacik et al., 2023; Reyes et al., 2023; Sadera et al., 2020; Syamsuri & Bahtiar, 2023; Tomas, 2023).

(d) *Other experience causing poor performance in map reading*

A study in Turkish schools found that students' poor performance in map reading is due to unwillingness, inadequate experience with directions, locations, scales and legends, lack of understanding of colours and physical maps, poor timetabling and weak math skills (Gökçea, Nazlı 2015). This aligns with a study in Western Nigeria, which suggested that map reading requires quantitative reasoning and mathematical skills, causing anxiety among learners. Learners in Western Nigeria often suffer from quantitative phobia due to poor mathematical backgrounds and lack of exposure to different topographical sheets (Amosun, 2016). It leads to inconsistent experiences in map reading and interpretation provided by teachers (Amosun, 2016; Ceschia et al., 2023; Gökçea, Nazlı 2015)

Encouraging hands-on experiences that promote abstract and spatial reasoning is a justifiable recommendation for educators. It will empower learners to construct their own educational experiences. Various factors contribute to the difficulty of map reading, including educators' readiness and access to teaching and learning resources (Atiso Ahiaku et al., 2019). But one thing remains. What are the teaching and learning experiences in map reading in Malawian schools?

2.3 Experiences in the Teaching and Learning of Statistical Methods in Geography

The word “statistics” refers to the science of learning from data, encompassing making measurements, controlling uncertainty and effectively communicating findings (Bernabeu, 2012). Additionally, statistics provides a cohesive set of tools and concepts for handling data across various fields of study. According to the perspective of Bernabeu (2012), statistics has been a part of the secondary school curriculum since the 1980s for three primary reasons. Firstly, statistics plays a crucial role in our daily lives. Secondly, it is fundamental in cultivating critical thinking skills among learners. Lastly, statistics is vital in business, economics, biology, environment, mathematics, information technology and social studies. This multidisciplinary nature underscores the importance of statistical literacy as an educational goal for all learners (Harris et al., 2013; Jalal et al., 2023; Zwartjes Luc et al., 2015). In geography, statistics involves the collection, analysis and presentation of geographic information and areal measurements (Mufida et al., 2023; Wild et al., 2018; Wild & Pfannkuch, 1999; Zapata-Cardona & Martínez-Castro, 2023).

Although incorporating statistics into geography education has benefits (Cob & Moore 1997; Harris et al., 2013; Jalal et al., 2023; Zwartjes Luc et al., 2015), it seems to pose some challenges for teachers and learners worldwide which have resulted in poor performance of learners in statistics (Mufida et al., 2023; Wild et al., 2018; Wild & Pfannkuch, 1999; Zapata-Cardona & Martinez-Castro, 2023). In the paragraphs that follow, teacher experiences and learner experiences in statistics are explained.

2.3.1 *Teacher experiences*

In this section, the experiences of teachers that appear to cause poor performance in in statistics are described. The teacher experiences are described as follows:

2.3.1.1 Fear of mathematics by teachers

Grounded on Conners et al. (1998), the primary challenge in teaching statistical geography is the inclusion of mathematics. The mere mention of math can trigger fear and anxiety in teachers, leading to a negative attitude towards statistics education. This fear, also known as mathematics phobia, can cause some teachers to avoid teaching statistics altogether, resulting in poor development of statistical thinking and processes in learners (Zwartjes Luc et al., 2015). Based on the Theory of Experience, the theory guiding this study, fear is considered a negative force.

Inadequate teaching experiences or the omission of topics by teachers can pass this feeling to students, leading them to believe that statistics is a challenging subject that should be feared. Consequently, this may hinder students' personal growth.

Teachers play a vital role in reducing the knowledge gaps that learners often experience. Thus, the failure to cultivate statistical thinking and process experiences among students can lead to subpar academic performance, insufficient application of statistical reasoning and limited progress in utilising statistics in real-world contexts beyond the classroom. These effects can manifest in professional and personal spheres of life (Batanero et al., 2011).

2.3.1.2 Focus on mathematical component

Zwartjes Luc et al. (2015) identified several challenges in teaching statistics, including a tendency for teachers to focus on the mathematical aspect of the subject. This approach can leave learners feeling ill-equipped to apply statistical concepts to real-world problems. In essence, it appears statistics is taught as if it were mathematics, which can result in poor application and a lack of development of statistical thinking skills. It runs counter to the objective of cultivating statistical reasoning in learners rather than simply imparting knowledge (Wild et al., 2018). Then, it entails that geography educators need to recognise the distinction between statistics and other mathematical disciplines. Unlike traditional math, learning experiences in statistics involve analysing data that are not just figures but also have context and meaning (Batanero, 2011; Zwartjes Luc et al., 2015). As such, it requires a distinct way of thinking.

Moreover, Bernabeu (2012) shares a similar view regarding teaching statistics in mathematics. Bernabeu (2012) further notes that statistics is not typically taught as a separate subject but rather integrated into mathematics education. As a result, prospective statistics teachers often receive their training within the mathematics department. However, the philosophy of mathematics differs from that of statistics, which may explain why learners tend to struggle with applying statistics concepts in a mathematical context. Unfortunately, it seems many mathematics teachers fail to cultivate statistical thinking and reasoning experiences, leading to poor application of statistics by their students.

To prevent this, Bernabeu (2012) suggests the appropriate interactions when training teachers in mathematics to reduce the tension created by the adequate philosophy of statistics. Considering that mathematics teachers may fail this way, it is contendingly striking what geography teachers do, especially those who did not major in mathematics. Are the teachers able to teach statistics in

geography so that learners develop statistical thinking and reasoning to apply statistics? Rightly putting it, Batanero (2011) asserts that it does not matter in which field statistics is being taught. Teachers without a background in statistics might design irrelevant learning experiences, causing students to develop a dislike for the subject and struggle with statistics, which contradicts the Theory of Experience that is guiding this study.

2.3.1.3 Insufficient teaching and learning resources

Another issue is the insufficient resources that has cornered teachers when evaluating learners' statistical thinking and literacy during statistics instruction. Bernabeu (2012) noted that teaching statistics in Brazil is difficult due to limited didactic materials and software. Similarly, Polot-Okurut and Opyene Eluk (2012) reported that teachers in Uganda struggle to access adequate textbooks. Furthermore, the few available textbooks in Uganda introduce statistics using non-authentic data.

It appears that teaching statistics without sufficient resources presents a challenge. It suggests that the experiences that teachers provide for their learners may not achieve the desired statistical skills and processes. The reason is that teaching and learning resources are designed to accommodate various learning styles and preferences. It ensures that all learners have the chance to interact with the materials in ways that are meaningful to them. Seemingly, it contradicts the Theory of Experience that is guiding this study (Roth & Jornet, 2014). The question arises: do geography educators in Malawi have access to the necessary resources for teaching statistical methods effectively?

2.3.1.4 Poor statistical pedagogy

There appears to be a dearth of knowledge in statistical pedagogy. This type of knowledge pertains to the teaching and learning methods utilised in statistics. It is essential to employ appropriate procedures in statistics education to foster the development of statistical thinking and processes among learners. Batanero et al. (2011) has highlighted that in countries such as Brazil, the United States of America as well as in African nations like South Africa and Uganda, many teachers exhibit a lack of pedagogical content knowledge in statistics. It means that they are employing inappropriate methods in teaching and learning statistics. In other words, this indicates that educators may not be providing students with the necessary learning experiences. It could potentially result in negative emotions in learners. This scenario appears to contradict the fundamental theory underpinning this study. When students are given inadequate learning

experiences, it can significantly affect their performance in standardised tests. The implications of this are particularly concerning when considering the teaching and learning of statistics in geography in Malawi.

2.3.2 *Learner experiences*

More like the teachers, it is reported that learners too face a considerable challenge when it comes to learning of statistics that seem to make them not to perform well in statistics in other parts of the world are described in this section as follows:

2.3.2.1 Mathematics phobia

Based on Corners et al. (1998), the main challenge in learning statistics in geography is the inclusion of mathematics. Mathematics triggers fear in the learners, resulting in the development of negative attitude in the learners. As a result, it seems that more learners have developed inadequate statistical methods. The role of an adult teacher is critical in reducing knowledge gaps among learners by creating learning experiences that evoke positive emotions. This approach helps students to develop a liking for the subject and make significant personal growth (Kolb, 1984; Romano, 1998).

2.3.2.2 Lack of learning resources

According to Bernabeu et al. (2012) research, statistics learners in Brazil face a scarcity of didactic materials. It is a common trend in education for teachers to possess more resources than their students, leaving the latter at a disadvantage. Consequently, statistics topics become challenging for learners to comprehend. In the research conducted by Porot-Okurut (2012), a similar concept is illustrated. The study reveals that learners in Ugandan schools face challenges accessing adequate learning resources. The lack of satisfactory materials also poses a challenge for learners studying statistics. Consequently, learners may not acquire the necessary statistical skills and processes.

This idea appears to contradict the Theory of Experience, which emphasises the importance of learners' interaction with diverse learning materials so that they can gain their own experiences. Teaching and learning resources spark interest in students and educators, enhancing the learning process by being carefully designed and utilised.

2.4 Experiences in Teaching and Learning of Continental Drift Theory and Plate Tectonics Theory

Most geography syllabi cover topics such as Continental Drift Theory and Plate Tectonics. These theories focus on plate movement and are considered a global framework for understanding the Earth. They help to unify various fields of earth science and provide a basis for comprehending geological facts and natural occurrences (Chakour et al., 2016; Dolphin & Benoit, 2016; En-Nhili et al., 2023; Mills et al., 2017, 2019; Pellegrin, 2019; Yount, 2009). It is posited that understanding these theories can greatly aid young geographers in comprehending concepts in earth science. Even though the Continental Drift Theory and the Plate Tectonics Theory are essential fundamentals in physical geography (Chakour et al., 2016; Dolphin & Benoit, 2016; En-Nhili et al., 2023; Pellegrin, 2019; Yount, 2009), it seems that the teaching and learning of abstractions in other parts of the world has challenges (Edwin, 2022; McLure et al., 2021; McDonald et al., 2019; Price, 2021). The challenges encountered in teaching and learning this topic are described in the following paragraphs.

2.4.1 *Teacher experiences*

The following sections describe experiences teachers encounter in other parts of the world regarding the teaching of continental and plate tectonics theories:

2.4.1.1 Abstract words and terms

Edwin (2022) lists three main problems that make the topics of continental drift and plate tectonics challenging in Quezon City in the Philippines. Firstly, the nature of the course, for example, some words and terms are abstract and challenging to retain and regurgitate. It seems that as a result, teachers find it difficult to help students understand the concepts or persuade them that these issues occur in nature. The Theory of Experience guiding this study suggests that in situations like these, teachers should provide hands-on experiences, such as exploring the local environment or taking virtual tours, to help students learn more effectively. Such experiences can bring abstract concepts to life and make their learners like their subject and later on perform well in their examinations (Hutchinson, 2015; Roth & Jornet, 2014).

2.4.1.2 Scientific nature of the topic

Secondly, it is the scientific nature of the topic. The Continental Drift Theory and Plate Tectonics are scientific in nature (Edwin 2022). McLure et al. (2021) and McDonald et al. (2019) assert that the topic of Plate Tectonics and Continental Drift borrows a leaf from physics and chemistry. These topics are associated with terms like force, pressure, density, energy transfer and names of mineral elements. In other geography books, especially earth science books, periodic tables are put there for the appreciation of the rocks and minerals.

A grasp of the fundamentals of physics and chemistry is essential for understanding the complexities of the periodic table. As such, it is highly recommended that educators approach these concepts from a scientific perspective. Price (2019) also noted the benefits of this approach for individuals studying continental drift and plate tectonics, although geography teachers generally do not require a foundational understanding of science.

It implies that teachers need to provide scientific experiences so that learners can learn from them. Such an experience can make the learners appreciate concepts in continental drift and plate tectonics theory, as this aligns with the Theory of Experience that is guiding this study. Moreover, examining the teaching and learning practices specific to Malawian geography education could yield valuable insights, particularly in light of challenges observed in other regions (Edwin, 2022; McClure et al., 2021; Price, 2021).

2.4.1.3 Lack of content knowledge (CK) and pedagogical content knowledge (PCK).

Teachers may struggle to effectively deliver content on these topics to their students due to lack of content knowledge (CK) or pedagogical content knowledge (PCK) - the method through which information is conveyed to learners to aid in knowledge construction. The complexity of the subject matter and the scientific principles involved (Price, 2019) could account for this. It is contrary to the theory of this study if educators do not possess adequate content and pedagogical knowledge (CK and PCK), as they are essential in helping students to bridge knowledge gaps. This inadequacy in CK and PCK may lead teachers to create unrequired or fewer experiences for their learners to tap from. Such teachers may have less enthusiasm for teaching, which could demotivate their students and create a dislike for the subject.

Additionally, teachers may not have adequate preparation or time for lesson delivery, which is vital for learners to undergo the experiences prepared by their teachers. Several studies have highlighted these challenges (McLure et al., 2021).

2.4.2 *Learner experiences*

This section describes the experiences that learners face in other parts of the world regarding the learning of continental drift and plate tectonics theories that seem to lead to poor performance the learners:

2.4.2.1 Challenging terms

Similarly to educators, students face challenges when it comes to certain subjects. One such obstacle is the nature of the topic or course itself. For instance, some words and concepts may be abstract or difficult to understand and recall. Edwin (2022) reported that at Quezon City University, students struggled with comprehending earth science due to the complex terminology that is used. This abstract language can also contribute to misunderstandings and misconceptions about the topic among learners (Edwin, 2022).

2.4.2.2 Lack of prior knowledge

Learners often lack the necessary prior knowledge required to understand concepts related to Plate Tectonics and Continental Drift Theory (Edwin, 2022). It was highlighted in a study that examined challenging topics in the Senior High School Core Curriculum Subject (Earth and Life Science), as perceived by first-year college students in Quezon City, Philippines. The study found that due to a lack of prerequisite knowledge, many learners struggled to perform well in these topics (Edwin, 2022). It suggests that in other parts of the world, learners may also encounter difficulties when learning these topics without prior knowledge. Explained differently, it means that the learners' prerequisite experiences are crucial for learning from the current experiences provided by teachers as per the Experiential Learning Theory.

2.4.2.3 Abstract concepts

The concepts of Continental Drift and Plate Tectonics often seem abstract and intangible to many learners (Edwin, 2022; Price, 2019). It is crucial to provide ample evidence to demonstrate the legitimacy of these theories and dispel the notion that they are merely fictional accounts. Dolphin and Benoit (2016) and Price (2019) advocate for an evidence-based approach to teaching abstract

topics like Plate Tectonics and Continental Drift. By presenting concrete evidence, learners can better experience and appreciate the relevance of these complex concepts in the real world. This approach aligns with Theory of Experience, which emphasises the importance of learners interacting with the environment and understanding concepts with the guidance of teachers. Such experiences would act as a movement or a change that provides a holistic way to conceptualise a situated nature of cognition (Bada & Olusegun, 2015; Gledler, 2012; Roth & Jornet, 2014). As a result, learners can gain a deeper understanding of the processes involved in plate tectonics and develop a greater appreciation for the subject matter.

2.4.2.4 Confusing theories

It is noted that the Continental Drift Theory and the Plate Tectonics Theory are confusing. It implies that they can be confused for each other. For example, En-Nhili et al. (2023) noted that secondary school students in Morocco struggle to distinguish between Plate Tectonics and the Continental Drift Theory, likely due to their closely related definitions and causes. Additionally, En-Nhili et al. (2023) further noted that research in science education has not adequately addressed the challenges of teaching physical geography topics in Morocco, with no comprehensive studies focused on resolving these difficulties.

It is fascinating to analyse the teaching and learning experiences of the continental drift and plate tectonics theories in Malawian secondary schools, considering the experiences in other parts of the world described in the preceding paragraphs.

2.5 Experiences in Teaching and Learning of Riverine and Coastline Features

Riverine landscapes, which are created by rivers (Sexton, 2012), and coastline features, formed by the meeting of lakes, seas, and oceans with land (Mukhopadhyay & Karisiddiah, 2014) provide diverse and unique examples (Jyoti, 2023). These features have given rise to eco-regions that offer ideal habitats for human settlement (Chakraborty, 2021) and various forms of wildlife; especially fish (Sumreka et al., 2016). Moreover, they hold significant economic importance, contributing to crop and fish farming, attracting tourism (Chakraborty, 2021) and playing an important role in mitigating climate change by reducing greenhouse emissions (Ladrera et al., 2020; Singh, 2018).

Official documents in Malawi recognise the importance of imparting this knowledge to learners as it enables them to appreciate and protect their environment, and preserve natural resources

(MoE, 2013). However, in different parts of the world, teachers and learners face challenges when teaching and learning about riverine and coastline features, as described in the following paragraphs.

2.5.1 *Teachers' knowledge and skills*

According to Casinader and Kidman (2018), it is suggested that educators are encouraged to have a strong grasp of scientific methods that enable students to construct their understanding when teaching riverine and coastline features. Moreover, teachers should strive to highlight complex concepts by allowing students to become more engaged with the subject matter. When real-life scenarios are not feasible, teachers can utilise cutting-edge technological advances such as Augmented Reality (AR) to establish an immersive learning environment that fuses virtual and real-world elements. In this sense, it would seem that teachers are creating an experience for their learners to learn from (Kolb, 1984; Roth & Jornet, 2014; Turan et al., 2018).

This idea seems to align perfectly with the Theory of Experience that underpins this research, which emphasises that the role of the teacher is to create positive experiences that can enhance learners' academic outcomes. For example, visiting the big rivers and lakes to see such features would make learners gain first-hand experiences with the abstractions learned, even though it would be resource-demanding and time-consuming for most schools to afford this. But where such an experience is obtained, teachers and learners get motivated and gain the force to develop a solid understanding of the concepts (Kolb, 1984; Roth & Jornet, 2014).

It seems many teachers in South African schools continue to rely on traditional teaching methods based on rote memorisation of facts and definitions, despite the shift towards an outcome-based curriculum (Mbuyazwe, 2011). This approach fails to align with the goals set out by the country's educational system. Similarly, Malawi has adopted an outcome-based curriculum, highlighting the importance of hands-on learning experiences and field visits for subjects like geography, where knowledge is best developed through practical application (Jose et al., 2017; Chirwa et al., 2014). It would be valuable to analyse teaching and learning experiences related to riverine and coastline features in a Malawian context, even if different experiences are observed in other countries.

2.5.2 *Learning experiences*

Regarding the learning of riverine and coastline features, Opoku et al. (2021) pointed out that in Ghana, these topics seem to be particularly difficult because they seem to be abstract. Additionally, learners may struggle to connect these concepts to real-life situations, which is further complicated by the fact that their schools are maybe located in a semi-deciduous zone far from the coast and lack prominent rivers.

The situation in Ghana appears to bear a striking resemblance to that of Malawi, a country surrounded by land. Therefore, it is unlikely that students in Malawian schools can experience the ocean and its associated processes firsthand, except for those near the freshwater lake of Malawi or major rivers. As a result, it may be challenging for most learners to have an experience of the characteristics of both the riverine and coastal environments.

In his thought-provoking study on students' understanding of the role of rivers in canyon formation, Sexton (2012) discovered that many learners had a weak grasp of the scientific concepts involved. Specifically, they struggled to connect the surface-level processes with the underlying changes in the base level that shape canyons. It underscores the importance of educators and students having solid scientific experiences to comprehend the formation of riverine features fully.

In educational settings in Ghana and Malawi, there is a notable absence of real-life examples that could offer practical insights to help students connect theoretical concepts with real-world applications. Grounded on the theory guiding this study, exposure to real-life examples allows students to engage with their environment, potentially sparking increased motivation to comprehend academic material. Real-life experiences have the potential to breathe life into abstract concepts learned in the classroom, fostering a deeper understanding and appreciation for the subject matter. Furthermore, these experiences may ground students in their learning and kindle a genuine interest in the subject matter (Kolb, 1984).

It would be fascinating to analyse the teaching and learning experiences of riverine and coastline features in Malawian secondary schools, considering the experiences in other parts of the world described in the preceding paragraphs.

2.6 Experiences in the Teaching and Learning of Geographic Information Systems (GIS)

In Malawi, GIS is a newly introduced topic in the geography curriculum (MoE, 2013; Mzuza & Van der Westhuizen, 2020). GIS comprises a set of integrated software programmes for storing, retrieving, analysing, manipulating and displaying geographic information (Mzuza, 2019). GIS is a crucial technology with wide applications in fields like mathematics, political science, medicine, transportation and health (Pamuk, 2023). It plays a vital role in combining and visualising location data from various sources like satellites, maps and space databases (Cutler, 2014). It suggests that teachers must be knowledgeable about technology and pedagogy to effectively teach GIS.

In education, there are two main aspects of GIS: learning about GIS and learning through GIS. Learning through GIS involves using GIS as a tool to teach subjects like mathematics, political science and medicine, aiming at developing spatial abilities in learners (Bearman et al., 2015; Branch, 2016; Mkhongi & Musakwa, 2020). It is also used in problem-solving in various fields. On the other hand, learning about GIS involves understanding its use in geography and GISciences, preparing learners for future careers in this field. It can also be posited that teachers must be knowledgeable about technology and pedagogy to effectively teach GIS. This content has gained attention worldwide, leading to increased interest in GIS education (Backer, 2012; Mkhongi & Musakwa, 2020).

There are strong reasons for incorporating GIS in geography education. It allows geographical research, provides comprehensive information, improves cartographic skills, and supports decision-making and problem-solving. This suggests that GIS furnishes learners and other stakeholders with more comprehensive information through various sources (Mkhongi & Musakwa, 2020).

2.6.1 *Poor performance in GIS*

Although GIS education provides numerous benefits, such as enhancing spatial reasoning and problem-solving skills in learners (Baker et al., 2012, 2015; Bauer, 2019; Dima et al., 2022; Hong & Stonier 2015; Hutchinson 2015; Pugh et al., 2017), it is not without its unique challenges (Ghafar et al., 2023; Mzuza & Vander Westhuizen, 2020). In the following sections experiences of teachers and learners that lead to failure of learners in the teaching and learning of GIS are described.

2.6.1.1 Teacher experiences

The sections below describe the teaching experiences from other parts of the world that seem to lead to poor performance of learners in GIS. They are described in this section as follows:

(a) *Lack of ICT knowledge or expertise*

It seems ICT knowledge and expertise is a challenge globally amongst educators. Even in technologically advanced countries like the United States, Canada and Australia, teachers and students struggle to access computer labs and receive IT support. Despite having high-performing computers, efficient internet and proper software for spatial analysis, these challenges persist. Additionally, Walshe (2017) observed that teachers in the United Kingdom tend to avoid incorporating GIS into their teaching practices.

It seems that some teachers in this region lack the necessary expertise to independently utilise GIS and instead rely on IT personnel within their schools. Another possible factor could be that educators in these countries are not actively seeking technological advancements to effectively teach GIS classes. Additionally, limited access to computer laboratories may prevent learners from practicing, leading to a lack of independent learning and hindering their ability to gain practical experience (Kerski et al., 2013).

This concept challenges the Theory of Experience that serves as the foundation for this study by suggesting that educators and students face obstacles when using GIS equipment, thus hindering their interaction with it. In other words, GIS equipment appears vital in providing optimal experiences for teachers and learners, and the lack of it seems to dampen their enthusiasm. This implies that teachers and learners lack the motivation to develop an appreciation for GIS, which is crucial for gaining meaningful learning experiences. This situation is likely to result in poor performance among learners.

(b) *Lack of administrative support*

Additionally, Ghafar et al. (2023) reported that in Malaysian secondary schools, GIS education faces a challenge of lack of administrative support. It is indicated that in most schools there is faulty equipment that impedes teachers' ability to connect to LCDs and computers, poor internet connectivity, a shortage of ICT equipment, particularly school computers, and LCDs, as well as the necessary GIS curriculum requirements. Despite these challenges, Malaysia is considered one of the most technologically advanced countries in its region, surpassing most African

countries. It is possible that the current difficulties in teaching and learning GIS can be attributed to the lack of support from the Malaysian government in terms of improving internet connectivity and providing up-to-date equipment for GIS education.

(c) *Lack of interest in ICT technology among teachers*

Perhaps another factor contributing to the problem is a lack of interest among teachers in acquiring ICT skills needed to teach GIS effectively, or a negative attitude towards the technology-intensive subject matter. Joseph et al. (2023) found that in Turkish schools, the primary challenge in GIS education is the negative attitudes of teachers. It suggests that teachers may not attend training programmes where they can gain technological pedagogical content knowledge (Höhnle et al., 2016; Oda et al., 2020) due to their negative attitudes. An alternative explanation for the negative attitudes could stem from the teachers' past negative experiences or their lack of prior experiences with technology.

The theory guiding this study suggests that well-planned teaching and learning experiences are a significant factor, as they can motivate or demotivate. Thus, the negative attitudes may be transferred to the learners through inappropriate or misguided experiences created by the teachers during the learning process, resulting in lacklustre performance by students. This may not reflect the transformation expected of the teachers and learners. Conversely, the researcher believes that teachers' positive attitudes towards GIS can facilitate the successful integration of the topic into geography lessons.

(d) *Lack of material and human resources*

Sumari et al. (2017) found that in Tanzania, the obstacles hindering the progress of GIS education are comparable to those faced by other developing countries. These challenges are linked to the shortage of both material and human resources despite the increasing prevalence of ICT and GIS expertise in higher education institutions and society as a whole. Despite this, there are still difficulties in teaching and learning GIS. Schools in Tanzania lack the necessary ICT infrastructure, such as computer labs, to effectively manage, access and utilise information.

In line with the conditions in Tanzania, Mzuza and Van der Westhuizen (2020), and Kholoshyn et al. (2021) revealed that teaching and learning GIS in South Africa, Botswana and Lesotho face similar challenges. These challenges include shortage of resources, such as computers and GIS software, poor internet connectivity and shortage of GIS teachers. Mkhize (2023) noted that

teachers in South Africa lack technological pedagogical content knowledge (TPCK) in teaching GIS, which needs to be blended with subject matter (Puertas-Aguilar et al. 2021).

The poor posture of teachers in terms of content knowledge, technological pedagogical knowledge and lack of resources contradict the Theory of Experience. Such teachers may fail to offer appropriate experiences to their learners because they may not like to teach a topic in this posture. In addition, this may also cause the learners not to like the topic because the teachers seem to offer almost no drive or motivation for the learners to like the topic.

2.6.1.2 Learner experiences

In the realm of GIS education, it appears that learning outcomes are contingent upon the availability of GIS resources, the competence of teachers, and to some extent, the technological pedagogical content knowledge (TPCK) of the teachers. However, for learners to effectively harness GIS and ICT, they must possess a fundamental understanding of computational knowledge, which ideally should have been acquired in earlier stages of education. Putting it differently, learners should have prior exposure to ICT technologies. Regrettably, many students are introduced to GIS without acquiring this foundational experience. Additionally, in several African countries, computer studies is offered as an optional subject, potentially limiting the number of learners with prior computer experience in a geography class (Sumari, 2017).

This approach appears to contradict the Theory of Experience, which underscores the significance of prior experiences in shaping present experiences. Past experiences are instrumental in fostering a passion for present experiences in learners, suggesting that positive prior experiences may lead to positive passions. Such positive passions serve as a driving force in cultivating an affinity for current experiences, thereby facilitating meaningful learning. Consequently, if learners lack prior experiences, they may approach current learning experiences with negative emotions, potentially resulting in diminished performance in GIS (Mzuza, 2019; Sikanda, 2016; Roth & Jornet, 2014; Sumari et al., 2017).

As far as GIS education in other parts of the world is concerned, the problems in GIS include lack of CK, TPCK, and learning resources. When compared to other SADC countries that have included GIS in their curriculum, it appears Malawi is far behind both economically and technologically. However, if even a country like South Africa struggles in GIS education, it is crucial to understand how Malawian schools fare in this area. This study aims at analysing real teachers' and learners' experiences in the teaching and learning of GIS in Malawian schools.

2.7 Chapter Summary

Throughout the world, literature is filled with discussions on the varied experiences encountered by both teachers and learners in teaching and learning different subjects. Concerning geography, it has been discovered that geography teachers and learners face distinct challenges during teaching and learning. This chapter offered an insightful overview of the obstacles experienced in teaching and learning selected geography topics across different regions of the world. It has highlighted that both teachers and learners struggle with issues such as map reading, statistical methods in geography, continental drift and plate tectonics theory, riverine and coastline features, and GIS. Generally, these challenges revolve around CK, PCK, TPCK, resources, and the abstractness of the content matter.

This chapter has provided a comprehensive overview of the essential studies and gaps in the literature that have informed this research. Additionally, it has established a cohesive connection between the primary concepts and variables discussed in the literature, relying on the theoretical framework that underpins this study. In the following chapter, the research design and methodology will be elaborated, including the techniques used to ensure the rigour and credibility of the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter discusses the research design methodology that was used in this study. The chapter focuses on the research design, area of study, population, sample of the population, sampling techniques, instruments for data collection validation and reliability of the research instruments.

3.2 Research Design

3.2.1 *Pragmatism*

A paradigm refers to a particular way of thinking, a set of shared beliefs or a school of thought that shapes how research data is interpreted. It influences researchers' ontological, epistemological and methodological viewpoints when analysing phenomena by giving rise to an understanding of and explanations for the emotions that relate to reality and the truthfulness of the world. In this study, the goal was to gain insight into the experiences of teaching geography topics in Mzuzu city secondary schools (Cohen, 2018; Cohen et al., 2007; Creswell, 2012; Creswell et al., 2007; Kivunja & Kiyuni, 2017; Lyke, 2015; Taherdoost 2016).

Pragmatism is an adaptable research approach that rejects a narrow-minded perspective and, instead, advocates for a practical and diverse methodology. Scholars who follow pragmatic principles believe that there is no single scientific method that can access reality alone. Biddle and Shafft (2015) suggest that pragmatism instead employs a mixed methods approach by allowing for a combination of techniques. Rather than prioritising specific research methods, pragmatism prioritises the results of research and the questions being asked. This open-minded approach to research allows for a more comprehensive understanding of participant behaviour including the beliefs that underpin it and the potential outcomes of different actions. Therefore, this study adopts the pragmatic paradigm (Cohen, 2018; Creswell & Clark, 2018; Kivunja & Kiyuni, 2017; Taherdoost, 2016).

3.2.2 *Research approach*

This study incorporated a mixed method approach by employing both quantitative and qualitative methodologies to collect and analyse data. However, a greater emphasis was placed on the quantitative approach. The study used the explanatory sequential design, also known as a two-phase model, which involves collecting quantitative data before obtaining qualitative data to provide further insight into the quantitative results (Creswell, 2012).

The reason behind this strategy is that since the quantitative data and results offered a broad understanding of the research problem, the qualitative data collection and analysis provided a more detailed, refined and comprehensive explanation. As such, the study heavily relied on qualitative data to supplement and expand the insights generated by quantitative data analysis.

3.3 Study Area

The study was carried out in the Northern Education Division (NED), specifically in secondary schools in Mzuzu City. The schools were intentionally selected for this study. The reason for focusing on Mzuzu City secondary schools was that they were conveniently located for the researcher.

3.4 Study Population

The study focused on examining the experiences of teachers and learners in teaching and learning specific topics. Seven CDSS in Mzuzu City were chosen. Within these schools, geography teachers and geography learners were selected to participate.

3.5 Sampling Technique

Sampling is a process used in statistical analysis where a subject of a population of interest is selected to make observations and inferences of statistics about that population. This study used purposive sampling in quantitative research and simple random techniques in qualitative research.

In the quantitative research for this study, purposive sampling was utilised to select schools, geography teachers and geography learners. This approach was chosen to ensure that the participating schools, teachers, and learners could provide detailed and relevant information aligned with the research objectives (Ames et al., 2019; Cohen, 2018; Creswell, 2012).

In qualitative research, schools were chosen through simple random sampling from the list of schools to prevent being bias.

3.6 Sample size

The quantitative research involved 23 geography teachers and 198 geography students. To determine this sample size, the researcher utilized the Krejcie and Morgan chart for samples and sample sizes. According to the subject teachers (geography teachers), the total number of geography students was approximately 500. All 23 geography teachers participated in this

research. Geography teachers were selected for their role in teaching the subject and their knowledge which is relevant to the study. Form four geography learners were chosen because they had covered a wide range of topics in physical geography and could provide valuable insights into their learning experiences.

In the qualitative research, data saturation was achieved with 4 participants, determining the sample size.

3.7 Data Collection Methods and Instruments

To gather data for this study, the researcher used questionnaires and structured questions. The questionnaire primarily gathered quantitative data and was intentionally designed with mostly closed-ended questions as well as a section of open-ended questions to ensure a broader range of information (see appendices 11A & 11B). Two questionnaires were employed; one designed for teachers and the other one for learners. The secondary approach implemented for collecting qualitative data involved using an interview guide (see appendix 11C).

The questionnaire for teachers had three sections: demographic profile, survey and structured questions. The survey portion aimed at gaining insight into experiences of teachers who are teaching selected geography topics. It comprised 26 Likert scale questions which allowed respondents to indicate their level of agreement or disagreement with specific prompts. The structured questions were designed to gather information about the challenges educators encounter when teaching these topics. Consisting of 10 open-ended questions, they provided a more comprehensive understanding of teachers' perspectives.

The learners' questionnaire comprised 32 questions that were categorised into three sections: biographic profile, survey and structured questions. Its purpose was to gather insights into the learners' experiences while studying specific topics in Geography and the challenges they encountered. The survey section consisted of 21 Likert scale questions to gauge the respondents' level of agreement or disagreement with specific statements while the structured questions included 10 open-ended prompts which helped to get the challenges faced in the teaching and learning of the selected geography topics.

Respondents provided written responses to the open-ended questions. Additionally, the researcher conducted interviews to collect qualitative data. These interviews consisted one open-ended question. The open-ended question delved into the respondent's thoughts, emotions and

beliefs regarding a specific topic. Where necessary, the researcher probed follow up questions (Adams et al., 2022; Creswell, 2012; Ryan et al., 2009).

3.8 Data Analysis

Data analysis is a process that involves imputing, cleansing, transforming, and modelling data to find information that can be used to inform conclusions and support decision-making (Creswell, 2012).

This study utilised descriptive statistics, a technique for summarising data through frequency counts, percentages, means and cross-tabulations. Based on Brandes et al. (2022), descriptive statistics arrange data in a manner that emphasises the connections between variables within a sample population. Descriptive statistics offer basic information about a data set and potential inter-variable relationships. The data analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 26.

To achieve more meaningful results, this study combined descriptive statistics with qualitative methods (Brandes et al., 2022; Kaur & Phutela, 2018). The researcher obtained qualitative information by conducting interviews. A voice recorder was used to record interviews. Subsequently, the researcher transcribed the audio communications verbatim. Then, the researcher analysed the transcribed data to identify themes, patterns and insights related to the research questions. Voice-recorded data allowed the researcher to capture the nuances of spoken language and non-verbal communication, providing rich context for qualitative analysis. This method proved invaluable in gaining a more profound understanding of the information and drawing meaningful conclusions. Additionally, it assisted in systematically organising the information, effectively communicating the findings and supporting arguments with concrete evidence, thereby establishing credibility and rigour (Kleinhesksel et al., 2020; Taherdost, 2016).

3.9 Validity and Reliability of Research

The concept of validity in research pertains to the precision and authenticity of scientific discoveries. Essentially, a valid study should provide a clear representation of reality. Additionally, it involves utilising recognised methods or tools to accurately measure what is intended to be measured (Brink, 1993; Noble & Smith, 2015). As this study utilised both quantitative and qualitative research methods, it incorporated multiple techniques to strengthen the reliability and credibility of the results and ensure their validity.

3.9.1 *Validity and reliability in quantitative research*

Quantitative research entails various approaches to ensure accuracy, validity, and consistency. These tactics encompass internal and external validity, objectivity, and reliability (Andrade, 2018; Cresswell, 2014; Li & Frank, 2022; Steccolini, 2022). Validity pertains to how well measurement instruments can comprehensively cover the research subject and gauge what it intends to measure.

The study used questionnaires to assess the teaching and learning experiences related to selected geography topics. To validate the content, an expert from Mzuzu University reviewed the questionnaires and made necessary adjustments, such as removing some questions and rephrasing others to ensure that the questionnaires served their intended purpose. To guarantee the accuracy and reliability of the research findings, the research tools were pre-tested at a single school before being administered to the participants. After the pre-test, feedback was given to an expert at Mzuzu University, who made adjustments by removing and adding items, rephrasing words, and restructuring the questionnaire to make it more user-friendly. These measures ensured that the tools effectively measured the intended variables.

Internal reliability concerns the credibility and coherence of research, particularly in establishing causation between variables (Letherby, 2013; Merriam & Tisdell, 2016; Ratner, 2022). In this study, the researcher employed standardised and validated measurement tools, such as questionnaires and interview guides, to gather data, ensuring the use of triangulation methods. Additionally, a pilot study was conducted to test the reliability of the measurements and appropriate adjustments were made to ensure content validity.

Moreover, the researcher successfully minimised the risk of withdrawal rates by ensuring a substantial number of participants completed the questionnaire. Before filling it in, the researcher emphasised to the participants the significance of completing the questionnaire, thereby strengthening the internal reliability of the research. To ensure external validity, the researcher utilised rigorous research methodologies, conducted thorough analysis, and produced reproducible results that can be generalised to other contexts. Throughout, the researcher sustained objectivity by emphasising factual evidence over personal beliefs or sentiments. The researcher achieved this through relying on measurable and empirical data produced by the research, statistical analyses and standardised research methodologies.

3.9.2 *Trustworthiness in qualitative research*

In both qualitative and quantitative research, validity and reliability are important factors. To attain these, credibility, transferability, dependability and confirmability are significant considerations (Brink, 1993; Cofie et al., 2022; Noble & Smith, 2015).

Credibility is particularly significant in ensuring that the outcomes of qualitative research are believable to the participants involved in the study. The researcher in this study used multiple methods of collecting data to cross-validate the findings.

Transferability pertains to the capacity to apply or extend qualitative research outcomes to different scenarios or environments (Andrew et al. 2009; Brink 1993; Merriam & Tisdell 2016). To promote transferability and enable future readers to make informed decisions, the researcher included thick descriptions or detailed and richly contextualised descriptions of social phenomena in the final report. Thick descriptions invite readers to assess the transferability and relevance of the study's findings to their circumstances.

In qualitative research, dependability is a key consideration as it pertains to the ability to obtain consistent results through multiple observations of the same phenomenon. To ensure that the findings are reliable and replicable, the researcher of this study has meticulously retained all forms of recorded communication and interviews, with transcribed notes serving as a helpful audit trail.

Confirmability pertains to the capacity of outsiders to validate the outcomes. It deals with the degree of certainty that the research discoveries are rooted in the accounts and recollections of the participants rather than being influenced by the researchers' predispositions (Noble & Smith 2015; William & Morrow 2009). The audit trail for this study has meticulously documented each stage of the data analysis process.

3.10 Ethical Considerations

It is widely recognised among scholars that research is intricately tied to morality and ethics, especially when human subjects are involved. As emphasised by Ramrathan et al. (2017), it is crucial to uphold the welfare and rights of participants at all times. Ethical research, as articulated by Cohen (2018) and Ramrathan et al. (2017), is founded on moral principles that dictate the researchers' conduct. It includes ensuring the credibility of their research, substantiating findings with evidence, providing rationale for arguments and adhering to

established research protocols. In research methodologies, mixed methods, as defined by Zawacki-Richter (2020), combine quantitative and qualitative approaches.

To uphold ethical standards, the researcher sought approval from multiple entities, including the Mzuzu University Research Ethical Committee (MZUNIREC), the manager of the Education Division in the Northern Region (EDM), as well as the head teachers and participants who were involved in this study. It is evident that the researcher adhered to established research protocols.

In this study, the researcher surveyed with the assistance of subject teachers to organise the participation of learners. The participants were given a clear explanation of the purpose, benefits and potential risks involved, and were informed that their participation was voluntary. Sufficient time was provided for participants to respond to the questionnaires, and they were asked to sign an informed consent form to indicate their willingness to participate. To ensure anonymity and confidentiality, participants were assigned numbers (e.g. T1, T2) in place of their names.

3.11 Study Limitations

Obtaining insights on challenging and sensitive topics, particularly from the perspective of educators, can prove to be a daunting task. It is largely because such research often requires teachers to showcase their pedagogical abilities and subject expertise. Some teachers completed the questionnaires with exaggerated responses to conceal their shortcomings in other areas.

3.12 Chapter Summary

This chapter delved into the research design and methodology that underpins the study. The research paradigm and approaches employed are thoroughly examined, analysed, and presented. The study area and population are clearly defined, and the sampling techniques are explained in detail. Finally, the researcher's validity and reliability, as well as the ethical considerations of the study, are carefully discussed. The next chapter will present the study findings, and the discussion of the findings separately.

CHAPTER 4: FINDINGS AND DISCUSSION

4.1 Chapter Overview

This chapter discusses the presentation, statistical analysis and discussion of the findings collected from the questionnaire. Further to this, tables have been used in this presentation for a simple, clear and easy comprehension of the results from the analysis.

4.2 Demographic Characteristics

4.2.1 *Gender of the students*

The demographic characteristics of learners only included whether they were male or female.

Table 4.1: *Gender of learners*

Variable	Frequency	Percent
Female	107	54.0
Male	91	46.0
Total	**198**	**100.0**

The gender demographics of the 198 learners reveal that females account for 54% while males account for 46% (Table 4.1). It suggests a relatively balanced distribution of genders among learners. Interestingly, the number of female learners slightly surpasses that of male learners in this study, which goes against the common belief that most secondary schools in Malawi have more males than females. It could be attributed to the fact that one of the schools included in this study has a girls' boarding programme, leading to a higher number of female learners than male learners.

4.2.2 *Demographic characteristics of teachers*

The demographic characteristics of teachers encompass factors such as their gender, highest level of qualification, teaching experience, and academic background in geography.

4.2.2.1 Gender of teachers

The gender demographic of teachers is summarised in Table 4.2.

Table 4.2: *Gender of teachers*

Variable	Frequency	Percent
Female	5	21.7
Male	18	79.3
Total	**23**	**100.0**

The gender demographics of the 23 teachers indicate that males account for 79.3% while females account for 21.7%. It suggests an imbalanced distribution of genders among teachers, as there are more male teachers than female ones.

4.2.2.2 Level of qualification of teachers

The summary of teachers' qualification is presented in Table 4.3.

Table 4.3: *Level of qualification of teachers*

Variable	Description	Frequency	Percent
Highest level of qualification	Teaching Certificate	1	4.3
	Diploma	2	8.7
	Degree	20	87
Total		**23**	**100**

In Mzuzu city secondary schools, the majority of geography teachers (about 87%) hold a bachelor's degree (Table 4.2).

4.2.2.3 Teaching Experience of teachers

In this section a summary of teaching experience of teachers is presented in Table 4.4.

Table 4.4: *Teaching experiences of teachers*

Variable	Description	Frequency	Percent
Teaching experience	Less than 5 years	6	26.1
	6 to 10 years	8	34.8
	11 to 15 Years	9	39.1
Total		**23**	**100**

It is worth noting that when it comes to teaching experience, about 26.1% of educators have less than 5 years of experience, while 34.8% have between 6 and 10 years, and nearly 40% (39.1%) have 11 to 15 years of experience (Table 4.3). These statistics suggest that a substantial number of teachers have gained valuable expertise in their field, particularly those with 5 to 10 years or 11 to 15 years of experience.

4.2.2.4 Academic Background of the Teachers.

In this section an academic background of teachers is presented in Table 4.5.

Table 4.5: *Academic background of teachers*

Variable	Description	Frequency	Percent
Are you a Geography major?	No	13	56.5
	Yes	10	43.5
Total		**23**	**100**

In terms of academic background, about 43.5% of the teachers in Mzuzu city secondary schools have a degree in Geography, while the remaining 56.5% do not (Table 4.5). This data suggests that a significant proportion of geography instructors in the region may not possess formal training in this subject. As a result, it raises concerns about the quality of education that non-geography majors may be providing to their students.

4.3 Experiences of Teachers in Teaching of Selected Geography Topics in Mzuzu City Secondary Schools

This section presents findings on the experiences of teachers in teaching selected geography topics in Mzuzu City secondary schools. The topics covered include map reading, statistical methods in geography, Continental Drift and Plate Tectonics Theories, riverine and coastline features, and geographic information systems (GIS). The summary of the findings from teachers is presented in Table 4.5.

The scale below was used to interpret the mean scores of the responses of all the respondents in each question.

i. = Strongly disagree (SD)
ii. = Disagree (D)
iii. = Neutral (N)
iv. = Agree (A)
v. = Strongly Agree (SA)

Statement of clarity

For the sake of a good understanding of the findings of this study, Strongly Disagree (SD) and Disagree (D) are represented by **Disagree.** While Agree (A) and Strongly Agree (SA) are represented by **Agree.**

i. Strongly Disagree (**SD**) and Disagree (**D**) = **Disagree**
ii. Agree (**A**) and Strongly Agree (**SA**) = **Agree**

4.3.1 *Summary of responses from teachers in teaching selected topics*

Table 4.6 shows a summary of responses from teachers in teaching selected geography topics.

Table 4.6: *Summary of teaching experiences in selected topics with regard to ease of teaching*

Topic	Disagree	Neutral	Agree	Total
Teaching experiences in map reading	15.9	12.4	71.7	**100**
Teaching experiences in statistical methods in geography	23.5	18.3	58.2	**100**
Teaching experiences in Continental Drift and Plate Tectonics Theories	13.9	16.6	69.5	**100**
Teaching experiences in riverine and coastline features	14.8	20.8	64.4	**100**
Teaching experiences in GIS	36.4	26.2	37.4	**100**

Note: Details for this table appear in appendices 2 – 6.

The study on teaching selected topics in Mzuzu city secondary schools, emphasising map reading, statistical methods in geography, Continental Drift and Plate Tectonics Theory, and riverine and coastline features, yielded noteworthy results. Over 58% (58.2%, 64.4%, 69.5%, and 71.7%) of teachers agree to easily instruct learners in statistical methods in geography, riverine and coastline features, Continental Drift, and map reading, respectively. Less than 38% (37.4%) agree to teach GIS without difficulty, while more than 36% (36.4) disagree.

4.4 Experiences of Learners in Learning of Selected Geography Topics

This section is going to present findings on the experiences of learners in learning selected geography topics in Mzuzu City secondary schools. The topics covered include map reading, statistical methods in geography, continental drift and plate tectonics theories, riverine and coastline features, and geographic information systems (GIS). The summary of the findings is presented in Table 4.7.

4.4.1 *Summary of responses from learners in learning selected geography topics*

The table below presents a summary of responses of learners in learning selected geography topics.

Table 4.7: *Summary of learning experiences in selected geography topics with regard to ease of learning*

Topic	Disagree	Neutral	Agree	Total
Learning experiences in Map Reading	22.4	29.6	48.0	**100**
Learning experiences in Statistical Methods in Geography	34.1	18.3	47.6	**100**
Learning experiences in Continental Drift and Plate Tectonics Theories	33.8	20.6	45.6	**100**
Learning experiences in Riverine and Coastline Features	31.9	32.3	35.9	**100**
Teaching experiences in GIS	42.8	34.2	23.0	**100**

Note: Details of this table appear in appendices 7 – 11.

In Table 4.6 above, the findings suggest that the learners' experiences in learning selected geography topics in Mzuzu city secondary schools are not entirely positive. For instance, less than 49% (48.0%, 47.6%, 45.6% and 35.9%) of the students reported having good experiences in learning map reading, statistical methods in geography, Continental Drift and Plate Tectonics, and coastline and riverine features, respectively. Conversely, over 31% (31.9%, 32.8%, 34.1%, and 42.8%) expressed disagreement regarding riverine and coastline features, continental drift and plate tectonics, statistical methods in geography, and GIS. Additionally, almost 30% (29.6%) of learners remained neutral in their stance on map reading, while over 32% (32.3% and 34.2%) took a neutral stance on riverine and coastline features and GIS.

4.6 Qualitative research findings

The qualitative research findings are based on the following question posed to the teachers.

Based on the teaching experiences analysis, most of you teachers are comfortable in teaching the selected topics. However, it seems the learning experiences of the learners are contrary. What could be the cause of this? (Map reading, statistical methods in geography, continental drift and plate tectonics theories, riverine and coastline features, and geographic information systems).

The inquiry aimed to identify the root cause of the disparities in the teaching and learning experiences concerning specific geography topics. We ask that only geography teachers involved in this survey respond to this question. We kindly requested that the teachers share their thoughts on the learners' and teachers' perspectives. Please see below for the comments provided by the teachers regarding each perspective. It is also important to note that qualitative research findings are presented verbatim in the manner teachers responded.

4.6.1 *Teachers' views*

The comments made by teachers to their side were as follows:

4.6.1.1 Regarding map reading

It was found that some teachers find it challenging to teach map reading. Some of them are not well-versed in the different aspects of map reading, while others are simply lazy.

Teacher 2 commented as follows:

> "*…many teachers were indicating it is ok to teach map reading but there are some who find it hard. They are not well conversant with map reading work like to tell the truth. So that could be the problem."*

As if this is not enough, the same teacher had this to add;

> *"...sometimes teachers, we are lazy, we can't do with such learners in map reading"*

When it was followed up on the same, teacher 4 commented the following;

> *"...some teachers fail because I have been in other schools, you find a teacher teaching in form 4, but will call you so that you help with issues like gradient,*

implying that we do have a good number of teachers who fail in other components of map reading…"

Common voice: not every teacher is competent enough to teach map reading

4.6.1.2 Relating to statistical methods in geography

When it comes to teaching statistical methods in geography, it was observed that a majority of teachers lacked proficiency in mathematical concepts. As a result, they often chose to skip this topic altogether.

Teacher 2 commented as follows:

"…most of us are not conversant with mathematical issues, because it is only a few teachers who handle that one well. Most teachers decide to leave it like that."

Teacher 3 had commented on the following:

"…its like you teacher do not understand it, how can you convey? It is also a challenge. It is also a big one, and some of us just skip it"

Common voice: not many teachers are conversant with statistical methods in geography

4.6.1.3 Concerning continental drift and plate tectonics

It was observed Continental Drift and Plate Tectonic Theories are often considered abstract and challenging. To facilitate a better understanding, interactive teaching methods such as videos and field visits were necessary.

Teacher 2 commented as follows:

"…these topics are abstract. But there must be the use of maybe the videos or if it is possible field trips..."

Teacher 3 made the following comment:

"…this is an abstract topic to the learners, but the issues of convergence and divergence, they are fine…"

Common voice: The topic is abstract, therefore, it is difficult to teach

4.6.1.4 Regarding riverine and coastline features

The topic of riverine and coastal features was challenging and time-consuming in the syllabus. It requires real-life examples to help learners understand the concepts.

Teachers 4 said as follow:

> *"...like the topic of riverine and coastline features, teaching learners, is difficult. And you tend to look at content being presented in the syllabus against time. Maybe if you can be out there trying to show the learners the real things, maybe that one can make quicker delivery of concepts. But without that there is nothing"*

Teacher 4 had this to say when a follow-up question was made-

Imagine in terms of resources, if teachers had all the resources, like other topics learners require seeing, visits, is it possible in the CDSS?

> *"...I don't think schools like CDSS can support more than one educational visit a term. ...thanks if the administration can accept because resources are limited."*

Additionally, it has been observed that there is a lack of attention from the teachers. Despite having access to computers and television screens, which could be utilised to showcase videos and virtual tours, the teachers do not make use of these resources. Instead, they tend to focus on completing the syllabus.

Teacher 2 made the following comment:

> *"...the reason is lack of care. There is carelessness amongst most of us. Like here we have these gadgets, we can show them. We do not care, and we just we are only concentrating on finishing the work without looking into the quality that learners have understood or not."*

Common voice: The topic needs field visits, but there are no resources.

4.6.1.5 Relating to GIS

The topic of GIS was found to be resource-demanding. It is ICT-based. Therefore, it needs resources like computers which most schools do not have.

Teacher 2 commented on the following:

> *"...that topic is a big problem. That one needs gadgets, materials, properties, so most of the schools do not have GIS materials"*

Teacher 3 had the following to comment:

> *"...the problem with the topic of GIS is materials. We can use locally available materials, but it is not true with the topic of GIS..."*

Teacher 1 made the following comment:

> *"...teachers are competent, but maybe the problem is creativity to cater for both passive and active learners. So, to carry the two types of learners at once, what type of methodologies can be used? With the case of GIS, it becomes a problem."*

Common voice: GIS is difficult to teach because of unavailability of resources or GIS materials.

Summary: The teachers that took part in the interviews found the topics challenging due to a lack of knowledge, skills, resources, and abstract content.

4.6.2 *Comments from the teachers about the learners*

The comments made by teachers on the side of learners included the following:

4.6.2.1 Concerning map reading

Regarding the topic of map reading, it was found that most learners lack seriousness. Learners are failing to practice and search for information in the library.

Teacher 1 had this to comment:

> *"...our learners lack seriousness. Map reading is a practical topic. If they are failing, they are supposed to go to the library to read, get a map and its tools and ask teachers for help..."*

On the same, Teacher 2 had this to say:

> *"...on the part of learners, there is lack of practice. Most learners lack practice. So, I feel they are faring it hard in terms of map reading..."*

Common voice: learners lack seriousness, therefore do not get enough practices in map reading.

4.6.2.2 Regarding statistical methods in geography

Concerning the matter of statistical methods in geography, a prevailing issue among most learners is their apprehension towards mathematics. This fear is further compounded by inadequate teaching methods employed by educators. Furthermore, a lack of strong mathematical foundations among learners has been identified as another contributing factor to their struggles in this area.

Teacher 2 made the following comment:

> *"...you know already that most learners have this fear when it comes to mathematics, learners have got problems and if the teacher is not able to teach, then learners, that one is also a challenge..."*

Teacher 3 had this to say:

> *"...the problem is understanding, background; it is like ... I have experience with the boarding schools. Learners are sharp... but here it is totally different"*

Common voice: statistics is difficult for learners because of the inclusion of mathematical calculations and a poor mathematical background.

4.6.2.3 Relating to continental drift and plate tectonics theories

Regarding this subject matter, it has been determined that the topic may appear abstract to learners. By utilising videos, educators can help facilitate a better understanding of concepts, allowing learners to construct their knowledge. Moreover, some learners may hold the belief that certain concepts, such as drifting and plates, do not exist.

Teacher 2 made the following comment:

> *"...these topics are abstract. But there must be a need of maybe videos or if it is possible field trips"*

Teacher 3 had this to add:

"…this topic is abstract to learners but some learners say these things do not exist or are not there. And they take it like that and end up failing during examinations"

Common voice: The topic is abstract for the learners

4.6.2.4 Concerning riverine and coastline features

Concerning this topic, it was found that the topic is difficult, it has difficult words and that most schools are disassociated with big rivers and the lake.

Teacher 1 made the following comment:

> *"…when you talk of the riverine and coastline features; it is the issue of language. Most of our learners, when they find something difficult … they cannot research… all they need is spoon feeding"*

On the same Teacher 3 made this comment:

> *"…topics like riverine and coastline features are abstract topics, … at least there is a need that those learners should at least see things…"*

Common voice: riverine and coastline features are difficult

4.6.2.5 Regarding GIS

Concerning the topic of GIS, it was found that the topic is difficult, and that it does not have enough resources for the practice of learners so that they are able to construct their own learning. Teacher had this to comment:

> *"…the other time I was involved in continuous professional development seminars (CPDs) in the NED where we were dealing with difficult topics. Like one of them was GIS. So how can a child understand it."*

Teacher 1 commented as follows:

> *"…the topic is difficult generally. Just explaining without learners seeing the things, it is difficult to understand. Sometimes learners just listen as if they listen to the radio; better a television has some pictures. Even if you paste a picture in the class, still learners will question. What things are they? How does*

it function? Most of our learners require that they should have real life experience with the things they are learning. So, with GIS it is a problem. In addition, there are some words difficult for the learners to understand"

Teacher 2 had this to add:

"…GIS ee! That is a very big problem. That one needs gadgets, materials …so most of the schools do not have GIS materials"

Common voice: GIS is difficult and it lacks resources

Summary: The learners struggle with concerned topics due to a lack of seriousness, weak mathematical background, and limited resources.

4.7 Challenges in the Teaching and Learning of Selected Geography Topics

The researcher gathered data on the difficulties experienced by both educators and students through a structured questionnaire. This section highlights the obstacles encountered during the teaching and learning process of the chosen subjects. The researcher summarized the results in tables for the readers' convenience. The challenges faced by teachers are presented first, followed by those faced by learners.

4.7.1 *Challenges that teachers face in the teaching of selected geography topics*

Below are the challenges faced by geography teachers for each of the selected topics, summarised in tables with their frequencies and percentages.

Table 4.8: *Summary of significant challenges faced in teaching selected topics*

Topic	Type of Challenge	F	%
Map Reading	Inadequate resources	10	43.6
Statistical Methods in Geography	Challenging math problems	7	30.4
Continental Drift and Plate Tectonics Theory	Abstract content / less reality	12	52.2
	Inadequate resources	6	26.1
Riverine and Coastline Features	Inadequate resources	8	34.9
Geographic Information Systems	Inadequate resources	10	43.5

Note: Details for this table appear in appendices 12 – 16.

Regarding the challenges faced in teaching selected topics, over 43% (43.6%) of respondents indicated adequate resources in map reading. In comparison, over 30% (30.4%) indicated challenging mathematical calculations, and over 26% (26.1%) pointed to less time allocation in statistical methods. Slightly above 52% (52.2%) of respondents indicated abstract content in Continental Drift and Plate Tectonics Theory, while over 26% (26.1%) mentioned inadequate resources. Close to 35% (34.9, and over 43% (43.5%) of teachers indicated insufficient resources in riverine and coastline, and GIS respectively.

4.7.2 *Challenges learners face in learning of selected topics*

Below are the significant challenges faced by geography learners for each of the selected topics, summarized in a table with their frequencies and percentages.

Table 4.9: *summary of significant challenges faced in learning selected topics*

Topic	**Type of Challenge**	**F**	**%**
Map Reading	Mathematical calculations	153	77.3
Statistical Methods in Geography	Mathematical calculations	110	56.6
Continental Drift and Plate Tectonics Theory	Abstract content	119	60.1
Riverine and Coastline Features	Abstract content	62	52.1
	Lack of field visits	29	14.6
Geographic Information System	Did not learn	77	38.9
	Difficult/complex topic	32	16.2

Note: Details for this table appear in appendices 17 – 21.

With reference to the Table above an overwhelming 77.3% of learners were challenged with mathematical calculations. Similarly, over 55% (55.6%) of learners were challenged with mathematical calculations in statistical methods in geography. Close to 40% (60.1%) of learners mentioned abstract content in continental drift and plate tectonics. Regarding riverine and coastline features, over 52% (52.1%) mentioned abstract content, and less than 15% (14.6%) stated a lack of field visits. On the topic of GIS, nearly 40% (38.9%) pointed out that they did not learn, while about 16.2% mentioned inadequate resources and abstract content respectively.

4.7.3 *Suggested solutions for the challenges in the teaching and learning of the selected geography topics in Mzuzu City secondary schools*

When teaching and learning the selected geography topics, the tables list potential solutions to address the challenges. While each solution is significant, a few stand out as particularly effective. These solutions were gathered through a structured questionnaire exclusively administered to teachers. Table 4.25 summarises the solutions for each topic, including their respective percentiles and frequencies.

Table 4.10: *Summary of significant suggested solutions for challenges faced in selected topics*

Topic	**Suggested solution**	**F**	**%**
Map reading	Adequate resource	8	34.8
Continental Drift Theory	Adequate resources	16	69.6
Riverine and coastline features	Adequate resources	6	26.3
Riverine and coastline features	Field visitation	10	43.5
Statistical Methods	Motivation of learners	5	21.8
Geographic Information Systems	INSETs/CPDs for teachers	10	43.5
Statistical methods	Extra lessons	5	21.8

Note: Details for this table appear in appendices 22 – 26.

Concerning solutions to challenges in selected geography topics, over 26% (26.3%, 34.8%, and 69.6%) mentioned adequate resources for riverine features, map reading, and Continental Drift Theory, respectively. More than 21% (21.8%) stated the motivation of learners in statistical methods. Nearly 44% (43.5%) indicated field visitations and in-service training riverine and coastline, and GIS, respectively. Close to 22% (22.8%) pointed out extra lessons in statistical methods in geography.

4.8 Discussion of the Findings

4.8.1 *Experiences of teaching selected geography topics*

This section discusses the experiences of teachers as they teach map reading, statistical methods in geography, continental drift and plate tectonics theory, riverine and coastline features, and geographic information systems (GIS).

4.8.1.1 Regarding the topic of map reading

Based on quantitative data, teachers have reported positive experiences in teaching various components of the topic, with an average score of over 71% (71.7%) (Table 4.6). However, qualitative research findings suggest that not all teachers are adequately equipped to teach map reading. If the quantitative research findings are accurate, they seem to fall short of explaining the reasons for the failure of geography learners in both terminal and national examinations (see appendix 1). It is also possible that some teachers merely completed the questionnaire hastily to get it out of the way due to time constraints.

It can also be posited that maybe some teachers fail to teach map reading because they find it difficult. The difficulty might be due to teachers' poor mathematical backgrounds, as some teachers are caretakers due to a shortage of geography teachers (see section 4.3.1; 4.6.1). Similar issues have been noted in Nigerian secondary schools, where geography teachers have been reported to struggle with the mathematical components of different topics (Amosun, 2016). Stated differently, such teachers seem to fail to provide experiences for learners to learn from. This idea seems to conflict with the theoretical framework that forms the basis of this study, particularly when considering instances where teachers may display shortcomings in some map reading components. The Theory of Experience emphasises the vital role of teachers in creating tangible experiences for learning that can create passion in the learners to like the topic, transforming them for the better.

Alternatively, it could be due to lack of commitment to excellence of teaching. It appears committed teachers can provide tangible learning experiences to their learners that can motivate them, shaping their inclination toward the topic, a notion that aligns well with the Theory of Experience.

4.8.1.2 The topic of statistical methods in geography

Grounded on quantitative data in Table 4.6, teaching experiences in statistical methods in geography are generally positive. However, qualitative research has revealed that only a few teachers feel confident teaching this topic, with many opting not to cover it at all. This may also help explain the poor performance of learners in national examinations (MSCE) based on the anecdotal evidence (see Appendix 1). These findings also suggest that a fear of mathematical calculations in teachers may be contributing to teachers' reluctance to teach statistical methods in geography. It is also possible that these teachers may not have received adequate training in this subject, or may be unqualified. It appears to contradict the Theory of Experience, which emphasizes the positive passion of teachers in creating positive learning experiences for students.

The experience is also transformational. Teachers' fear of teaching statistical methods in geography stems from negative experiences they encountered in the past. It suggests that the current state of experiences created by the teachers is likely to affect the learners. It implies that learners are also expected to have negative experiences, which may affect their future views on something to do with statistics or numbers. Without proper guidance, learners may find it challenging to develop their statistical reasoning and apply statistical knowledge in real-world situations after leaving school (Batanero et al., 2011). While this may seem contradictory to the theoretical framework that has influenced this study, it is significant to recognize that the experiences teachers create play a crucial role in fostering positive learning experiences for their students. However, if teachers avoid teaching this particular topic, it suggests that students may struggle to develop their understanding of statistics. A comparable situation can be observed in Namibia and South Africa, where many teachers in geography lack proficiency in basic mathematical calculations (Larangeira & Vander Merwe, 2016; Naxweka & Wilmot, 2019).

It seems those who teach statistical methods in geography lack the necessary pedagogical content knowledge. They may be instructing statistics in the same manner as mathematics, or using incorrect methods altogether. Unfortunately, this approach can hinder the development of statistical thinking and processes in learners. It follows that teachers who lack pedagogical content knowledge may struggle to bring in appropriate experiences for their students.

4.8.1.3 Concerning the topic of Continental Drift and Plate Tectonics Theories

Considering the theory of Continental Drift and Plate Tectonics, the quantitative findings indicate that teachers exhibit strong teaching abilities. It is supported by the notably high average

score of nearly 70% (69.5%) (Table 4.6). These results are consistent with qualitative research that suggests teachers feel confident in their ability to teach concepts related to this topic.

It seems that most educators are generally optimistic about their ability to effectively teach the concepts of Continental Drift and Plate Tectonics Theories. This confidence likely stems from their extensive teaching experience, as most respondents hold certifications and have been teaching for over five years. Their accumulated experience and qualifications may enable them to discern which experiences are most beneficial for their students' learning. This perspective appears to align with the Theory of Experience which underpins this study which states that teachers who can offer relevant experiences to their students play a crucial role in bridging the knowledge gap, especially when students struggle to grasp complex concepts. Relevant experiences stimulate interest and drive the learners to learn more and this in return motivate teachers to teach better.

The responses are rather strange because even though there are knowledgeable teachers, students seem to struggle as evidenced by their poor performance at MSCE. It could be suggested that perhaps the issue lies in the student's ability to comprehend the lessons provided by their teachers. The Theory of Experience proposes that teachers should develop passion for teaching geography and this passion will drive the learners to like the subject and therefore this will lead to better performance

4.8.1.4 Relating to riverine and coastline features

Based on the results of quantitative data, participants reported positive teaching experiences related to riverine and coastline features. The average scores across all areas stand at 64.4% (refer to Table 4.6). This favourable perspective may indicate that most participants find teaching these subjects relatively straightforward. This perception could stem from the participants' familiarity with these features as adults, given their firsthand experiences and readings. Furthermore, many participants were geography majors, likely possessing the expertise to create effective learning opportunities for their students, potentially contributing to their confidence in teaching these features.

Perhaps another contributing factor is the convenience of accessing information in our modern era. With the evolution of technology and the prevalence of smartphones and affordable internet, educators may swiftly download informative materials such as videos and virtual tours to provide experiences that can facilitate independent learning among students. These stimulate

passion in the learners as there is an interplay of learners and the learning environment. It appears this notion is in line with the Theory of Experience. The Theory of Experience encourages the shift from teacher-centred approaches to learner-centred ones. In learner-centred approaches, learners can learn from the experiences of their peers, local environment, and virtual environments. Such experiences can speed up their understanding of concepts, leading to positive change and personal growth of learners (transformation). Likewise, this concept aligns with Whiteley et al.'s (2014) recognition of the effectiveness of diverse instructional approaches in conveying tangible geographical features such as riverine and coastal formations.

In contrast to the preceding notion, the qualitative findings present a divergent perspective. The results of qualitative research suggest that the subject matter is intricate and theoretical, possibly due to complex terminologies that can be confounding to educators. Furthermore, it seems a significant number of geography teachers are not adequately qualified and are merely serving as temporary substitutes due to a shortage of qualified geography teachers. This idea goes against the theory guiding the study. The fact that some geography teachers are under qualified suggests that they might not have the drive or force to create the right experiences for learners to learn from. Such teachers are likely to misguide their learners such that the learners may fail to gain motivation to acquire meaningful learning experiences.

4.8.1.5 Concerning GIS

The quantitative data in GIS instruction highlights a moderate level of teaching proficiency. Scores across specific areas within GIS are averaged to less than 40% (37.4%). This figure suggests that many educators struggle in this area of geography. Conversely, disagree scores were 36.4%. Such a trend confirms that most teachers face a challenge in this field of geography (Table 4.6). This trend may imply that most respondents face challenges when utilizing ICT technologies, including computer use and GIS software manipulation.

Despite having the required equipment and experienced teachers, many educators appear to lack the technological skills needed to skilfully incorporate computers into GIS education. This shortfall hampers teachers' ability to create captivating learning opportunities for their students, potentially impacting student performance in national examinations. Furthermore, despite technological advancements in the country, Ghafar et al. (2023) have noted that some Malaysian teachers encounter difficulties connecting an LCD to a computer. This highlights a failure on the

part of teachers to instil the necessary motivation to cultivate students' interest in the subject, which contradicts the Theory of Experience underpinning this study.

The quantitative data findings align with the qualitative findings of the GIS study; it appears that most teachers are facing challenges in effectively teaching this topic. The respondents seem to be encountering difficulties in improvising because the subject demands using computer technology, which is not readily available in most schools. It looks like the MoE may have prioritised the implementation of GIS education over the provision of adequate resources and training of teachers. Furthermore, even in cases where computer laboratories are present, the equipment is often outdated and non-functional. Despite attending CPDs on GIS and other complex topics, it seems that the discussed issues are not interesting.

The idea goes against the Theory of Experience because a shortage of resources limits the ability to create meaningful learning experiences. Additionally, inexperienced teachers, particularly in ICT, may struggle to offer effective learning experiences in GIS, which can hinder transformational effects on students and teachers. The scarcity of GIS resources in secondary schools in Mzuzu city impedes students' access to relevant GIS experiences, which contradicts the principles of Theory of Experience.

4.8.2 *Experiences of learning selected geography topics*

This section discusses the experiences of learners as they learn map reading, statistical methods in geography, continental drift and plate tectonics theory, riverine and coastline features, and geographic information systems (GIS).

4.8.2.1 Regarding map reading

The findings from the study suggest that map reading presents a challenge for learners in secondary schools in Mzuzu City. Less than 50% (48.0%) of the learners find map reading easy, while almost 30% (29.6%) remain neutral on the matter (Table 4.7). It indicates that the geography classes are comprised of students with varying abilities, with some grasping concepts more easily than others. Moreover, it seems that many learners struggle to find sufficient time to practice map reading, potentially due to the demands of studying for the MSCE certificate. In addition, factors such as laziness and fear of the mathematical aspects of map reading may also contribute to the challenges students face. The qualitative research findings also suggest a lack of seriousness and motivation among many learners when practicing map reading.

Learners may face difficulties with map reading practice due to insufficient resources like map sheets and related tools, which could negatively impact their examination performance. Moreover, some teachers may not be using varying instructional methods to offer experiences to effectively develop their students' spatial and abstract thinking abilities, which are crucial for comprehending maps. The lack of diverse resources and teaching techniques for map-reading may cause learners not to like the topic, and this goes against the principles of Theory of Experience, as an environment devoid of such resources and methods may negatively affect the passions of the learners toward the topic. It seems these experiences are not limited to Mzuzu secondary schools but extend to other parts of the world. For instance, Turkish secondary school students struggle with map reading due to lack of seriousness, inadequate knowledge of legends, and weak mathematical abilities (Gökçea Nazlı, 2015). Similarly, Amosun (2016) notes that many geography students in Nigerian secondary schools avoid map reading due to the associated mathematical calculations. In South African schools, Atiso Ahiaku et al. (2019) found a widespread inability among students to perform basic calculations involving gradient and vertical exaggerations.

4.8.2.2 Statistical methods in geography

Quantitative data indicate that less than 48% (47.6%) of learners agree that statistical methods in geography are a simple topic. Conversely, more than 34% (34.1%) disagree that the topic is simple (Table 4.7). These findings align very well with qualitative study findings that suggest that statistics is difficult for learners because of the inclusion of mathematical calculations. It appears that both quantitative and qualitative findings seem to justify why learners fail in geography at MSCE examinations.

It seems that the fear of mathematical calculations involved in statistical methods is a significant factor contributing to learners' difficulties in statistics. This fear may stem from inadequate mathematical preparation or insufficient guidance from teachers who themselves may share the same apprehension (section 4.8.1.2.). Furthermore, students might not have sufficient learning resources to improve their statistical understanding.

It appears that this scenario challenges the Theory of Experience, which underscores the idea that involvement arises as passion, formed by the interaction between the individual and the environment. If learners are surrounded by fearful teachers and lack resources, this will probably lead to negative emotions, potentially affecting their performance in the MSCE. It initially

indicates a wrong transformation. Furthermore, this could hinder their ability to apply statistics in the future.

4.8.2.3 Relating to Continental and Plate tectonics Theories

According to the quantitative findings on Continental Drift and Plate Tectonics, it was discovered that only 45.6% of learners consider these theories to be simple. On the other hand, a significant 33.8% of learners disagree, suggesting that they struggle to grasp these fundamental geological concepts (Table 4.7). This indicates that not all learners in secondary schools in Mzuzu City have a strong understanding of these topics. Additionally, qualitative research suggests that the abstract nature of the topic makes it difficult for learners to comprehend, indicating that some respondents may have overstated their understanding when completing the questionnaires.

It looks like the topic is abstract and difficult for learners to comprehend because many of the concepts are not tangible, as maybe they took place millions of years ago, or they are very slow to take place and even taking place within the crust where it is likely that no one has lived to prove. It also appears that there is a conflict between the theories especially the Continental Drift Theory and the creation story of the Bible. From a young age, Christian families and churches impart the creation story to their children. It is not until the age of 15, typically in form 3, that they encounter scientific explanations such as continental drift and plate tectonics. This transition seems challenging as many learners doubt to depart from their faith and embrace what may seem like a human invention. Because of this, learners may take the topics for granted and fail during examinations.

Further, the topic seems to appeal to the understanding of scientific concepts to explain the movements of continents and plates and the formation of ridges and trenches. Additionally, because the topic is abstract and scientific, it seems teachers fail to bring in convincing experiences in their classrooms for their learners to learn from. Based on the Theory of Experience guiding this study, experience is a driving force that brings change. As a result, teachers are encouraged to incorporate experiences that can inspire learners and influence their interest in the subject or topic.

Edwin (2022) emphasises the difficulties that learners in Quezon City, Philippines, encounter in understanding the concepts of continental drift and plate tectonics, in contrast to other research studies. It is attributed to the abstract nature of terms and concepts such as plate movements and

mid-oceanic ridge formation, which are not commonly encountered elsewhere. The qualitative research conducted in this study supports this idea, revealing that the theories of continental drift and plate tectonics are often perceived as challenging.

4.8.2.4 Concerning riverine and coastline features

The learning experiences in this topic were rated below the moderate level, with only 35.9% agreeing that the themes are simple, 31.9% disagreeing that the topic is easy, and 32.2% taking a neutral stance (Table 4.7). These findings align with the qualitative findings of this study, indicating that the riverine and coastline features are challenging topics. Both the quantitative and qualitative findings corroborate poor results in national examinations (see Appendix 1).

The findings suggest that learners may struggle with the topic due to several technical terms, making the subject difficult, boring, and confusing to remember, leading to negative experiences. Additionally, the absence of nearby big rivers and a lake in Mzuzu city could deprive learners of tangible reference points for better experiences. Furthermore, teachers may not be fully leveraging creative and resourceful methods, which are crucial for engaging learners and aligning with the Theory of Experience guiding this study. By using innovative and resourceful methods, teachers can capture learners' attention, making the learning process enjoyable and effective. Ultimately, these experiences could lead to a positive change in learners and improved results at MSCE.

Rendering to the findings of Opoku et al. (2021) in Ghana, the intricate processes that shape the physical features of coastlines and river systems are abstract and not readily observable in the immediate environment. As a result, learners struggle to fully grasp these concepts and effectively build their knowledge in these areas.

4.8.2.5 Regarding GIS

Based on the quantitative data gathered from the GIS survey, it appears that over 42% (42.8%) disagree that the topic of GIS is simple, and more than 34% (34.2%) take a neutral stand (Table 4.7). Qualitative findings confirm that GIS is difficult, and in addition to that it lacks resources.

It is disheartening to consider the current situation. Based on statistical data, it appears that in many secondary schools within Mzuzu City, teachers tend to skip over this topic. It suggests that learners are left to study independently solely to pass exams, resulting in only a few (23%) truly understanding the underlying concepts. Furthermore, it seems that many schools that do teach

GIS fail to provide learners with access to essential resources such as LCDs and computers which are crucial in providing experiences in GIS. It appears that other schools lack necessary GIS equipment, including computer labs, software, and other related resources.

It appears that most geography teachers lack proficiency in ICT technology, which may impede their ability to effectively teach computer-related subjects such as Geographic Information Systems (GIS). Consequently, this could be one of the contributing factors to the low passing rate in geography at MSCE examinations. This deviation from the Theory of Experience suggests that even when teachers cover GIS topics, they often resort to traditional teaching methods that do not offer adequate learning experiences due to the lack of necessary resources. Appropriate resources can engage students, making learning both enjoyable and effective. They can also ignite a positive enthusiasm which may result in improved performance and increased interest in the subject, consequently leading to better academic outcomes. Conversely, inadequate resources in teaching and learning may lead to insufficient experiences, potentially hindering positive growth in students.

Based on the qualitative research conducted, the study's findings support the ideas mentioned before. The research indicates that learners struggle with this topic due to its complexity and heavy reliance on technology such as computers and GIS software. Unfortunately, such resources are not readily available in most secondary schools in Mzuzu city. As a result, teachers may shift the blame onto the learners rather than taking responsibility. However, it would be more appropriate to allocate much of the blame to the teachers and the MoE for not providing the necessary GIS resources to schools promptly, especially considering its inclusion in the syllabus.

According to Dermis (2014), even in countries like the United States of America, Canada, and Australia, teachers often experience difficulties teaching GIS due to a lack of ICT skills and inadequate support from ICT staff. It is surprising, given the advanced technological infrastructure in these areas. It is possible that some teachers are not interested in keeping up with the latest technological advances. Similarly, Ghafar et al. (2023) found that geography teachers in Malaysia struggle to connect an LCD to their computers, despite the advanced technology available in their country.

4.8.3 *The challenges teachers and learners face in teaching and learning selected geography topics in Mzuzu City secondary schools*

The study aimed to identify the obstacles faced in teaching and learning specific geography topics. To gather insights, a meticulously crafted questionnaire was administered, which contained open-ended questions to encourage the respondents to express their views freely and comprehensively.

4.8.3.1. Challenges teachers face in teaching selected geography topics

The significant challenges teachers face include a lack of resources, abstractness of the topics or less reality of the issues, challenging mathematical problems, and less time allocation. About 43.6% mentioned inadequate resources in map reading, close to 35% (34.9%) stated a challenge of resources in riverine and coastline features, over 26% (26.1%) indicated lack of resources in Continental Drift and Plate Tectonics Theory, and nearly 45% (43.5%) stated lack of resources in GIS. Regarding the abstractness of the topics, over 52% (52.2%) mentioned Continental Drift and Plate Tectonics (refer to Table 4.8). Lastly, about 26.1% indicated less time allocation in statistical methods in geography.

(a) *Challenges in teaching and learning resources*

It was noted that many secondary school teachers in Mzuzu city are facing challenges with map reading due to a shortage of teaching and learning materials, including maps and mathematical instruments necessary for working with maps (Table 4.8). Moreover, it appears that schools may not have enough map sheets due to some teachers failing to retain an adequate supply after national exams. It seems that geography maps provided for each national examination, based on the candidate's location, are not being returned to the examination board, potentially leading to a sufficient supply of map sheets for future classes. As highlighted by Amosun (2016), many secondary schools in Nigeria lack dedicated geography facilities for resource storage. Similarly, it seems that most schools in Mzuzu do not have dedicated geography rooms, labs, or departmental stores for map storage. The limited availability of resources for map reading appears to hinder learners from fully engaging with the materials, ultimately impeding their ability to grasp key concepts during these sessions.

Based on the data collected, it appears that the primary educational resource for learning about Continental Drift and Plate Tectonics is a textbook. It seems that the school may lack resources

such as books, printed charts, pictures, and videos, possibly due to insufficient funding from the Ministry of Education (MoE). Alternatively, while funding for school resources may be available, it is possible that geography resources are not a priority. Additionally, many teachers may struggle to adapt and provide the necessary learning experiences for students to understand these concepts effectively.

It appears that teachers could benefit from a wider array of teaching resources to cover riverine and coastline features, as the current methods seem to be confined to textbooks and charts. However, given the nature of the topic, a more interactive approach is necessary, allowing both teachers and students to engage with the surrounding environment. This approach would offer positive experiences for both learners and educators, leading to a deeper understanding of the features shaped by rivers and lakes. In Mzuzu, there does not seem to be a sizable river that can be utilized to provide valuable experiences for students to grasp these concepts. Furthermore, it appears that most schools in the city cannot afford field visits to the lake or any other large river outside the city due to inadequate funding.

It seems that some schools teaching GIS may face challenges in adequately equipping their teachers to effectively teach the subject. This could be due to a lack of resources, as teaching and learning rely solely on the textbooks. Additionally, it seems that the technologically demanding nature of the subject might lead some geography teachers to skip over it, especially if they are not well-versed in using computers. The insufficient resources and lack of technological know-how among teachers contradict the Theory of Experience that this study is based on. In a broader context, the introduction of GIS instruction in Malawi seems to have outpaced the proper training of teachers and the acquisition of necessary equipment for the schools. This has the potential to hurt the quality of education in the country and impede learners' performance.

The state of GIS in Malawi is comparable to that of other developing African nations. Sumari (2017) agrees by stating that Tanzania has GIS challenges due to a dearth of material and human resources despite the growing ICT and GIS proficiency at universities and beyond. Likewise, Mzuza and Van der Westhuizen (2020) observed similar challenges in South Africa, Botswana, and Lesotho, where GIS education is impeded by insufficient resources, infrastructure, and a lack of computers and software. Additionally, some areas suffer from poor or non-existent internet connectivity.

The lack of resources in map reading, Continental Drift Theory, riverine and coastline features, and GIS raises concerns and does not appear to align well with the Theory of Experience guiding this study. There are numerous benefits to using diverse and stimulating teaching methods, particularly in meeting the needs of different learning styles and preferences. Incorporating resources such as maps, pictures, games, hands-on experiences, and real-world examples can bring abstract concepts to life and ignite a passion for the subject among learners. Providing such experiences can catalyse positive change, fostering improved performance in examinations, including the MSCE, and enabling learners to apply their knowledge beyond the classroom.

(b) *Challenging mathematical calculation statistical methods in geography*

The reports on the obstacles teachers encounter may not accurately represent the real thing on the ground. It appears that over 30.4% of teachers experience difficulties with mathematical calculations, which are not only challenging but also require significant time for the preparation and delivery of lessons (Table 4.8). Consequently, many teachers opt not to teach this topic. This notion is also confirmed by qualitative research of this study. Instead, they opt to provide learners with more understandable excuses. It raises concerns about the mathematical competence of geography teachers, as it appears that they may not have acquired enough experiences to confidently develop activities for this topic, which contradicts the theory guiding this study.

One of the challenges in statistics education could be a lack of training for geography teachers in statistics. Their education tends to focus on teaching methods rather than statistical concepts, which may limit their ability to effectively teach statistics consequently, geography teachers, may have less experiences in statistical calculations, which could hinder their ability to create positive learning experiences for their students, not aligning with the Theory of Experience. According to Bernabeu (2012), integrating a thorough understanding of statistical philosophy into teacher training programs, regardless of the subject being taught, could greatly benefit students by enhancing their grasp of statistical thinking and reasoning, and better preparing them to apply statistical concepts in real-world scenarios.

(c) *Abstract content in Continental Drift and Plate Tectonics theories*

The data suggests that the concepts of continental drift and plate tectonics may be challenging for learners to grasp. This presents a dilemma for teachers who may struggle to find effective teaching methods or experiences to convey these concepts. It appears that teachers may not be

making use of diverse teaching strategies, such as integrating visual aids, videos, and virtual tours, to enhance students' understanding of the subject matter. These resources could also help students to better relate to and comprehend the concepts being taught, in line with Theory of Experience. This situation is not unusual, as both Edwin (2022) and Price (2019) have observed that continental drift and plate tectonics can be abstract and difficult to comprehend. Specifically, Edwin (2022) discovered that first-year students at Quezon University struggle with the abstract nature of this topic. Alternatively, it is possible that many learners are encountering this topic for the first time and may lack the foundational knowledge necessary to fully grasp the material.

4.8.3.2 Challenges learners face in learning selected topics

The significant challenges learners face in learning selected topics in geography include; challenging mathematical calculations, abstractness on the topics, lack of field visits, and not orienting some topics. Over 77% (77.3%) of the learners stated mathematical calculations in map reading, and nearly 57% (56.6%) mentioned mathematical calculations in statistical methods in geography. Over 52% (52.1%) indicated abstractness of the topic of Continental Drift and Plate Tectonics Theory, and over 60% (60.1%) pointed out abstractness in riverine and coastline features. Almost 15% (14.6%) mentioned a lack of field visits to riverine and coastline line features, and nearly 40% (38.9%) stated that they did not learn (Table 4.9).

(a) *Difficult mathematical calculations*

Based on quantitative data, it looks like mathematical calculation poses a challenge. Qualitative feedback on map reading and statistical methods in geography suggests that many learners struggle due to a fear of mathematics, perhaps due to a weak foundation in the subject. Although mathematics involved in map reading and statistical methods in geography may not be as complex as other mathematical concepts, learners who struggle with math may still struggle with map calculations. On the other hand, it is possible that some learners simply lack the necessary focus or dedication when it comes to map reading and statistical calculations. Additionally, failure to solve mathematical calculations of learners may reflect on the experiences the teachers provide for their learners to learn from, for example, ineffective learning methods. Such methods lacking in other areas may make the learners not interested in making calculations.

Another example is where some teachers partially teach the topics or even skip the whole topic providing negative experiences, and learners will continue viewing the topics abstract. It might also be that some learners are afraid of mathematical calculation because of the negative

experiences they had before. Because experience can act as a force, negative experiences may force learners to change in an undesired manner. Based on Gökçea Nazlı (2015), Turkish schools often see low levels of readiness and poor mathematical skills among students, which can hinder their success in calculations in geography. Similarly, Amosun (2016) notes that in Nigeria, many learners struggle with map calculations due to a fear of mathematics.

(b) *Abstract content*

Based on the quantitative and qualitative findings of this study, it seems that Continental Drift Theory, riverine and coastline features, and GIS present abstract or challenging concepts for learners to grasp. This could be attributed to the lack of resources on these topics, leading learners to require additional time to understand them. Alternatively, it's possible that these topics demand a strong foundation in scientific knowledge, which some learners may lack, thereby hindering their comprehension. Furthermore, the teaching methods used for abstract topics may not always accommodate the diverse learning styles of individual students, further contributing to their perceived complexity. Additionally, these topics might not always seem relevant to learners' everyday lives; for instance, the connection between the Continental Drift and plate tectonics theory and real-life examples may not be demonstrated, making it challenging to believe in their occurrence.

(c) *Field visits*

Field visits are often referenced in discussions about riverine and coastline features. They are seen as integral to enhancing learning experiences by providing hands-on learning and real-world applications of classroom theories. However, it seems that most schools in Mzuzu City are unable to facilitate field visits in geography, possibly due to insufficient financial support from the management. Additionally, it appears that integrating field visits into the curriculum could be time-consuming, as many teachers prioritise completing the syllabus over ensuring that students receive the full learning experience on the topic.

(d) *Topics not learnt*

The study's quantitative and qualitative data both indicate that the teaching of GIS in most secondary schools in Mzuzu City is lacking. This deficiency seems to have far-reaching implications, as students may struggle to comprehend related concepts and apply them practically, resulting in poor performance in examinations (refer to appendix 1). Time constraints

and the pressure to cover a broad range of geography topics within a limited period appear to be contributing factors, potentially leading to the prioritisation of other topics over GIS. Additionally, the lack of resources such as computers and related software for effective teaching and the technological demands of GIS seem to dissuade teachers from including it in their curriculum. Furthermore, it seems that many teachers do not possess the expertise to effectively teach GIS, potentially influencing students' negative attitudes towards the subject and impacting their performance in the Malawi School Certificate of Education (MSCE) examinations.

4.8.4 *Suggested solutions to the challenges faced in the teaching and learning of selected topics in Mzuzu City secondary schools*

Through a structured questionnaire, five solutions were suggested by the teachers in this study. The resolutions include the following:

4.8.4.1 Need for adequate resources

Based on this study, the main challenge in providing quality geography education in most secondary schools in Mzuzu city is the lack of resources, including map sheets, textbooks, visual aids, audio-visual materials, physical models, and updated ICT equipment, particularly in GIS, map reading, and Continental Drift Theory and Plate Tectonics. The presence of adequate teaching and learning resources in teaching and learning geography align very well with the principles of Theory of Experience, where the merge of diverse teaching and learning resources, as well as the presence of adult instructors, that is, qualified teachers, can foster meaningful experiences for learners. The availability of resources allows learners to experience passion as they interact with the resources. This experience motivates learners, making them eager to gain more proficiency, ultimately leading to positive personal growth. This approach is consistent with the literature that explains the significance of incorporating diverse materials to enrich learners' spatial comprehension and enhance their geography-related competencies (Smith, 2015).

4.8.4.2 CPDs and inserts

According to a recent survey, a significant number (43.5%) recognize the value of Continuing Professional Development (CPD) or instructional supplements, especially when it comes to Geographic Information Systems (GIS) education (Table 4.10). A previous observation revealed that several teachers within the secondary schools in Mzuzu city do not instruct GIS, and often overlook certain map reading components due to their perceived complexity. Therefore,

conducting CPDs or providing instructional supplements is essential to keep teachers informed about GIS and map skills, enabling them to guide their students effectively in acquiring knowledge and skills.

The continuous professional development (CPD) sessions help teachers gain relevant experiences that can positively influence their attitude toward the subjects they teach. In addition, because teachers have liked the subject, it can help them create positive experiences for their learners. Because of this, they can instil passion in their learners so that their interest is inclined toward the subject. This notion fits very well with the purpose of Theory of Experience in this study.

4.8.4.3 Motivation of learners

The importance of motivating learners was highlighted in statistical methods in geography. Findings indicated that many learners experience anxiety when it comes to the mathematical aspects of statistics. Therefore, it is crucial to cultivate their interest in the topic as indicated by about 21.7% of teachers as a suggested resolution (Table 4.10). One effective way of achieving motivation could be through sharing inspiring experiences about statistics and the numerous employment opportunities it offers. As Borah (2021) aptly states, motivation is the key to successful learning, particularly in subjects where learners struggle.

4.8.4.4 Extra lessons

The study has identified statistical methods in geography as a topic that requires additional attention. However, it is concerning to note that the syllabus allocates relatively less time to this topic. It could result in insufficient coverage and incomplete learning for students, particularly in schools where it is taught. To address this, teachers should consider organizing extra lessons outside the regular timetable which was also suggested by an insignificant number (21.7%) of the teachers (Table 4.10). As Amosun (2016) suggests, such initiatives demonstrate a commitment to excellence, and teachers who are committed to excellence are constantly seeking new ideas and approaches to enhance their students' performance.

4.8.4.5 Field visits

The importance of field visits in teaching and learning about riverine and coastline features has been highlighted by almost 50% (47.8%) of the teachers (Table 4.10). However, many teachers in Mzuzu city secondary schools face financial constraints when planning such visits.

Fortunately, advancements in education technology have made it possible to bring the field to the classroom. With resources such as pictures, videos, and virtual tours readily available online, learners can easily gain their experience and grasp abstract concepts. This innovative approach can have a significant impact on the learning environment and methods (Casinader & Kidman, 2018).

An alternative effective method involves the use of evidence-based approaches. Price (2019) recommends the use of evidence-based techniques for teaching and understanding complex topics in his publication. This method can be particularly helpful for abstract topics like riverine features, coastline features, and plate tectonics, which can be challenging for students to grasp. With this approach, teachers and students work together to analyse the evidence of natural phenomena, such as surface processes, and how rivers develop different features along their course. This collaborative approach encourages real-world experience with the environment.

Such experiences fit very well with the Theory of Experience. It is because learners can interact with real-world environment experiences that may stimulate their desire to gain experiences that will never leave them the same.

4.9 Chapter Summary

This chapter presented and discussed the study's findings in the order of the objectives. Below is a summary of the study's findings:

- The teaching experiences for selected topics are commendable, indicating that the teachers possessed ample knowledge about the subject matter and effective teaching methods. However, some other areas proved quite challenging for the teachers both in terms of content and pedagogy, ultimately leading to those topics being left untaught.
- The learning experiences were found to be unsatisfactory as it was found that most learners struggled with most of the components of the selected topics.
- The challenges faced by both teachers and learners include difficult or abstract content, a lack of teaching and learning resources, challenging mathematical calculations, and specifically for teachers, insufficient technological pedagogical content knowledge (TPCK).

The next chapter will highlight the key findings, conclusions, and recommendations to the various key stakeholders.

CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Chapter Overview

In this chapter, there is a comprehensive overview of the study, including a summary of the findings, conclusion, and recommendations for future research. The primary focus of this study was to examine the teaching and learning experiences surrounding specific topics taught in secondary schools located in Mzuzu city.

5.2 Summary of the Study

The findings are organised based on the three main objectives that guided this research.

i. Analyse experiences of teaching selected geography topics in Mzuzu city secondary schools
ii. Examine experiences of learning selected geography topics in Mzuzu city secondary schools
iii. Evaluate challenges faced in teaching and learning selected geography topics in Mzuzu city secondary schools

The study was based on the Theoretical Framework of Experience. This theory emphasises the interactive nature of learning from experience (Hutchinson 2020; Roth & Jornet 2014). In other words, learning involves cognitive and behavioural changes occurring in a physical environment influenced by different individuals. Genuine learning arises from actively engaging with the environment and reflecting on those experiences, leading to the accumulation of positive or negative experiences. The theory was pertinent to this study as it indicates that emotions and affect significantly influence how individuals perceive and react to situations. It also proposes that an individual's emotional responses are closely connected to cognitive processes, shaping the significance of our experiences.

The study employed a mixed methods approach, incorporating quantitative and qualitative methodologies to gather and analyse data. However, the research placed greater emphasis on the quantitative aspect. To achieve this, the study utilized an explanatory sequential design, also known as a two-phase model. It involved collecting quantitative data followed by qualitative data to provide further insights into the quantitative findings.

In Mzuzu city, a purposeful selection of 7 community day secondary schools was made for a study with 221 participants. This group included 198 learners and 23 teachers. Among the learners, 107 (54%) were female and 91 (46%) were male. The teachers' demographic characteristics showed that 20 (87%) held degrees, 2 (8.7%) held diplomas, and 1 (4.3%) had a teaching certificate. In terms of experience, 9 teachers (39.1%) had 11-15 years under their belts, 8 teachers (8) had 6-10 years of experience, and 6 teachers (6) had less than 5 years of experience. In addition, 10 teachers (10) majored in geography while 13 (13) did not.

The gathered quantitative data from questionnaires underwent analysis using the statistical package for social science (SPSS) version IBM SPSS statistic 26 and was then presented in descriptive statistics. These descriptive statistics were in the form of frequency distribution tables and charts. Meanwhile, the qualitative data obtained from the structured questionnaire also underwent SPSS analysis and was presented in frequency distribution charts. Lastly, qualitative data from interviews were collected, transcribed, and analysed using content analysis.

5.3 Summary of findings

5.3.1 *Experiences of teachers in teaching selected geography topics*

(There is a contradiction between quantitative results and qualitative findings)

The study found that the teaching experiences were positive, indicating teachers' knowledge of content and pedagogy are of high quality. On average, based on quantitative findings, over 58% (Table 4.6) of teachers agreed that had no difficulty in teaching learners in statistical methods in geography, riverine and coastline features, Continental Drift, and map reading. Less than 38% (37.4%) agreed to teach GIS without difficulty, while more than 36% disagreed (Table 4.6). Despite this, qualitative research findings of this study proved that teachers faced challenges teaching selected topics, specifically challenging mathematical calculations and abstract content.

5.3.2 *Experiences of learning selected topics*

(Quantitative findings are confirmed by qualitative findings)

The dominant experience of the learners is that the selected topics are difficult. For example, less than 49% of students had positive experiences learning about continental drift and plate tectonics, map reading, statistical methods in geography, and coastline and riverine features (Table 4.7). Conversely, over 31% expressed disagreement with the selected topics (Table 4.7). Qualitative

research findings confirmed the same. This indicates that the selected geography topics were indeed difficult topics for learners.

5.3.3 *Overall finding of the study*

The overall findings of this study from the quantitative and qualitative results is that the topics that are viewed as difficult are indeed difficult based on the experiences of teachers and learners.

5.4 Challenges teachers and learners face in teaching and learning selected geography topics

This study found out the following as challenges in the teaching and learning of the selected topics which are grouped into two as challenges for teachers and challenges for learners.

5.4.1 *Challenges for teachers*

i. There are inadequate teaching and learning resources in almost all the topics selected, including the digital teaching and learning materials in GIS
ii. There are challenging mathematical calculations in map reading and statistical methods in geography
iii. There is abstractness and less reality of the topics as in the topics of Continental and Plate Tectonics Theories

5.4.2 *Challenges for learners*

i. There are challenging calculations in topics like map reading and statistical methods in geography
ii. The topics have difficult or abstract terms like in the case of continental drift and Plate Tectonics Theories
iii. There is a lack of field visits in topics like riverine and coastline features
iv. Learners did not learn other topics like in the case of GIS and statistical methods in geography

5.5 Suggested Solutions

By way of making teaching and learning difficult topics in geography, the study suggests the following ways of addressing the experienced challenges;

i. The Ministry of Education must take decisive action to guarantee that resources are distributed fairly, ensuring that every school has equal access to the learning resources and support they need to thrive.
ii. The school inspectorate needs to fulfil its responsibilities by evaluating the schools, ensuring schools have adequate resources, and confirming that teachers are effectively teaching.
iii. The school inspectorate should conduct CPDs through cluster centres to keep teachers updated on challenging topics.
iv. Another important aspect is the necessity for teachers to be well-prepared and creative in their instruction, enabling them to create meaningful experiences for their students. Additionally, teachers may consider organizing extra classes and motivating their learners. In some instances, teachers can employ TALULAR.
v. Teachers have an opportunity to collaborate with school management in planning exciting field visits at least once each term. These outings can provide students with invaluable real-world experiences that enhance their learning and spark their curiosity.

5.6 Conclusions of the study

The following deductions are made based on the analysis of the experiences in the teaching and learning of selected geography topics in Mzuzu city secondary schools.

i. Most geography teachers have the required qualifications, mostly with a degree, but some are not geography teachers by major.
ii. Both teachers and learners have their own unique challenges that they face in the teaching and learning of the selected geography topics.
iii. There is a need for continued in service training for the teachers so that they are updated on how they can handle difficult topics.
iv. There is a need for more resources in the teaching and learning of the selected topics so that learners are able to construct their own learning.

5.7 Recommendations

i. To combat the issues stemming from inadequate teaching resources, it is essential to improve accessibility to them. Educational institutions and policymakers must invest in acquiring a broad range of up-to-date and diverse teaching materials. Additionally, establishing networks for sharing resources among schools and implementing digital

platforms for distribution can help overcome geographic limitations and ensure a fair and even distribution of teaching resources.

ii. It is highly recommended to allot ample time for practical sessions that emphasize the importance of hands-on learning in geography education. To ensure that teachers and students have sufficient time to engage in interactive and experiential learning, it may be necessary for the Ministry of Education to review and potentially update the curriculum with extended practical sessions in mind.

iii. To overcome the challenges identified in GIS, it is recommended to implement focused interventions in GIS education. It entails offering practical training sessions for teachers and students alike, to enhance their competency in GIS software. Collaborating with industry experts, technology firms, and geospatial organisations can facilitate the development of customized training programmes to further enhance GIS proficiency.

5.8 Areas for Further Study

i. This study focused on schools in the NED specifically in Mzuzu City. This study needs to be expanded to other schools in different divisions to improve the generalisation of the research.

ii. This study utilised mixed methods. A similar study could be conducted, focusing solely on qualitative research.

iii. To gain more insights into GIS education in Malawi, qualitative research on GIS education in Malawian secondary schools (a case study) is needed.

5.9 Chapter Summary

This chapter has highlighted the key findings of the study, the conclusions of the study, and the recommendations of the study to the various stakeholders. It has also suggested solutions to the challenges faced in the teaching and learning of the selected topics and the areas for further study.

REFERENCES

Adams, C. R., Barrio Minton, C. A., Hightower, J., & Blount, A. J. (2022). A systematic approach to multiple case study design in professional Counseling and Counsellor education. *Journal of Counselor Preparation and Supervision*, *15*(2), 24.

Ames, H., Glenton, C., & Lewin, S. (2019). Purposive Sampling in a Qualitative Evidence Synthesis: A Worked Example from a Synthesis on Parental Perceptions of Vaccination Communication. *BMC Medical Research Methodology*, *19*(1), 26. https://doi.org/10.1186/s12874-019-0665-4

Amosun, P. A. (2016). Why Nigerian Geography Teachers Scarcely and Scantly Teach Map reading and why Students are Scared of it. Journal of Gender, Information and Development in Africa, 8(1).

Andrade, C. (2018). Internal, External, and Ecological Validity in Research Design, Conduct, and Evaluation. *Indian Journal of Psychological Medicine*, *40*(5), 498–499. https://doi.org/10.4103/IJPSYM.IJPSYM_334_18

Andrew, S. (2009). Mixed Methods Research for Nursing and the Health Sciences. *A John Wiley & Sons, Ltd., Publication*.

Anlimachie, M. A. (2019). Understanding the Causes of Students' weak Performance in Geography at the WASSCE and the Implications for School Practices; A Case of Two Senior High Schools in a Rural District of Ghana. University of South Australia, III(III), 18.

Anunti, H., Vuopala, E., & Rusanen, J. (2020). A Portfolio Model for the Teaching and Learning of GIS Competencies in an Upper Secondary School: A Case Study from a Finnish Geomedia Course. Review of International Geographical Education Online.

https://doi.org/10.33403/rigeo.741299

Arthurs, L. A., Baumann, S. P., Rice, J. M., & Litton, S. D. (2023). The development of Individuals' Map-reading skill: What Research and Theory Tell us. International Journal of Cartography, 9(1), 3–28. https://doi.org/10.1080/23729333.2021.1950318

Aslan, S., & Reigeluth, C. M. (2015). Examining the Challenges of Learner-centered Education. Phi Delta Kappan, 97(4), 63–68. https://doi.org/10.1177/0031721715619922

Asli, A., & Zsoldos-Marchis, I. (2021). Teaching applications of Mathematics in other Disciplines:Teachers' Opinion and Practice. Acta Didactica Napocensia, 14(1), 142–150. https://doi.org/10.24193/adn.14.1.11

Atiso Ahiaku, P. K., W. Mncube, D., & Olaniran, S. O. (2019). Teaching mapwork in South African schools: Reflections from Educators' Experiences, Concerns and Challenges. Journal of Gender, Information and Development in Africa, 8(2), 19–36. https://doi.org/10.31920/2050-4284/2019/8n2a2

Bada, S. O., & Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *Journal of Research & Method in Education*, *5*(6), 66-70.

Baken L. (2014). The Piaget Theory of cognitive development: an Educational Implications. Article in Educational Psychology, Research Gate.

Baker, T. R., Battersby, S., Bednarz, S. W., Bodzin, A. M., Kolvoord, B., Moore, S., Sinton, D., & Uttal, D. (2015). A Research Agenda for Geospatial Technologies and Learning. *Journal of Geography*, *114*(3), 118–130. https://doi.org/10.1080/00221341.2014.950684

Baker, T. R., Kerski, J. J., Huynh, N. T., Viehrig, K., & Bednarz, S. W. (2012). *Call for an Agenda and Center for GIS Education Research*. *2*(3).

Batanero, C., Burrill, G., & Reading, C. (2011). *Teaching Statistics in School Mathematics-Challenges for Teaching and Teacher Education: A joint ICMI/IASE study: the 18th*

ICMI study (Vol. 14). Dordrecht: Springer.

Bauer, J. T. (2019). Review of Introduction to Human Geography Using ArcGIS Online. *Cartographic Perspectives*, *93*. https://doi.org/10.14714/CP93.1573

Bearman, N., Munday, P., & McAvoy, D. (2015). Teaching GIS Outside of Geography: A case Study in the School of International Development, University of East Anglia. Journal of Geography in Higher Education, 39(2), 237–244. https://doi.org/10.1080/03098265.2015.1010146

Bello, L. K. (2020). A Qualitative Study on Teachers' and Students' Perspectives on the Integration of Digital Storytelling in Map Reading Instruction. 9.

Bernabeu, C. B. (2012). Joint ICMI/IASE Study: Teaching Statistics in School Mathematics. Challenges for Teaching and Teacher Education. Vol. 7 (10). University of Granada Spain.

Bernabeu, C.B., Burrill, G., & Reading, C. (Eds.). (2011). Teaching Statistics in School Mathematics-Challenges for Teaching and Teacher Education (Vol. 14). Springer Netherlands. https://doi.org/10.1007/978-94-007-1131-0

Biddle, C., & Schafft, K. A. (2015). Axiology and Anomaly in the Practice of Mixed Methods Work: Pragmatism, Valuation, and the Transformative Paradigm. *Journal of Mixed Methods Research*, *9*(4), 320–334. https://doi.org/10.1177/1558689814533157

Borah M. (2021) Motivation in Learning. Student Department of Education Tezpur University Napaam Tezpur (ASAAM). Journal of Critical Reviews V.8 issue 02, 2021

Branch, J. (2016). Geographic Information Systems (GIS) in International Relations. InternationalOrganization, 70(4), 845–869. https://doi.org/10.1017/S0020818316000199

Brandes, I., Kleine-Budde, K., Heinze, N., Binder, S., Klug, C., Schippert, C., Ebert, A. D., & Halis, G. (2022). Cross-sectional study for Derivation of a Cut-off Value for

Identification of an Early Versus Delayed Diagnosis of Endometriosis Based on Analytical and Descriptive research methods. *BMC Women's Health*, *22*(1), 521. https://doi.org/10.1186/s12905-022-02044-x

Brink, H. I. L. (1993). *Validity and Reliability in Qualitative Research*. University of South Africa *16*(2).

Cain, V. E. M. (2015). Seeing the World: Media and Vision in US Geography Classrooms, 1890–1930. Early Popular Visual Culture, 13(4), 276–292. https://doi.org/10.1080/17460654.2015.1111591

Casinader, N., & Kidman, G. (2018). Fieldwork, Sustainability, and Environmental Education: The Centrality of Geographical Inquiry. Australian Journal of Environmental Education, 34(1), 1–17. https://doi.org/10.1017/aee.2018.12

Ceschia, S., Di Gaspero, L., & Schaerf, A. (2023). Educational Timetabling: Problems, Benchmarks, and State-of-the-art Results. *European Journal of Operational Research*, *308*(1), 1–18. https://doi.org/10.1016/j.ejor.2022.07.011

Chakour, R., Alami, A., Selmaoui, S., Eddif, A., & Chalak, H. (2022). Conceptions of Moroccan Secondary School Students in Relation to the "Integrative Concept" of Plate Tectonics. International Journal of Evaluation and Research in Education (IJERE), 11(4), 2095. https://doi.org/10.11591/ijere.v11i4.21861

Chakraborty, S. K. (2021). Riverine Ecology Volume 2: Biodiversity Conservation, Conflicts And Resolution. Springer International Publishing. https://doi.org/10.1007/978-3-030-53941-2

Chapman, L. (2010). Dealing with Maths Anxiety: How Do You Teach Mathematics in a Geography Department? Journal of Geography in Higher Education, 34(2), 205–213. https://doi.org/10.1080/03098260903208277

Chirwa, G., Naidoo, D., & Chirwa, G. (2014). Curriculum Change and Development in Malawi: A Historical Overview. *Mediterranean Journal of Social Sciences*. https://doi.org/10.5901/mjss.2014.v5n16p336

Çimer, A. (2012). What Makes Biology Learning Difficult and Effective: Students' Views. 7(3), 11.https://doi.org/10.5897/ERR11.205

Cofie, N., Braund, H., & Dalgarno, N. (2022). Eight Ways to Get a Grip on Intercoder Reliability using qualitative-based measures. *Canadian Medical Education Journal*. https://doi.org/10.36834/cmej.72504

Cohen, L. (2018). Research Methods in Education. *Routledge Taylor & Francis Group* London and Newyork, 8th edition, 945.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed). Routledge.

Conners, F. A., McCown, S. M., & Roskos-Ewoldsen, B. (1998). Unique Challenges in Teaching Undergraduate Statistics. Teaching of Psychology, 25(1), 40–42. https://doi.org/10.1207/s15328023top2501_12

Coulter, B. (2014). Moving Out of Flatland: Toward Effective Practice in Geospatial Inquiry. In J. MaKinster, N. Trautmann, & M. Barnett (Eds.), *Teaching Science and Investigating Environmental Issues with Geospatial Technology* (pp. 287–302). Springer Netherlands. https://doi.org/10.1007/978-90-481-3931-6_17

Creswell, J. W. (2012). *Educational research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th ed). Pearson.

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative and Mixed Methods Approaches (4th ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative Research Designs: Selection and Implementation. *The Counseling Psychologist*, *35*(2), 236–264. https://doi.org/10.1177/0011000006287390

Dima, A., Bugheanu, A.-M., Boghian, R., & Madsen, D. Ø. (2022). Mapping Knowledge Area Analysis in E-Learning Systems Based on Cloud Computing. *Electronics*, *12*(1), 62. https://doi.org/10.3390/electronics12010062

Dolphin, G., & Benoit, W. (2016). Students' Mental Model Development During Historically Contextualized Inquiry: How the 'Tectonic Plate' Metaphor Impeded the Process. International Journal of Science Education, 38(2), 276–297. https://doi.org/10.1080/09500693.2016.1140247

Edwin. (2022). Challenging Topics in the Senior High School Core Curriculum Subject (Earth and Life Science) as Perceived by First Year College Students. https://doi.org/10.17605/OSF.IO/ZJA9Q

En-Nhili, L., Boubih, S., Amiri, M., & El Alaoui, M. (2023). Diagnosis of Learning Difficulties of Plate Tectonics Concepts Among Secondary School Students using: Focus Group, Nominal Group, and Questionnaire. E3S Web of Conferences, 412, 01061. https://doi.org/10.1051/e3sconf/202341201061

Etobro, A. B., & Fabinu, O. E. (2017). Students' Perceptions of Difficult Concepts in Biology in Senior Secondary Schools in Lagos State. Global Journal of Educational Research, 16(2), 139. https://doi.org/10.4314/gjedr.v16i2.8

Falode, O. C., Usman, H., Ilobeneke, S. C., Mohammed, H. A., Godwin, A. J., & Jimoh, M. A. (2016). Improving Secondary School Geography Students' Positive Attitude Towards Map Reading Through Computer Simulation Instructional Package in Bida, Niger State, Nigeria. 10, 14.

Ghafar, N. A., Rahmatullah, B., Razak, N. A., Muttalib, H. A., Adnan, M. H. M., & Laela, L. (2023). Systematic Literature Review on Digital Courseware Usage in Geography Subjects for Secondary School Students. Journal of ICT in Education (JICTIE). https://doi.org/10.37134/jictie.vol10.1.3.2023

Gökçea Nazlı. (2015). Social Studies in Improving Students' Map Skills: Teachers' Opinions. Educational Sciences: Theory & Practice. https://doi.org/10.12738/estp.2015.5.0071

Gredler, M. E. (2012). Understanding Vygotsky for the Classroom: Is It Too Late? *Educational Psychology Review*, *24*(1), 113–131. https://doi.org/10.1007/s10648-011-9183-6

Gurlek Kisacik, O., Sonmez, M., & Ozdas, A. (2023). How Attitudes Towards E-Learning Affected The Academic Achievement During the Covid-19 Pandemic: An Example of a Nursing Skills Teaching. Turkish Online Journal of Distance Education, 24(1), 129–144. https://doi.org/10.17718/tojde.1077087

Harris, R., Fitzpatrick, K., Souch, C., Brunsdon, C., Jarvis, C., Keylock, C., Orford, S., Singleton, A., & Tate, N. (2013). Quantitative Methods in Geography. http://creativecommons.org/licenses/by-nc-nd/3.0/

Havelková, L., & Hanus, M. (2019). Map Skills in Education: A Systematic Review of Terminology, Methodology, and Influencing Factors. *Review of International Geographical Education Online*, *9*(2). https://doi.org/10.33403/rigeo.591094

Höhnle, S., Fögele, J., Mehren, R., & Schubert, J. C. (2016). GIS Teacher Training: Empirically-Based Indicators of Effectiveness. *Journal of Geography*, *115*(1), 12–23. https://doi.org/10.1080/00221341.2015.1016546

Hong, J. E., & Stonier, F. (2015). GIS In-Service Teacher Training Based on TPACK. *Journal of Geography*, *114*(3), 108–117. https://doi.org/10.1080/00221341.2014.947381

Hošková-Mayerová, Š., Maturo, F., & Kacprzyk, J. (Eds.). (2017). Mathematical-Statistical Models and Qualitative Theories for Economic and Social Sciences (Vol. 104). Springer International Publishing. https://doi.org/10.1007/978-3-319-54819-7

Hutchinson D. A. (2015). Coming to Understand Experience; Dewey's Theory of Experience and Narrative inquiry. University of Kansas. Journal of Thought, fall winter 2015, 3.

Jalal, A. A., Hamid, H. S. A., & Zulnaidi, H. (2023). Statistical Literacy of Education Policy Makers: A Pls Sem Approach. 2, 12.

Jose, S., Patrick, P. G., & Moseley, C. (2017). Experiential Learning Theory: The importance of Outdoor Classrooms in Environmental Education. International Journal of Science Education, Part B, 7(3), 269–284. https://doi.org/10.1080/21548455.2016.1272144

Joseph, I., Nasir, Z., & Abubakar, H. (2023). Teachers' Factors Influencing Adoption and Integration of Information and Communication Technology into Teaching and Learning. 17.

Joyti A. (2023) Coastal Features: Types and Formation. https://sciencequery.com

Joyti A. (2023) What is Fluvial Activity. https://sciencequery.com

Kaberia, B. M. (2020). Factors Influencing Students' Choice of Geography in Public Secondary Schools in Kieni East Sub -County Nyeri County, Kenya. Africa Nazarene University.

Kaur, H., & Phutela, A. (2018). Commentary upon Descriptive Data Analytics. *2018 2nd International Conference on Inventive Systems and Control (ICISC)*, 678–683. https://doi.org/10.1109/ICISC.2018.8398884

Kerski, J. J., Demirci, A., & Milson, A. J. (2013). The Global Landscape of GIS in Secondary Education. *Journal of Geography*, *112*(6), 232–247. https://doi.org/10.1080/00221341.2013.801506

Kholoshyn, I., Nazarenko, T., Bondarenko, O., Hanchuk, O., & Varfolomyeyeva, I. (2021). The Application of Geographic Information Systems in Schools around the World: A Retrospective Analysis. Journal of Physics: Conference Series, 1840(1), 012017. https://doi.org/10.1088/1742-6596/1840/1/012017

Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, *6*(5), 26. https://doi.org/10.5430/ijhe.v6n5p26

Kleinheksel, A. J., Rockich-Winston, N., Tawfik, H., & Wyatt, T. R. (2020). Qualitative Research in Pharmacy Education. *American Journal of Pharmaceutical Education*, 11.

Kolb, D. A. (1984). Experiential Learning: Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice Hall.

Korvasová, V. (2022). Attractive geographical themes and topics from the perspective of students (2000−2021): A systematic review. *Geografie*, *127*, 1. https://doi.org/10.37040/geografie.2022.009

Krahenbuhl, K. S. (2016). Student-centered Education and Constructivism: Challenges, Concerns, and Clarity for Teachers. The Clearing House: A Journal of Educational Strategies,Issues and Ideas, 89(3), 97–105. https://doi.org/10.1080/00098655.2016.1191311

Kufakunesu, M., Mavezera, T. F., Mashoko, D., & Malasha, S. L. (2019). Professional Enhancement or Needless Baggage: Attitudes of Undergraduate In-Service Secondary School Student Teachers towards Educational Psychology in Zimbabwe. 24(19), 10. https://doi.org/10.9790/0837-2409055968

Ladrera, R., Rodríguez-Lozano, P., Verkaik, I., Prat, N., & Díez, J. R. (2020). What Do Students Know about Rivers and Their Management? Analysis by Educational Stages and

Territories. Sustainability, 12(20), 8719. https://doi.org/10.3390/su12208719

Larangeira, R., & van der Merwe, C. D. (2016). Map Literacy and Spatial Cognition Challenges for Student Geography Teachers in South Africa. Perspectives in Education 34(2), 34(2). https://doi.org/10.18820/2519593X/pie.v34i2.9

Letherby, G., Scott, J., & Williams, M. (2013). *Objectivity and Subjectivity in Social Research*. SAGE Publications Ltd. https://doi.org/10.4135/9781473913929

Lescesen, I., Ivanovic-Bibic, L., Djukicin-Vuckovic, S., Hercik, J., & Kotorcevic, L. (2021). The Importance of Teaching Equipment in Geography Llassrooms. Journal of the Geographical Institute Jovan Cvijic, SASA, 71(3), 325–332. https://doi.org/10.2298/IJGI2103325L

Li, T., & Frank, K. (2022). The Probability of a Robust Inference for Internal Validity. *Sociological Methods & Research*, *51*(4), 1947–1968. https://doi.org/10.1177/0049124120914922

Lyke, B.V. (2015). Research Design and Methods part 1, South Africa: University of Western Cape

MANEB (2020 - 2024). Chief Examiners Report. Geography I and II

Mbuyazwe V. (2011). Exploring how Teachers acquire Knowledge of Marine and Coastal Issues to Contextualize the Natural Science Curriculum. Rhodes University, Department of Education.

McDonald, S., Bateman, K., Gall, H., Tanis-Ozcelik, A., Webb, A., & Furman, T. (2019). Mapping the Increasing Sophistication of Students' Understandings of Plate Tectonics: A Learning progressions approach. Journal of Geoscience Education, 67(1), 83–96. https://doi.org/10.1080/10899995.2018.1550972

McLure, F., Won, M., & Treagust, D. F. (2021). What Students' Diagrams Reveal About Their Sense-Making Of Plate Tectonics in Lower Secondary Science. International Journal of Science Education, 43(16), 2684–2705. https://doi.org/10.1080/09500693.2021.1983922

Merriam, S. B., & Tisdell, E. J. (2016). Qualitative Research: A Guide to Design and Implementation (4th ed.). San Francisco, CA: Jossey Bass.

Mills, R., Tomas, L., & Lewthwaite, B. (2017). Junior Secondary School Students' Conceptions About Plate Tectonics. International Research in Geographical and Environmental Education, 26(4), 297–310. https://doi.org/10.1080/10382046.2016.1262511

Mills, R., Tomas, L., & Lewthwaite, B. (2019). The Impact of Student-Constructed Animation on Middle School Students' Learning about Plate Tectonics. Journal of Science Education and Technology, 28(2), 165–177. https://doi.org/10.1007/s10956-018-9755-z

Ministry of Education (2013). Syllabus for Geography. Malawi Institute of Education Domasi Malawi.

Mkhize, T. F. (2023). Experiences of the Geography Subject Advisors in the Implementation of Geographic Information Systems in KwaZulu-Natal Province. Research in Social Sciences and Technology, 8(1), 63–73. https://doi.org/10.46303/ressat.2023.5

Mkhongi, F. A., & Musakwa, W. (2020). Perspectives of GIS Education in High Schools: An Evaluation of uMgungundlovu District, KwaZulu-Natal, South Africa. Education Sciences, 10(5), 131. https://doi.org/10.3390/educsci10050131

Mládek, J., Káčerová, M., Popjaková, D., & Vančura, M. (2017). Changes in Demographic Behaviour: Possible Use of Its Findings in Didactic Practice. In P. Karvánková, D. Popjaková, M. Vančura, & J. Mládek (Eds.), Current Topics in Czech and Central European Geography Education (pp. 253–280). Springer International Publishing.

https://doi.org/10.1007/978-3-319-43614-2_14

Morris, T. H. (2020). Experiential Learning – a Systematic Review and Revision of Kolb's Model. *Interactive Learning Environments*, *28*(8), 1064–1077. https://doi.org/10.1080/10494820.2019.1570279

Mtitu, E. A. (2014). Learner-Centred Teaching in Tanzania: Geography Teachers' Perceptions and Experiences. Victoria University of Wellington New Zealand.

Mufidah, A. A., Salim, R. M. A., Siahaan, F. M. M., Setiamurti, A., & Normawati, M. (2023). Perceived Creativity Fostering Teacher Behavior and Student Engagement in Statistic Course: Academic Self-Efficacy as Mediator. 4(3), 8. https://doi.org/10.46843/jiecr.v4i3.708

Mukhopadhyay, R., & Karisiddaiah, S. M. (2014). The Indian Coastline: Processes and Landforms. In V. S. Kale (Ed.), *Landscapes and Landforms of India* (pp. 91–101). Springer Netherlands. https://doi.org/10.1007/978-94-017-8029-2_8

Mzuza, M. K. (2019). Skills Gained and the Significance There of in Teaching With or Through Gis. 10(3).

Mzuza, M. K., & Van der Westhuizen, C. (2020). Inclusion of GIS in Student-Teacher Training and its Significance in Higher Education in Southern African Countries. International Research in Geographical and Environmental Education, 29(4), 332–346. https://doi.org/10.1080/10382046.2019.1684660

Naxweka, J., & Wilmot, D. (2019). Namibian Teachers' Perceptions and Practices of Teaching Mapwork. The Journal of Geography Education in Africa, 2(1), 1–14. https://doi.org/10.46622/jogea.v2i1.2479

Nkochi W. (2021). Education in Malawi: Quality, Quantity, and Relevance. The Malawi Development Digest. *Student Corner 32*.

Noble, H., & Smith, J. (2015). Issues of Validity and Reliability in Qualitative Research. *EvidenceBased Nursing*, *18*(2), 34–35. https://doi.org/10.1136/eb-2015-102054

Oda, K., Herman, T., & Hasan, A. (2020). Properties and Impacts of TPACK-based GIS Professional Development for In-Service Teachers. International Research in Geographical and Environmental Education, 29(1), 40–54. https://doi.org/10.1080/10382046.2019.1657675

Ogunkola, B., & Samuel, D. (2011). Science Teachers' and Students' Perceived Difficult Topics in the Integrated Science Curriculum of Lower Secondary Schools in Barbados. *World Journal of Education*, *1*(2), p17. https://doi.org/10.5430/wje.v1n2p17

Opoku, F. (2021). Geography Education in Ghanaian Senior High Schools: A qualitative Study Of the Gender Differences in Students' Geographical Knowledge and Interests. International Research in Geographical and Environmental Education, 30(4), 283–298. https://doi.org/10.1080/10382046.2020.1779987

Ory, J., Christophe, S., Fabrikant, S. I., & Bucher, B. (2015). How Do Map Readers Recognize a Topographic Mapping Style? The Cartographic Journal, 52(2), 193–203. https://doi.org/10.1080/00087041.2015.1119459

Pamuk, M. (2023). Teaching Geographical Thinking with GIS-Based Projects: Learning From Experienced Teachers' Perspectives. Florida State University, College of education.

Pellegrini, P. A. (2022). About the Reaction to Styles of Thought on the Continental Drift Debate. Journal for General Philosophy of Science, 53(4), 573–582. https://doi.org/10.1007/s10838-022-09617-2

Pellegrini, P. A. (2019). Styles of Thought on the Continental Drift Debate. Journal for General Philosophy of Science, 50(1), 85–102. https://doi.org/10.1007/s10838-018-9439-7

Polot-Okurut C and Eluk P.O. Statistics Curricular in Uganda in Bernabeu C.B. (2012) Joint ICMI/IASE Study: Teaching Statistics in School Mathematics Challenges for Teaching and Teacher Education.

Price C. (2019) An Evidence Based Approach to Teaching Plate Tectonics in High School. Daramalan College ACT. Canberra, Australia. Vol 65 issue 2.

Prathoshni M.S. Priya V.V. Gayathri R. (2018). The effect of Teaching Aids on Students Academic Performance in Professional Courses. Drug Invention Today 2018, Vol 10 issue 12 P 2358

Puertas-Aguilar, M.-Á., Álvarez-Otero, J., & De Lázaro-Torres, M.-L. (2021). The Challenge of Teacher Training in the 2030 Agenda Framework Using Geotechnologies. Education Sciences, 11(8), 381. https://doi.org/10.3390/educsci11080381

Pugh, K. J., Bergstrom, C. M., & Spencer, B. (2017). Profiles of Transformative Engagement: Identification, Description, and Relation to Learning and Instruction. *Science Education*, *101*(3), 369–398. https://doi.org/10.1002/sce.21270

Ramrathan, L., Le Grange, L., & Shawa, L. B. (2017). Ethics in Educational Research. *Education studies for initial teacher education*, 432-443.

Ratner, C. (2002). *Subjectivity and Objectivity in Qualitative Methodology*. *3*(3), 8.

Reyes, B., Jiménez-Hernández, D., Martínez-Gregorio, S., De Los Santos, S., Galiana, L., & Richardson, V. (2023). Constructivist Pedagogy. *Teachers College Record: The Voice Of Scholarship in Education*, *105*(9), 1623–1640. https://doi.org/10.1046/j.1467-9620.2003.00303.x

Romano, C. (1998). L'ev´ enement et le monde [Event and world]. Paris: Presses Universitaires de France.

Roth, W., & Jornet, A. (2014). Toward a Theory of *Experience*. *Science Education*, *98*(1), 106–126. https://doi.org/10.1002/sce.21085

Ryan, F., Coughlan, M., & Cronin, P. (2009). Interviewing in Qualitative Research: The One-to-one Interview. *International Journal of Therapy and Rehabilitation*, *16*(6), 309–314. https://doi.org/10.12968/ijtr.2009.16.6.42433

Sadera, J. R. N., Torres, R. Y. S., & Rogayan. Jr., D. V. (2020). Challenges Encountered by Junior High School Students in Learning Science: Basis for Action Plan. Universal Journal of Educational Research, 8(12A), 7405–7414. https://doi.org/10.13189/ujer.2020.082524

Seaman, J., Brown, M., & Quay, J. (2017). The Evolution of Experiential Learning Theory: Tracing Lines of Research in the *JEE*. *Journal of Experiential Education*, *40*(4), NP1–NP21. https://doi.org/10.1177/1053825916689268

Sexton, J. M. (2012). College Students' Conceptions of the Role of Rivers in Canyon Formation. Journal of Geoscience Education, 60(2), 168–178. https://doi.org/10.5408/11-249.1

Schuit, W. (2011). A Method for Teaching Topographic Map Interpretation. *Journal of Geography*, *110*(5), 209–216. https://doi.org/10.1080/00221341.2011.549497

Shyiramunda, T., & Bavugirije, F. (2020). Contribution of School Heads' Leadership Practices to Students' Academic Performance in the Public Secondary Schools of Muzo Sector, Gakenke District, Rwanda. *2*(6).

Sikandar, A. (2016). John Dewey and His Philosophy of Education. *Journal of Education and Educational Development*, *2*(2), 191. https://doi.org/10.22555/joeed.v2i2.446

Singh, D. S. (Ed.). (2018). The Indian Rivers: Scientific and Socio-economic Aspects. Springer Singapore. https://doi.org/10.1007/978-981-10-2984-4

Sumrekar, A., Polajnar Horvat, K., & Erhartič, B. (2016). The Beauty of Landforms. Acta Geographica Slovenica, 56(2). https://doi.org/10.3986/AGS.3039

Steccolini, I. (2022). What Counts as "good" Qualitative Accounting Research? Researchers' Perspectives on Assessing and Proving Research Quality. *Accounting, Auditing & Accountability Journal*. https://doi.org/10.1108/AAAJ-05-2022-5808

Sumari, N. S., Shao, Z., & Kira, E. (2017). Challenges and Opportunities for the Advancement Of GIS Education in Tanzania. Journal of Education and Practice.

Syamsuri, S., & Bahtiar, R. (2023). Determining the Relationship Between 11th Students' Attitude Towards Mathematics and Their Achievement in Mathematics. Technium Social Sciences Journal, 39, 148–154. https://doi.org/10.47577/tssj.v39i1.8056

Taherdoost, H. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3205035

Tomal, N. (2010). High school Students' Attitudes Towards Geography and the Questions they Wonder about. *Sci. Res. Essays*, 5.

Tomás, J. M. (2023). Prediction of Academic Achievement in Dominican Students: Mediational role of learning strategies and study habits and attitudes toward study. Psychology in the Schools, 60(3), 606–625. https://doi.org/10.1002/pits.22780

Turan, Z., Meral, E., & Sahin, I. F. (2018). The Impact of Mobile Augmented Reality in GeographyEducation: Achievements, Cognitive Loads and Views of university students. Journal of Geography in Higher Education, 42(3), 427–441. https://doi.org/10.1080/03098265.2018.1455174

Walshe, N. (2017). Developing Trainee Teacher Practice with Geographical Information Systems (GIS). Journal of Geography in Higher Education, 41(4), 608–628. https://doi.org/10.1080/03098265.2017.1331209

Whiteley, R. F., Gillespie, J., Robinson, C., Watts, W., & Carter, D. (2014). Effective Teaching and Learning in Interprofessional Education in Child Welfare. *Journal of Education and Training Studies*, *2*(4), 148-158

Wild, C. J., Utts, J. M., & Horton, N. J. (2018). Chapter 1: What is Statistics? Springer, 27.

Wild C.J. & Pfannkuch M. (1999) Statistical Thinking in Empirical Enquiry. Department of Statistics University of Auckland, New Zealand.

Williams, E. N., & Morrow, S. L. (2009). Achieving Trustworthiness in Qualitative Research: A Pan-paradigmatic Perspective. *Psychotherapy Research*, *19*(4–5), 576–582. https://doi.org/10.1080/10503300802702113

Yildiz, Y., & Celik, B. (2017). Commitment to the Teaching Profession. International Journal of Social Sciences & Educational Studies, 4(2). https://doi.org/10.23918/ijsses.v4i2sip93

Yount, L. (2009). Alfred Wegener: Creator of the Continental Drift Theory. Chelsea House Publishers.

Zapata-Cardona, L., & Martínez-Castro, C. A. (2023). Statistical Modeling in Teacher Education. Mathematical Thinking and Learning, 25(1), 64–78. https://doi.org/10.1080/10986065.2021.1922859

Zawacki-Richter, O., Kerres, M., Bedenlier, S., Bond, M., & Buntins, K. (2020). Systematic Reviews in Educational Research: *Methodology, perspectives and application* (p. 161). Springer Nature.

Zhou, M., & Brown D. (2015). Education Learning Theories: 2nd Edition. Education open Textbooks. GALILEO, University System of Georgia.

Zwartjes Luc, Donert Karl, & Klonari Aikaterina. (2015). The Introduction of use of Statistics in Education (I-Use): The Case of Use of Statistics in the Geography Curriculum. *GI_Forum 2014 – Geospatial Innovation for Society*, 242–253.

APPENDICES

APPENDIX 1: Table of Enrolment, Entry, and Performance at MSCE and Terminal Results

Table of Enrollment, Entry, and Performance at MSCE MANEB Examinations and Terminal Results of Learners in the Geography of Schools X and Y.

School	Exams	Enrolment	Entry	Distinctions (2)	Credits (3-6)	Pass (7-8)	Fail (9)	7-9 (%)
X	MSCE	238	**165**	4	92	**57**	**12**	**42**
Y	Terminal	104	**55**	2	28	**20**	**7**	**49**

APPENDIX 2: Teaching experiences in map reading

Experiences of Teachers in Teaching Map Reading	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
It is easy to teach map reading using topographical maps	2	8.7	3	13.0	18	78.3	**23**	**100**
It is simple to teach map distance measurement	3	13.0	2	8.7	18	78.3	**23**	**100**
It is simple to teach gradient on a map	6	26.1	0	0.0	17	73.9	**23**	**100**
It is simple to teach cross-sections	4	17.4	6	26.1	13	56.5	**23**	**100**
It is simple to teach map reduction and enlargement	3	13.0	2	8.7	18	78.3	**23**	**100**
Learners performed well in their practical exercise	4	17.4	4	17.4	15	65.2	**23**	**100**
Average degree of agreement		15.9		12.4		71.7	**23**	**100**

APPENDIX 3: Teaching experiences in statistical methods in geography

Teachers Experiences in Teaching Statistical Methods in Geography	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
It is simple to teach means	3	13.0	5	21.7	15	65.3	**23**	**100**
It is simple to teach deviations	7	30.5	6	26.1	10	43.4	**23**	**100**
It is easy to teach bar graphs	3	13.0	3	13.0	17	74.0	**23**	**100**
It is easy to teach age sex graphs	7	30.4	3	13.0	13	56.6	**23**	**100**
Learners performed well in their practical exercise on statistical methods	7	30.4	4	17.4	12	52.2	**23**	**100**
Average degree of agreement		23.5		18.3		58.2	**23**	**100**

APPENDIX 4: Teaching Experiences in Continental Drift and Plate Tectonics Theories

Teachers Experiences in Teaching Continental Drift and Plate Tectonics Theories	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
It is easy to teach Continental Drift Theory	6	26.1	0	0.0	17	73.9	**23**	**100**
It is easy to teach Plate Tectonics Theory	3	13.0	5	21.7	15	65.3	**23**	**100**
It is easy to teach the formation of the mid-oceanic ridge	4	17.4	2	8.7	17	73.9	**23**	**100**
It is simple to teach the formation of geological features along plate boundaries	1	4.3	4	17.4	18	78.3	**23**	**100**
Learners performed well in the Plate Tectonics and Continental Drift theory exercise	2	8.7	8	34.8	13	56.5	**23**	**100**
Average degree of agreement		13.9		16.6		69.5	**23**	**100**

APPENDIX 5: Teaching experiences in riverine and coastline features

Teacher's Experiences in Teaching Riverine and Coastline Features	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
It is simple to teach riverine features	1	4.3	3	13	19	82.7	**23**	**100**
it is easy to teach coastline features	1	4.3	3	13.0	19	82.7	**23**	**100**
It is easy to teach coastline features like erosional features	4	17.4	6	26.1	13	56.5	**23**	**100**
It is easy to teach the identification of coastal features	5	21.7	5	21.7	13	56.6	**23**	**100**
Learners performed well in an end-of-topic exercise	6	26.1	7	30.4	10	43.5	**23**	**100**
Average degree of agreement		14.8		20.8		64.4	**23**	**100**

APPENDIX 6: Teaching experiences in GIS

Teachers' Experiences in Teaching GIS	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
It is easy to teach satellite images	5	21.7	4	17.4	14	60.9	**23**	**100**
It is easy to teach how to recognize information from GIS	6	26.0	7	30.4	10	43.6	**23**	**100**
It is simple to teach the interpretation of information from GIS	7	30.4	9	39.2	7	30.4	**23**	**100**
It is easy to teach the manipulation of GIS software	13	56.5	4	17.4	6	26.1	**23**	**100**
Learners performed well in the GIS exercise	11	47.8	6	26.1	6	26.1	**23**	**100**
Average degree of agreement		36.4		26.2		37.4	**23**	**100**

APPENDIX 7: Experiences of learners in learning map reading

Experiences of Students in Learning Map Reading	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
I can calculate the actual distance from the map	31	15.7	69	34.8	98	49.5	**198**	**100**
I know how to calculate the gradient	44	22.3	69	34.8	85	42.9	**198**	**100**
I can make cross-sections	62	31.3	62	31.3	74	37.4	**198**	**100**
I can reduce and enlarge maps	62	31.3	57	28.8	79	39.9	**198**	**100**
I am able to calculate the area of the map	23	11.6	36	18.2	139	70.2	**198**	**100**
Average degree of agreement		22.4		29.6		48.0	**198**	**100**

APPENDIX 8: Experience of Learners in Learning Statistical Methods in Geography

Experience of Learners in Learning Statistical Methods in Geography	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
I am able to calculate the mean	34	17.2	27	13.6	137	69.2	**198**	**100**
I can calculate the deviation	81	40.9	33	16.7	84	42.4	**198**	**100**
I know how to make histograms	46	23.2	42	21.2	110	55.6	**198**	**100**
I can make age-sex graphs	109	55.1	43	21.7	46	23.2	**198**	**100**
Average degree of agreement		34.1		18.3		47.6	**198**	**100**

APPENDIX 9: Experiences of learners in learning Continental Drift and Plate Tectonics Theories

Experiences of Students in Learning Map Reading	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
I am able to explain the Continental Drift Theory	32	16.3	45	22.8	127	60.6	**198**	**100**
I can explain the Plate Tectonics Theory	81	40.9	33	16.7	84	42.4	**198**	**100**
I know the formation of mid-oceanic ridge	46	23.2	42	21.3	110	55.5	**198**	**100**
I can explain the formation of geological features along plate boundaries	109	55.0	43	21.8	46	23.2	**198**	**100**
Average degree of agreement		33.8		20.6		45.6	**198**	**100**

APPENDIX 10: Experiences of learners in learning riverine and coastline features

Learning Experiences of Students in Riverine and Coastline Features	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
I can explain coastline features	60	30.3	63	31.8	75	37.9	**198**	**100**
I can explain the term riverine features	51	25.8	51	25.8	96	48.4	**198**	**100**
I can explain the formation of an erosional coastline	88	44.5	69	34.8	41	20.7	**198**	**100**
I am able to identify coastal features on topographical maps	53	26.8	72	36.4	73	36.8	**198**	**100**
Average degree of agreement		31.8		32.3		35.9	**198**	**100**

APPENDIX 11: Experiences of learners in learning Geographic Information Systems (GIS)

Learning Experiences of Students in Geographic Information Systems (GIS)	Disagree		Neutral		Agree		Total	
	F	%	F	%	F	%	F	%
I can explain the term geographic information system	61	30.8	59	29.8	78	39.4	**198**	**100**
I know how to interpret information from GIS	86	43.4	71	35.9	41	20.7	**198**	**100**
I am able to manipulate GIS software competently	95	48.0	74	37.4	29	14.6	**198**	**100**
I can recognise information from satellite images	97	49.0	67	33.8	34	17.2	**198**	**100**
Average degree of agreement		42.8		34.2		23.0	**198**	**100**

APPENDIX 12: Challenges of Teachers in Teaching Map reading

N	Variable	Frequency	Percent
1	Inadequate teaching/learning resource	10	43.6
2	Visualization difficulties	3	13.0
3	Time consuming	2	8.7
4	Learner's interest	2	8.7
5	Identification of Northing/Easting	1	4.3
6	Distance and scale calculation	1	4.3
7	No challenge	1	4.3
8	Class size	1	4.3
9	Lack of prior knowledge	1	4.3
10	Teacher with poor maths background	1	4.3

APPENDIX 13: Challenges faced in teaching statistical methods in geography

N	Variable	Frequency	percent
1	Challenging math problem	7	30.4
2	Less time allocation	6	26.1
3	Bar graph/histogram confuse	2	8.7
4	No challenge	2	8.7
5	Technical terms	1	4.3
6	Variation/too much content in textbooks	1	4.3
7	Lack of prior knowledge	1	4.3
8	Lack of motivation	1	4.3
9	Inadequate resources	1	4.3
10	Unclear description of terms	1	4.3

APPENDIX 14: Challenges faced in teaching continental drift and plate tectonics theory

N	Variation	Frequency	Percent
1	Abstract content/ less reality of topic	6	52.2
2	Inadequate resources	6	26.1
3	Theories are confusing	3	13.0
4	Learners simplifying content	1	4.3
5	Topic is technical/scientific	1	4.3

APPENDIX 15: Challenges in teaching riverine and coastline features

N	Variation	Frequency	Percent
1	Lack of T/L resources	8	34.9
2	Lack of field visits	3	13.0
3	Poor diagrams in books	2	8.7
4	Too long topic	2	8.7
5	Riverine confused with coastline	2	8.7
6	Conflicting contents	2	8.7
7	Identification of contour lines	1	4.3
8	Negative attitude	1	4.3
9	Lack of prior knowledge	1	4.3

APPENDIX 16: Challenges in teaching GIS

N	Variation	Frequency	Percent
1	Digital T/L materials	10	43.5
2	Less time allocation	4	17.5
3	Prior knowledge lacking in learners	2	8.7
4	Lack of teacher training	2	8.7
5	Non-examinable topics	2	8.7
6	Difficult terms	1	4.3
7	Lack of resource persons	1	4.3
8	Scientific in nature	1	4.3

APPENDIX 17: Challenges of learners in map reading

N	Variables	Frequency	Percent
1	Calculation on maps	153	77.3
2	Inadequate resources	18	9.1
3	Faint maps	12	6.1
4	Interpretation of contour lines	7	3.5
5	Technical language	4	2.0
6	Inadequate time/learning/exam	2	1.0
7	Unsatisfactory teaching	1	0.5
8	Typing error on maps	1	0.5

APPENDIX 18: Challenges of learners in statistical methods in geography

N	Variables	Frequency	Percent
1	Mathematical calculation	110	55.6
2	Difficult topic	30	15.2
3	Inadequate resources	24	12.1
4	Incompetent teachers	6	3.0
5	Data interpretation	5	2.5
6	Data collection methods	4	2.0
7	Statistics not necessary	4	2.0
8	Did not learn	4	2.0
9	Inadequate time	3	1.5
10	Less information in textbooks	3	1.5
11	Large class	2	1.0
12	Data presentation	2	1.0
13	Lack of prior knowledge	1	0.5

APPENDIX 19: Challenges of learners in learning continental drift and plate tectonics theory

N	Variable	Frequency	Percent
1	Difficult/abstract terms or topic	79	39.9
2	Formation of geological features	40	20.2
3	Inadequate resources	22	11.1
4	Theories confuse	20	10.1
5	Weak evidences on theories	15	7.6
6	Less detail on theories	9	4.5
7	Lack of prior knowledge	8	4.0
8	Less skills in teachers	4	2.0
9	Did not learn	1	0.5

APPENDIX 20: Challenges of learners in riverine and coastline

N	Variable	Frequency	Percent
1	Topic abstract/difficult	62	31.3
2	Formation processes of features	41	20.7
3	Lack of field visits	29	14.6
4	Confusing concepts	17	8.6
5	Inadequate resources	17	8.6
6	Blurred diagram	11	5.6
7	Lack of prior knowledge	9	4.5
8	Unskilled teachers	6	3.0
9	Inadequate time	6	3.0

APPENDIX 21: Challenges of learner in GIS

N	Variable	Frequency	Percent
1	Did not learn	77	38.9
2	Inadequate resources	32	16.2
3	Difficult/complex topic	32	16.2
4	Recognition from GIS	20	10.1
5	GIS software manipulation	14	7.1
6	Inadequate information	7	3.5
7	Incompetent teachers	7	3.5
8	Inadequate time	5	2.5
9	Expensive to print GIS	3	1.5
10	Lack of prior knowledge	1	0.5

APPENDIX 22: Suggested solutions in map reading

N	Variable	Frequency	Percent
1	Adequate teaching resources	8	34.8
2	Improved methods	4	17.5
3	Intensive practical experience	3	13.0
4	CPD/INSET	2	8.7
5	Standard teacher-pupil ratio	2	8.7
6	Map reading in primary schools	2	8.7
7	Motivation of learners	1	4.3
8	Extra lessons	1	4.3

APPENDIX 23: Suggested solutions in statistical methods in geography

N	Variable	Frequency	Percent
1	Motivating learners	5	21.8
2	Extra lessons	5	21.7
3	Diverse methods	4	17.5
4	Teacher thorough preparation	2	8.7
5	Uniform content in textbooks	2	8.7
6	Improvisation/TALULAR	2	8.7
7	Emphasis on technical words	1	4.3
8	Sizable content	1	4.3
9	Adequate Teaching and Learning Resources	1	4.3

APPENDIX 24: Suggested solutions in continental and plate tectonics theory

N	Variable	Frequency	Percent
1	Adequate teaching resources including audiovisuals	16	69.6
2	Demystifying bible issues	3	13.0
3	Student-centered methods	2	8.7
4	Teacher content matter	2	8.7

APPENDIX 25: Suggested solutions in riverine and coastline features

N	Variable	Frequency	Percent
1	Field visitation	10	43.5
2	Adequate resources	6	26.3
3	Clean diagram in textbooks	2	8.7
4	Improvisation	1	4.3
5	CPD's for teachers	1	4.3
6	Extra lessons	1	4.3
7	Research and presentation	1	4.3
8	Group studies	1	4.3

APPENDIX 26: Suggested solutions in GIS

N	Variable	Frequency	Percent
1	INSETs/CPDs for teachers	10	43.5
2	Up to date ICT equipment, Teaching/learning resources	8	34.8
3	Resource person	2	8.7
4	Inter education strategies	2	8.7
5	Geoscience lab	1	4.3

APPENDIX 27: Permission Letter from Mzuzu University

MZUZU UNIVERSITY

DIRECTORATE OF RESEARCH

Mzuzu University
Private Bag 201
Luwinga
Mzuzu 2
MALAWI
TEL: 01 320 722
FAX: 01 320 648

MZUZU UNIVERSITY RESEARCH ETHICS COMMITTEE (MZUNIREC)

Ref No: MZUNIREC/DOR/23/52 **21/06/2023.**

Kerby Mtawali,
Mzuzu University,
P/Bag 201,
Luwinga,
Mzuzu 2.

mtawalikerby@gmail.com

Dear Kerby,

RESEARCH ETHICS AND REGULATORY APPROVAL AND PERMIT FOR PROTOCOL REF NO: MZUNIREC/DOR/23/52: EXPERIENCES OF TEACHING AND LEARNING SELECTED GEOGRAPHY TOPICS IN MZUZU CITY SECONDARY SCHOOLS.

Having satisfied all the relevant ethical and regulatory requirements, I am pleased to inform you that the above referred research protocol has officially been approved. You are now permitted to proceed with its implementation. Should there be any amendments to the approved protocol in the course of implementing it, you shall be required to seek approval of such amendments before implementation of the same.

This approval is valid for one year from the date of issuance of this approval. If the study goes beyond one year, an annual approval for continuation shall be required to be sought from the Mzuzu University Research Ethics Committee (MZUNIREC) in a format that is available at the Secretariat. Once the study is finalised, you are required to furnish the Committee with a final report of the study. The Committee reserves the right to carry out compliance inspection of this approved protocol at any time as may be deemed by it. As such, you are expected to properly maintain all study documents including consent forms.

Committee Address:
Secretariat, Mzuzu University Research Ethics Committee, P/Bag 201, Luwinga, Mzuzu 2; E-mail address: mzunirec@mzuni.ac.mw

APPENDIX 28: Letter of Introduction

MZUZU UNIVERSITY

Department of Teaching, Learning and Curriculum Studies

Mzuzu University
Private Bag 201
L u w i n g a
M z u z u 2
M A L A W I

Tel: (265) 01 320 575/722
Fax: (265) 01 320 568
mdolo.mm@mzuni.ac.mw

21st June 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION: MR KERBY MTAWALI

Mr Kerby Mtawali is a registered Master of Education (Teacher Education) Program student at Mzuzu University. He has been cleared by the Mzuzu University Research Ethics Committee (MZUNIREC) to collect data for the research study he is conducting as a requirement for the program.

Kindly assist him accordingly.

Yours faithfully,

Dr Margaret M. Mdolo
Program Coordinator

APPENDIX 29: Consent Letter from the EDMs Office NED

Telephone: +265 1 312 144
+265 1 312 107
Fax: +265 1 312 640

Communications should be addressed to
MINISTRY OF EDUCATION
EDUCATION DIVISION MANAGER (NORTH)
P.O. BOX 133
Mzuzu

Ref No: 1/1

8th August, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: LETTER OF INTRODUCTION: MR. KERBY MTAWALI

This letter serves to introduce Mr Kerby Mtawali, a Master of Education (Teacher Education) student at Mzuzu University.

Mr Kerby Mtawali would like to collect data in schools in the division for research purposes as a partial fulfilment for the award of a Master's Degree in Education. The topic of his research is 'Experiences of Teaching and Learning Selected Geography Topics in Mzuzu City Secondary Schools'.

Authority is hereby granted for Mr Kerby Mtawali to carry out his data collection for his academic research.

Please assist him accordingly.

EDUCATION DIVISION MANAGER
08 AUG 2023
P.O. BOX 133
MZUZU

Yours,

Sam-Hobbie Tembo (PQAO)
For: Education Division Manager (NED)

APPENDIX 30: Informed Consent Form

Mzuzu University Research Ethics Committee (MZUNIREC)

Informed Consent Form for Research in
Partial fulfillment of a master's degree course in Teacher Education

Introduction

I am **Kerby Mndondomeka Mtawali** from **Mzuzu University**. We are researching **experiences of teaching and learning selected geography topics in Mzuzu city secondary school.** This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or of another researcher.

Purpose of the research

The purpose of the research is to analyse the different experiences of teachers and learners in teaching and learning selected geography topics, identify the challenges both teachers and learners face, and suggest the solutions faced in teaching and learning topics in question.

Type of Research Intervention

This research will involve your participation in a group discussion and/or individual interview.

Participant Selection

You are invited to take part in this research because **you hold the right information that is needed for this research**.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate nothing will change. You may skip any question and move on to the next question.

Duration

The research takes place for a period of **10 months**.

Risks

You do not have to answer any question or take part in the discussion/interview/survey if you feel the question(s) are too personal or if talking about them makes you uncomfortable.)

Reimbursements
You will not be provided any incentive to take part in the research.

Sharing the Results
The knowledge that we get from this research will be shared with you and your community before it is made widely available to the public. Following this, we will publish the results so other interested people may learn from the research.

Whom to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact Associate Professor V. Mgomezulu, contact number: 0993962871; email mgomezulu@hotmail.com. Or Mr. Kerby Mndondomeka Mtawali, Mzuzu University, Masters, Teacher Education MEDTE: 0821, contact number: 0884387327; email: mtawalikerby@gmail.com.

This proposal has been reviewed and approved by Mzuzu University Research Ethics Committee (MZUNIREC) which is a committee whose task is to make sure that research participants are protected from harm. If you wish to find out more about the Committee, contact Mr. Gift Mbwele, Mzuzu University Research Ethics Committee (MZUNIREC) Administrator, Mzuzu University, P/Bag 201, Luwinga, Mzuzu 2, Phone: 0999404008/0888641486

Do you have any questions?

Part II: Certificate of Consent

I have been invited to participate in research about **Experiences of Teaching and Learning Selected Geography Topics in Mzuzu City Secondary Schools**.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

If illiterate [1]

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness_____ **Thumbprint of participant**

Signature of witness _____

Date _____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands the research project. I confirm the participant was allowed to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Signature of Researcher: 

Date: 26/june/2023

[1] A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Illiterate that participants should include their thumbprints as well.

APPENDIX 31 A: Questionnaire for Teachers

QUESTIONNAIRE FOR TEACHERS

INTRODUCTORY LETTER TO RESPONDENTS

Dear participant,

Ref: REQUEST FOR YOUR CONCERT TO PARTICIPATE IN RESEARCH

My name is kerby Mndondomeka Mtawali. I am a postgraduate student at Mzuzu University. I have prepared this questionnaire for academic purposes only for the partial fulfillment of a Master of Education in Teacher Education. I am administering this questionnaire to geography teachers only who teach forms 3 and 4.

Participants will not receive money after filling in the questionnaire. You are requested to provide honest answers because your responses are significant in determining the **experiences teachers face in teaching selected geography topics**. Your participation in this study is voluntary, and should you choose to discontinue participating in this study, you may withdraw at any time without prejudice, even after signing the consent form provided to you. It should take approximately 15 minutes to complete this questionnaire. The responses provided on this questionnaire will be used for academic purposes only. In addition, the information received will be confidential. This document will not bear your name or the name of your school.

I would greatly appreciate your participation in this survey. If you consent, you can proceed to give consent below and complete the questionnaire.

For further information, please contact:

Kerby Mndondomeka Mtawali
MEd Student, Mzuzu University, Mzuzu, Malawi
Email: mtawalikerby@gmail.com
Phone: +265 884 387 327 or +265 998 871 802

I have read and understood the information given above and I hereby consent.

Signature: _____ Date: _____

Instructions

- This questionnaire has **3** parts. The first part will ask you for biographic information. The second part has multiple-choice items and the third part has open-ended questions.
- Please attempt all questions provided in this questionnaire

PART A: Biographic Data of the Respondents

Please tick the boxes that correspond with your status

1. What is your highest academic qualification?

(a) MSCE ☐ (b) teaching certificate ☐ (c) diploma ☐ (d) degree ☐ (e) postgraduate ☐

2. For how long have you been teaching geography?

(a) Less than 5 years ☐ (b) 6 -10 years ☐ (c) 11 – 15 years ☐ (d) 16 and above ☐

3. Are you a geography major (a) yes ☐ (b) no ☐

PART B: Experiences of Teaching Selected Geography Topics

Section 1: Teaching Experiences in Map Reading

Please tick the response option that best corresponds to your experiences in teaching map reading.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A) 5 = Strongly Agree (SA)

S/N	STATEMENT	SD	D	N	A	SA
4	It is easy to teach map reading using topographical maps	1	2	3	4	5
5	It is simple to teach map distance measurement	1	2	3	4	5
6	It is easy to teach gradients on a map	1	2	3	4	5
7	It is simple to teach cross-sections	1	2	3	4	5
8	It is easy to teach map reduction and enlargement	1	2	3	4	5
9	Learners performed well in their practical exercises on map reading	1	2	3	4	5

Section 2: Teaching experiences in statistical methods

Please tick the response that best corresponds to your experience in teaching statistical methods in geography.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
10	It is simple to teach means	1	2	3	4	5
11	It is simple to teach deviations	1	2	3	4	5
12	It is easy to teach bar graphs	1	2	3	4	5
13	It is easy to teach age sex graphs	1	2	3	4	5
14	Learners performed well in their practical exercises on statistical methods.	1	2	3	4	5

Section 3: Teaching experiences in continental drift and plate tectonics theory

Please tick the response that best describes your experience in teaching continental drift and plate tectonic theory.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
15	It is easy to teach the Continental Drift Theory	1	2	3	4	5
16	It is easy to teach Plate Tectonics Theory	1	2	3	4	5
17	It is simple to teach the formation of the mid-oceanic ridge	1	2	3	4	5
18	It is simple to teach the formation of geological features along plate boundaries	1	2	3	4	5
19	Learners performed well in Plate Tectonics and Continental Drift Theory exercises	1	2	3	4	5

Section 4: Teaching experiences in riverine and coastline features

Please tick the response that best corresponds to your experience in teaching riverine and coastline features.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A) 5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
20	It is simple to teach riverine features	1	2	3	4	5
21	It is easy to teach coastline features	1	2	3	4	5
22	It is simple to teach coastline features like erosional coastline.	1	2	3	4	5
23	It is easy to teach the identification of coastal features on a topographical map	1	2	3	4	5
24	Learners performed well after giving them an assessment of riverine and coastline features.	1	2	3	4	5

Section 5: Teaching experiences in geographic information systems

Please tick the response that best corresponds to your experience in teaching Geographic Information Systems (GIS).

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A) 5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
25	It is easy to teach satellite images	1	2	3	4	5
26	It is simple to teach how to recognise information from satellite images	1	2	3	4	5
27	It is simple to teach the interpretation of information from GIS	1	2	3	4	5
28	It is easy to teach the manipulation of software components of GIS.	1	2	3	4	5
29	Learners performed well in a GIS exercise.	1	2	3	4	5

PART C: Challenges Teachers Face in the Teaching of Selected Geography Topics

Section 1: Map Reading

30. List two challenges you faced in teaching map reading.

_____

_____

31. Briefly explain how the challenges in map reading can be resolved.

_____

_____

Section 2: Statistical Methods

32. List two challenges you faced in teaching statistical methods in geography.

_____

_____

33. Briefly explain how the challenges in teaching statistical methods can be resolved.

_____

_____

Section 3: Teaching Experiences in Continental Drift and Plate Tectonics Theory

34. List two challenges you faced in teaching continental drift and plate tectonics theory.

_____

_____

35. Briefly explain how the challenges in teaching continental drift and plate tectonics can be resolved.

_____

_____

Section 4: Teaching experiences in riverine and coastline features

36. List any two challenges you face in teaching riverine and coastline features.

_____

_____

37. Briefly explain how the challenges in teaching riverine and coastline features can be resolved.

_____

_____

Section 5: Teaching experiences in geographic information systems (GIS)

38. List any two challenges you face in the teaching of GIS.

_____

_____

39. Briefly explain how the challenges in teaching GIS can be resolved.

_____

_____

Thank you for participating in the study

APPENDIX 33 B: Questionnaire for Learners

QUESTIONNAIRE FOR LEARNERS

INTRODUCTORY LETTER TO RESPONDENTS

Dear participant,

Ref: Ref: REQUEST FOR YOUR CONCERT TO PARTICIPATE IN RESEARCH

My name is kerby Mndondomeka Mtawali. I am a postgraduate student at Mzuzu University. I have prepared this questionnaire for academic purposes only for the partial fulfillment of a Master of Education in Teacher Education. I am administering this questionnaire to form 4 geography learners only.

Participants will not receive money after filling in the questionnaire. You are requested to provide honest answers because your responses are significant in determining the **experiences learners face in learning selected geography topics**. Your participation in this study is voluntary, and should you choose to discontinue participating in this study, you may withdraw at any time without prejudice, even after signing the consent form provided to you. It should take approximately 15 minutes to complete this questionnaire. The responses provided on this questionnaire will be used for academic purposes only. In addition, the information received will be confidential. This document will not bear your name or the name of your school.

I would greatly appreciate your participation in this survey. If you consent, you may proceed to give consent below and complete the questionnaire.

For further information, please contact:

Kerby Mndondomeka Mtawali
MEd Student, Mzuzu University, Mzuzu, Malawi
Email: mtawalikerby@gmail.com
Phone: +265 884 387 327 or +265 998 871 802

I have read and understood the information given above, and I hereby consent and accept.

Signature: _____ Date: _____

Instructions

- This questionnaire has **3** parts. The first part will ask you for biographic information. The remaining part has multiple-choice items and the third part has open-ended questions.
- Please attempt all questions in this questionnaire

PART A: Biographic Data of the Respondents

Please tick the boxes that correspond to your status

4. What is your gender? (a) Female ☐ (b) Male ☐

PART B: Experiences of Learning Selected Geography Topics

Section 1: Learning Experiences in Map Reading

Please tick the response options that best correspond to your learning experiences in map reading.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
2	I can calculate the actual distance from the map	1	2	3	4	5
3	I know how to calculate the gradient.	1	2	3	4	5
4	I can make cross-sections.	1	2	3	4	5
5	I can reduce and enlarge maps.	1	2	3	4	5
6	I am able to calculate the area of a map.	1	2	3	4	5

Section 2: Learning Experiences in Statistical Methods

Please tick the response that best corresponds to your experience in learning statistical methods in geography.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
7	I am able to calculate the mean.	1	2	3	4	5
8	I can calculate the deviation.	1	2	3	4	5
9	I know how to make histograms.	1	2	3	4	5
10	I can make age-sex graphs.	1	2	3	4	5

Section 3: Learning Experiences in Continental Drift and Plate Tectonics Theories

Please tick the response that best corresponds to your experience in learning continental drift and plate tectonic theory.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
11	I am able to explain the continental drift theory.	1	2	3	4	5
12	I can explain the plate tectonics theory.	1	2	3	4	5
13	I know the formation of the mid-oceanic ridge.	1	2	3	4	5
14	I can explain the formation of geological features formed along plate boundaries.	1	2	3	4	5

Section 4: Learning Experiences in Riverine and Coastline Features

Please tick the response that best corresponds to your experience in learning riverine and coastline features.

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

S/N	Statement	SD	D	N	A	SA
15	I am able to explain coastline features	1	2	3	4	5
16	I can explain the term riverine feature	1	2	3	4	5
17	I can explain the formation of an erosional coastline	1	2	3	4	5
18	I am able to identify coastal features on a topographical map	1	2	3	4	5

Section 5: Learning Experiences in Geographic Information Systems (GIS)

Please tick the response that best corresponds to your experience in learning Geographic Information Systems (GIS).

Key: 1 = Strongly disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A)

5 = Strongly Agree (SA)

NOTE: you can skip if you did not learn this topic

S/N	Statement	SD	D	N	A	SA

19	I can explain the term geographic information system GIS.	1	2	3	4	5
20	I know how to interpret information from geographical information systems.	1	2	3	4	5
21	I am able to manipulate GIS software competently.	1	2	3	4	5
22	I can recognise information from satellite images	1	2	3	4	5

PART C: Challenges Learners Face in Learning Selected Geography Topics

Section 1: Map Reading

23. List two challenges you faced in map reading.

_____

_____

24. Briefly explain the resources that you used in the topic of map reading

_____

_____

Section 2: Statistical Methods

25. List any two challenges you faced in learning statistical methods in geography.

_____

_____

26. Briefly explain the resources that you used on the topic of statistical methods in geography.

_____

_____

Section 3: Continental Drift and Plate Tectonics Theory

27. List any two challenges you faced in learning continental drift and plate tectonics theory.

_____

_____

28. Briefly explain the resources you used to learn continental and plate tectonics theory.

_____

_____

Section 4: Teaching Experiences in Riverine and Coastline Features

29. List any two challenges you faced in learning riverine and coastline features.

_____

_____

30. Briefly explain the resources you used to learn riverine and coastline features.

_____

_____

Section 5: Teaching Experiences in Geographic Information Systems

31. List any two challenges you faced in the learning of GIS.

_____

_____

32. Briefly explain the resources that you used in the learning of the topic of GIS.

_____

_____

Thank you for participating in the study

APPENDIX 33 C: Interview Guide

QUALITATIVE RESEARCH INTERVIEW GUIDE

Based on the teaching experiences analysis, most of you teachers are comfortable in teaching the topics, but it seems the learning experiences of the learners are contrary, what could be the cause of this. (map reading, statistical methods in geography, continental drift and plate tectonics theory, riverine and coastline features, and geographic information systems (GIS)).