ASSESSMENT OF GEOGRAPHY STUDENTS' MAP READING AND INTERPRETATION SKILLS, AND THE CONTRIBUTING FACTORS: A CASE OF THREE SCHOOLS IN MASERU, LESOTHO

By

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DECLARATION

I, Mphekeleli Johannes Besele, hereby affirm the following:

This dissertation is solely the result of my own efforts, and it has not been previously submitted to any other academic institution.

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SUPERVISOR'S STATEMENT

This dissertation has been submitted with/without my approval

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ABSTRACT

The primary objective of this study was to evaluate the map-work skills of Geography students with the intention of identifying their strengths and weaknesses. By understanding each student's capabilities and limitations, teachers can offer more effective assistance. Furthermore, the study aimed to investigate the factors influencing students' map reading and interpretation abilities. To accomplish this, Fischer's Skill Theory was employed as a theoretical framework. The research adopted a mixed methods approach involving Grade 11 Geography students and their teachers.

Three secondary schools were selected using convenience sampling, while the students and teachers were chosen through purposive sampling. The study employed two methods for data collection: a map-work test to measure student achievement and semi-structured interviews. Descriptive statistics were applied to analyse the data obtained from the map-work test, while thematic analysis was used for the qualitative data derived from the interviews.

The study's findings unveiled that students from the selected schools demonstrated knowledge in utilising map keys, grid referencing, interpreting contour lines for gradient assessment, and understanding contour intervals. Predominant errors were observed in calculating bearings, slope gradients, and interpreting map keys. The research further identified that students' skills were hindered by factors such as inadequate availability of maps and question papers, insufficient teacher scaffolding support, and limited practice opportunities.

Teacher interviews highlighted the challenges faced in enhancing students' map-work skills, including students' lack of motivation, scarcity of maps and question papers, and the demanding Geography syllabus to be covered within a restricted timeframe. Consequently, the study recommends that the Ministry of Education in Lesotho provide schools with diverse topographic maps. Collaboration between school principals and the ministry is advised to facilitate teacher participation in workshops focused on strategies for effectively covering the extensive syllabus in a limited timeframe.

LIST OF ABBREVIATIONS

B.Ed.	Bachelor of Education
DV	Dependent Variable
ECOL	Examinations Council of Lesotho
GPS	Global Positioning System
HE	Horizontal Equivalence
IV	Independent Variable
M.A.Ed.	Master of Arts in Education
MOET	Ministry of Education and Training
MV	Moderating Variable
SADC	Southern African Development Community
SAT	Student Achievement Test
TLR	Teaching and Learning Resources
VI	Vertical Interval

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CHAPTER ONE

BACKGROUND AND RATIONALE FOR THE STUDY

1.1 Introduction

This chapter serves as the introductory section of this report, marking its outset. Its primary purpose is to elucidate the justification behind undertaking this research. Furthermore, it delineates the set objectives and research inquiries that steered the data collection process within the three chosen schools. Concluding this chapter is an outline detailing the overarching organisation and structure of the entire report. Subsequent to this introduction, the subsequent chapter delves into the study's background.

1.2 Background of the study

Geography is defined by Ünlü (2011) as the study of the Earth and its components. Moreover, Geography is the most relevant subject in the school syllabus, equipping learners with an understanding of the spatial relationships between Earth's features (Filgona, Filgona & Sebaba, 2016). In recent years, as technology has become integrated into nearly every aspect of life, developments have exponentially increased, providing mankind with modernized tools such as Global Positioning Systems (GPS). GPS serves similar purposes as topographic maps, making the teaching and learning of map work more crucial than ever. Secondary schools impart skills that are applicable to GPS and remote sensing (Mohamed et al., 2015). Consequently, topographic maps are extensively used in school geography to effectively teach spatial patterns, enabling learners to comprehend the distribution of phenomena on Earth's surface (Falode et al., 2016). It can be concluded that finding a school offering Geography education without map work in the syllabus is impractical.

Special attention is not solely given to understanding relationships among Earth's features, but also to developing competencies and skills for pupils' survival and a country's economic growth (Madiwalar, 2012). Thus, Geography fosters skills such as research, problem-solving, observation, drawing, and data interpretation (Ünlü, 2011). These skills are essential for comprehending the intricate spatial patterns of the world and are evaluated through the use of maps and insets in examinations.

Despite its etymological definition, a map is characterized as an abstracted and generalized scaled representation of a part of the Earth (Aksoy & Selman, 2020; Albert, Ilyés, Kis, Szigeti, & Várkonyi, 2016; Kumar & Vakkil, 2020). From my perspective, a map is a graphically organized representation of the Earth's surface, aiding in understanding the spatial distribution of physical and human phenomena as seen from space.

In many countries, including Lesotho, schools assess geographic knowledge using two examination papers: Paper I (which includes map reading) and Paper II, where learners select questions to answer (Falode et al., 2016). In Paper I, candidates are required to interpret a provided map to answer questions based on it. The Lesotho Grade 9 Geography syllabus recommends developing skills based on resources, with maps being among them (MOET, 2020).

To be more specific, the syllabus emphasizes the development of map reading and interpretation skills, including:

- Extracting information from maps
- Recognizing symbols
- Reading heights at (and between) contours
- Measuring straight and winding distances
- Using grid references
- Identifying simple geographical relationships
- Relating maps to photographs and other sources of information
- Orienting in the field
- Calculating map area
- Identifying concave and convex slopes
- Forming generalizations from map data
- Recognizing the comparative limitations of maps for different purposes (MOET, 2020)

Furthermore, assessment is based on the reading and interpretation of the 1:50,000 and 1:25,000 topographic maps from SADC. Learners are evaluated on their ability to:

- Describe a map, read, and accurately interpret conventional symbols used in the map
- Locate places using 4 & 6 figure grid references
- Draw maps to show geographical features using symbols

- Measure distance and calculate area using scale
- Use instruments to measure distance and calculate bearing
- Give direction in terms of 16 points compass and compass bearing
- Locate places and features on a map using a coordinate reference system and 4 & 6 figure grid references
- Interpret ground, aerial, and satellite images (MOET, 2020).

The Lesotho Grade 10 Geography syllabus also includes the reading and interpretation of topographic maps. Learners are assessed on their ability to interpret different landforms using contours, use contours and conventional signs to describe relief, land-use, and human activities (MOET, 2019). Thus, it is clear that map work plays a significant role in the teaching and learning of Geography.

Despite map work being fundamental to Geography education globally, it is disheartening to note that students' performance in this area during external examinations is rarely outstanding (Aksoy & Selman, 2020). Poor performance in map work can be attributed to various factors, including acquired skills and learners' attitudes toward provided resources (Aksoy & Selman, 2020). The international scenario regarding students' performance in resource-based questions is generally unsatisfactory. Illustrative examples are provided in the following paragraphs.

India is evidence of the claim that resource communication poses the greatest difficulty in examinations. Kumar and Vakkil (2020) state that Indian students lack the skills to decode messages from resources, particularly maps. Consequently, this deficiency continues as learners move on to higher education without proper map interpretation skills (Kumar & Vakkil, 2020). This issue is exacerbated when these students become Geography teachers without adequate map reading and interpretation skills.

Similarly, Erol (2017) discovered that learners' map literacy in Turkey is at an intermediate level; they struggle to practically use maps. According to Erol (2017), learners merely memorize lessons, creating a barrier when they need to apply skills to decode messages from provided resources.

Additionally, poor performance in Geography by Nigerian students raises concerns about Geography's future in the school curriculum. Despite efforts by in-service teachers to effectively

teach geography in Nigerian secondary schools, the outcomes remain unsatisfactory. Learners struggle with map reading and resource interpretation (Falode et al., 2016).

Furthermore, South Africa and Lesotho face similar problems. According to Kwashi et al. (2019), South Africa's Grade 12 final examinations show poor performance in Geography, especially in map work. The authors found that candidates often couldn't identify map features or interpret photos (inserts)

1.3 Problem statement

The issue of poor performance in map work is widespread in Lesotho's secondary schools. According to ECOL's examiner reports for Geography in the years 2018, 2019, and 2021, map reading and interpretation skills, along with insert interpretation, continue to be areas of significant concern. Students face challenges in comprehending and interpreting provided resources, resulting in below-par scores that adversely affect their overall performance in Geography.

As previously discussed, map reading holds a fundamental role in Geography education across various countries, including Lesotho. However, ECOL's examiner reports over the past three years reveal that students from Lesotho who participated in these examinations struggled with map reading and questions based on inserts. Consequently, their inability to achieve high scores negatively impacts their overall grades.

The literature lacks a comprehensive understanding of the skills and contributing factors that lead to poor performance in map reading and insert interpretation among secondary school students in Lesotho. Nonetheless, a few studies suggest that inadequate resources and substandard teacher quality contribute to ineffective education in Lesotho (Bitso, 2012; Phosisi, 2019; Selepe, 2016).

Makahalanye (2021) conducted a study investigating teachers' perspectives on the factors contributing to students' inadequate performance in map reading and interpretation. The findings highlighted that teachers believed several factors, including resource shortages, student attitudes, and a lack of technological tools in schools, contributed to their students' struggles with map work. However, this study solely focused on teachers' viewpoints and did not provide a comprehensive understanding of the actual dynamics involved in teaching map reading and interpretation. Research by Finn et al. (2014), Ramos et al. (2013), Banik and Kumar (2019) suggests that skills have a direct impact on academic performance.

While no existing study appears to address the proficiency levels of Basotho students in map reading, there is a valid justification for investigating these skills. Assessing students' map reading skills can reveal their strengths and weaknesses, pinpointing areas where learners may require assistance (weaknesses) and areas where skills should be further cultivated (strengths). Furthermore, delving into additional factors that influence students' skill levels, such as resources, teaching methods, map characteristics, and students' emotional well-being, is essential for educators to understand how these elements influence students' performance in map reading.

1.4 Objective of the study

The main focus of the study was twofold: to evaluate the skills of Geography students and to delve into the factors influencing their proficiency in map reading. This overarching goal was further divided into the following specific objectives:

- To compare the skills of Geography students with the necessary map reading and interpretation skills.
- To examine students' perspectives on the factors that influence their competence in map reading.
- To explore the opportunities that teachers have to enhance students' abilities in map reading and interpretation.

To accomplish these objectives, the researcher formulated the subsequent research questions:

1.5 Research questions:

1. How do the skills possessed by Geography students compare with the required map reading and interpretation skills?
2. What do learners perceive as the factors affecting their skill level in map reading and interpretation?
3. What opportunities are available for the teachers to develop students’ map reading and interpretation skills?

1.6 Significance of the study

The study holds potential significance across various dimensions. As established in the rationale for this research, educators can effectively assist their students only when they possess a clear understanding of each learner's strengths and weaknesses. Furthermore, their ability to implement interventions is enhanced when they are informed about the factors influencing map skill levels.

Therefore, I anticipate that the conclusions and recommendations regarding students' skills, coupled with insights into the factors impacting their proficiency, can aid Geography teachers in devising strategies to support and motivate learners during map work instruction. Additionally, these findings can encourage teachers to reflect on their teaching methods and ascertain whether they align with educational objectives.

Moreover, this study could offer valuable insights to examiners. They can utilize its outcomes as a pivotal guide when crafting map work question papers, discerning what to include or exclude. It is my aspiration that the findings will furnish curriculum designers with informative insights while developing the Geography syllabus. Lastly, these conclusions might prove advantageous to the learners themselves, as the study serves as a reflection of their learning journey. Consequently, they can identify areas in map reading that warrant further attention and improvement.

1.7 Limitations of the study

Limitations refer to factors that could potentially affect the data generation process. Throughout the data collection phase of this study, certain challenges arose. Initially, teachers from School A and School B exhibited reluctance to grant permission for the research, apprehensive that it might be interpreted as an attempt to pinpoint their weaknesses. However, after a clear explanation of the study's nature and its ethical considerations, they eventually agreed to participate, albeit with some delay. Likewise, students at School C appeared eager to expedite the interviews so they could head home, which led to reservations about sharing exhaustive information.

1.8 Delimitation of the study

The research aimed to evaluate the map reading and interpretation skills possessed by Geography students, uncovering both their strengths and weaknesses. Furthermore, the study sought to explore the underlying factors influencing the skill levels of learners in map reading. While there may exist other factors impacting students' map reading and interpretation abilities, the current study focused exclusively on students' motivation or attitude, the clarity of test items, map design, teaching and learning practices, and the availability of resources. Fischer's Skill Theory, the guiding framework for this study, posits that investigating these factors is essential for comprehending the reasons behind students' performance levels.

Additionally, the researcher conducted interviews with Geography teachers to identify opportunities accessible to them for enhancing students' map reading and interpretation skills.

With this objective in mind, the study primarily adopted a mixed methods approach and was carried out with Grade 11 Geography learners and their teachers from three selected secondary schools in Maseru, Lesotho. These schools were chosen based on convenience and are public institutions.

1.9 Assumptions of the study

At the outset of this research, it was presupposed that Grade 11 Geography students had received instruction in map reading and interpretation during Grade 9, as stipulated by the syllabus. Furthermore, it was taken for granted that the Geography teachers in these schools were qualified educators. Lastly, the assumption was made that the information provided by the participants was accurate and unaffected by personal biases.

1.10 Definitions of significant terms

This section covers a brief description of key terms as operationally employed in the study.

1.10.1 Assessment

Assessment can be defined in multiple ways by different people and institutions. Yet in educational terms, assessment is defined as the process of gathering information from students' activities in order to deeply understand what students know, understand, and can do with the knowledge they gained from their educational experiences (Amua-Sekyi, 2016; Tontus, 2020). In expansion, Tontus (2020) further define assessment as the evaluation of the program and effectiveness of educational activities. In this study, assessment is employed to denote making judgments about a phenomenon and subsequently drawing conclusions.

1.10.2 Skill

For Zhang (2020), skill is defined as the learned ability to achieve the pre-determined results with maximum certainty. In addition, the concept 'skill' can be used to denote the high-level performance found in aspects of life such as games, arts, athletics, work, and professional practices (Rugby & Sanches, 2016; Zhang, 2020). Thus, the concept 'skill' is operationally used to denote the ability to perform a task proficiently.

1.10.3 Affect

Affect as the verb means 'to influence' or 'bring about'. When used as a noun, it means 'consequence' or 'result' (Enquist & Oates, 2013). According to Ott (2017), affect can also be

used to mean an intensive force that things/bodies exert on others, increasing or decreasing their capacities. In this study, I use 'affect' to indicate the impact on or influence over something.

1.10.4 Contribute

In an attempt to provide clarity about the word 'contribute', Leinder (2020) defines contribution as the addition of a something/moderator to an existing phenomenon. Therefore, the term 'contribute or contributing' is operational employed in this study as 'adding something to an existing phenomenon'.

1.10.5 Influence

To influence is to have an impact on the behaviors, attitudes, goals, and choices of others [Hall, 2007). In addition, the term 'influence' can be defined as the act of motivating or encouraging an institution, orgainisation, person to behave in a certain way (Juma & Sitienei, 2020). In this paper, influence signifies the process of affecting or guiding something to occur in a specific manner.

1.10.6 Academic performance

This the term used to mean knowledge gained by the students, which is normally assessed by the teacher or examiner at a particular point in time. It is the level of attainment by the students in an academic process (Kumar, Agawal, & Agawal, 2021). For Ampofo and Osei-owusu (2015), academic performance is the multidimensional construct composed of attitudes, behaviours, and skills which unfold the students' level of performance as they progress or complete their school experiences.

1.10.7 Map-work

While a map is defined as symbolized representation of some features of the earth as seen from space (Lapaine et al., 2021), map-work is operationally employed to mean the activities related to utilizing such maps.

1.11 Structure of the Study

This study comprises six chapters, each serving a distinct purpose. Below is a synopsis of each chapter's content.

1.11.1 Chapter One: Background and Study Overview

The initial chapter provides an introduction and orientation to the research. It outlines the study's background, problem statement, research objectives, research questions, significance, limitations, and delimitations. Additionally, the chapter offers an outline of the subsequent chapters.

1.11.2 Chapter Two: Literature Review

The second chapter, divided into three sections, delves into Fischer's Skill Theory and its relevance to this study. It reviews existing literature concerning students' map reading and interpretation skills, highlighting the study variables' relationships. Moreover, it addresses empirical research gaps within this domain.

1.11.3 Chapter Three: Research Design and Methodology

The third chapter explains the research methodology employed for data generation and analysis. It discusses the mixed methods approach, pragmatism paradigm, sequential explanatory mixed methods design, and sampling methods. Data collection tools, such as student achievement tests and semi-structured interviews, are outlined. Data analysis techniques and ethical considerations are also elaborated upon.

1.11.4 Chapter Four: Data Presentation and Analysis

Chapter four presents and analyzes data from the map-work test and interviews conducted with Grade 11 Geography students and teachers. The research questions guide the analysis. Test results are summarized with tables and charts, while interview findings are thematically discussed with supporting quotes.

1.11.5 Chapter Five: Discussion of Findings

In this chapter, the study's results are discussed, validating Fischer's Skill Theory and related literature. Findings are compared with empirical research to identify convergence and divergence regarding students' map reading and interpretation skills.

1.11.6 Chapter Six: Summary, Conclusions, and Recommendations

The final chapter offers a summary of the entire study and draws conclusions based on the research findings. Recommendations for various stakeholders are provided, alongside suggestions for further research.

1.12 Chapter Summary

This chapter provided an orientation to the study, addressing its background, problem statement, objectives, and significance. Definitions of key terms were presented, and an outline of the dissertation structure was provided. The chapter concluded by emphasizing the aim of assessing Grade 11 Geography students' map reading and interpretation skills and investigating factors affecting their map-work abilities. The upcoming chapter will delve into the literature on students' map reading and interpretation skills and the theoretical framework employed.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The preceding chapter addressed the rationale behind conducting this research, as well as the study's objectives and research questions. It also outlined the organization of chapters within the study. Consequently, this chapter is dedicated to elucidating the variables underpinning this study. Additionally, it elucidates the theoretical framework employed in conducting this research, while also underscoring the gaps present in empirical literature concerning this topic. Thus, this chapter is structured into three sections. The initial section centres on the theory that guides the study, the second section explicates the explanation and interrelation of study variables, and the final section scrutinizes the empirical literature, identifying gaps to be addressed. Subsequently, the discussion delves into the theory that provided the guiding framework for this research.

2.2 Theoretical underpinnings

The application of theories is relevant across various stages of both quantitative and qualitative research processes, including providing a rationale for the study, defining research aims and questions, determining methodological approaches, designing data collection tools, guiding data analysis and interpretation (Stewart & Klein, 2016).

The present study is grounded in Fischer's Skill Theory, serving as a conceptual foundation for the study's rationale rather than its methodology. Fischer's Skill Theory encompasses concepts employed as perspectives for developing and assessing skills in specific situations. Within this framework, skill is characterized as an individual's capacity to regulate cognitive, emotional, and behavioral aspects within a given environment (Fischer, 1980). This environment encompasses various elements such as objects, events, tasks, testing procedures, content, practice, and familiarity (Fischer, 1980). In essence, skill represents an individual's ability to act in an organized manner, influenced by the context in which those skills were cultivated (Fischer & Bidell, 2007).

While Skill Theory builds upon Piaget's stages of cognitive development, it introduces a distinction between skill levels rather than stages. Fischer proposes that skills progress through different levels, implying that an individual's performance cannot be uniform across all contexts and circumstances (Fischer, 1980). The varying factors that influence performance include emotional

state, task complexity, practice, familiarity, and contextual support (Fischer, 1980). A core tenet of Skill Theory is that an individual, at any developmental stage, can perform at either a functional or optimal level.

The functional level denotes an individual's routine or typical performance, while the optimal level signifies their highest performance under ideal conditions (Authurs et al., 2021). Motivation influences whether an individual performs at a functional or optimal level. Similarly, the complexity of the task impacts skill application; if a task is too intricate and lacks support or practice, optimal performance might not be attainable. Conversely, optimal performance is achievable when an individual is developmentally suitable, holds a positive attitude toward the task, the task's complexity is manageable, and there's consistent support and practice (K. Fischer & Fischer, n.d.; King & Vanhecke, 2006).

Considering these tiers outlined by Skill Theory, the study focuses on Grade 11 learners who possess the capability to engage with map reading, analysis, and interpretation tasks. These map-related skills are developed in prior grades, aligning with the study's context. Fischer's Skill Theory also underscores the importance of considering both the assessment context and the environment in which skills are cultivated when evaluating skill levels in children (Authurs et al., 2021; Mascolo, 2015).

Consequently, this study delved into contextual factors that potentially influence learners' skill levels. Factors such as map characteristics (design), learners' attitudes and motivations, teaching and learning practices (contextual support, practice), and the impact of map-related resources were investigated. Other factors affecting map reading and interpretation skills were also explored within the findings.

In essence, when assessing map reading and interpretation skills, this study examined contextual or environmental factors and correlated them with skill levels as delineated by Skill Theory. Both sets of data – test scores and interview responses – were analyzed and interpreted alongside Skill Theory's concepts to derive meaningful and well-informed conclusions about Grade 11 learners' map reading and interpretation skills.

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2.3 Conceptual background

2.3.1 Skill Definition and Types

The concept of "skill" can be defined in various ways depending on the context in which it is studied. For instance, Balcar (2016) elaborates on the concept of skill within the context of the labour market, characterising it as the capacity to proficiently and adaptively execute intricate and well-organised task patterns in order to achieve a specific objective. Balcar (2016) perceives "skill" as an individual's capability to complete tasks within a defined work environment, allowing for adaptation to different situations to yield results.

From a different standpoint, Wats (2009) and OECD (2019) approach the definition of skills from an epistemological angle. In their conceptualisation, Wats (2009) and OECD (2019) extensively permeate into skills as the knowledge an individual possesses and can utilise to meet the requirements of a given task. They position knowledge as a central element in defining a "skill," with Wats (2009) highlighting that task-related knowledge empowers one to carry out that specific task. Based on Wats' (2009) skill definition, it can be inferred that "knowledge" forms a foundational element for possessing an "ability."

These authors (Wats, 2009; OECD, 2019) tend to define skill in terms of qualities or attributes that an individual possesses and can leverage to achieve desired outcomes. Therefore, it might seem appropriate to define a "skill" as the capacity to accomplish a particular task. However, even from this definition, it is not entirely clear which capabilities are being considered to ascertain an individual's possession of a skill. Consequently, several scholars (Balcar, 2016; Dixon et al., 2010; Sida, 2018; Sopa et al., 2020; Wats, 2009) have further refined the concept of skill by categorising it into two primary types: soft skills and hard skills.

According to Sopa et al. (2020), soft skills pertain to knowledge rooted in an individual's emotions, values, and ideas. Additionally, Sopa et al. (2020) assert that soft skills reside within the human mind and are only evident in personal interactions. Similar viewpoints are shared by Wats (2009), who broadly characterizes soft skills as behaviours and traits possessed by employees unconsciously. This latter definition prompts further exploration of the specific behaviours and traits encompassed by soft skills. Consequently, (Dixon et al., 2010; Zhang 2012; Balcar 2016; Asbari et al., 2020) identify abilities such as communication, relationship-building, collaboration, and planning as indicators of soft skills.

While soft skills primarily involve an individual's personal and internalised attributes, hard skills are technical in nature and can be objectively measured (Dixon et al., 2010). Accordingly, hard skills can be described as the external and observable attributes of an individual. Additionally, Sopa et al. (2020) define hard skills as capabilities that yield direct and visible outcomes. In contrast, soft skills contribute to behaviours, whereas hard skills are the behaviours themselves (Wats, 2009; Asbari et al., 2020). In this context, it can be argued that soft skills play a role in shaping the development of hard skills, and in order to distinguish between the two, hard skills must be systematised to facilitate their identification as they manifest.

Considering the definitions of skills put forth by (Balcar, 2016; Zhang 2012; Asbari et al., 2020), it becomes evident that "skills" can be acquired traits. The distinction lies in the fact that soft skills are closely tied to an individual's values and ideas when performing a task, while hard skills manifest as observable behaviours aimed at achieving outcomes (Wats, 2009). In my perspective, soft skills build upon hard skills. In the current study, the researcher aimed to evaluate the hard skills of Geography students, specifically their competence in map reading tasks. Consequently, the ability to achieve the desired objective was regarded as an "attained or present skill," whereas the inability to achieve the desired outcome was categorised as "lack of skill."

2.3.2 Skills required for effective map reading and interpretation

For Unlu (2011) and Havelkova and Hanus (2019), map skills are defined in broader terms and they are built by sub skills associated with the use of maps. While map skills cut across four phases of skills (map reading, map analysis, map interpretation, map drawing), map reading and interpretation skills require familiarity with map key/legend which explains use of symbols, grid references, compass direction, map title, and distance estimation (Havelkova & Hanus, 2019; Ünlü, 2011). Figure 1 below shows the distribution of map skills.

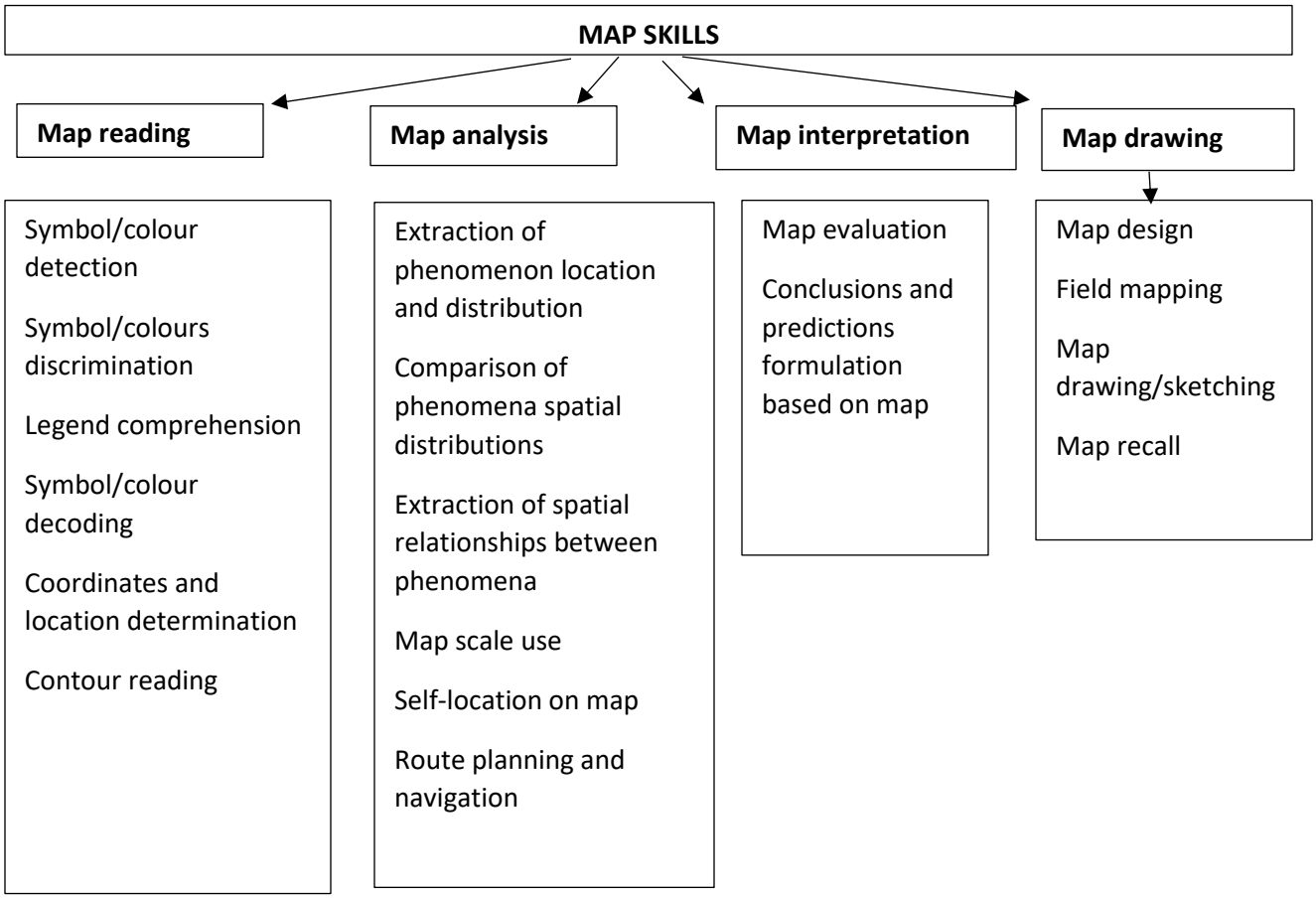


Figure 1: Map skills and sub skills

Source: Havelkova and Hanus (2019)

On the one hand, map reading skills include symbol/colour detection, symbol/colours discrimination, legend comprehension, symbol/colour decoding, coordinates and location determination, and contour reading (Arthurs et al., 2021). On the other hand, map analytic skills include extraction of phenomenon location and distribution, comparison of phenomena's spatial distributions, extraction of spatial relationships between phenomena, map scale use, self-location on map, route planning and navigation (Albert, Ilyés, Kis, Szigeti, & Dávid, 2016). The two listed sub skills are map interpretation and map drawing. Map interpretation skills include map evaluation, conclusions, and predictions formulation based on map. Lastly, skills required for map drawing are map designing skills, field mapping, map drawing/sketching, and map recalling.

Maps contain lines with various colours and symbols. The ability to recognise and evaluate the meaning of those symbols is considered a map reading skill (Unlu, 2011). In most cases the symbols will be explained in the map's key or legend. As such, students need to know or familiarise themselves with the legend in order to understand the meaning of symbols and colours. In addition, map key plays an import role in map reading as it explains features encoded in the map. If the learner does not know how to use a legend or key (s)he will not be able to locate places or features portrayed in the map (Albert et al., 2016).

In some instances, the learners may be asked to locate a certain feature or place on a map. This may be done with the use of map key and through grid references or compass direction (Danjuma et al., 2017). Therefore, it is important that the learners develop locational skills in terms of grid references and compass direction (Lingwal et al., 2020). What is more, students may be asked to calculate distance between certain features on a map. To do so, students should first be able to find those features by using map key or legend, then they will be able to measure the distance between the two points of interest. However, an ability to calculate distance using map scales is an import map reading skill to perform such calculations (Uyar et al., 2022).

Contour reading is considered a component of map reading skills. Topographic maps often include contour lines with measurements. The learners may be asked to calculate the difference between contour lines (gradient of the slope) on to evaluate the altitude of a certain feature using contour line. Therefore, it is important that learners master this skill in order to address the question (Lingwal et al., 2020). Map interpretation also feature in this skill as learners have to interpret and make conclusions about the altitude of the feature or gradient of the slope.

According to Albert et al. (2016), Havelkova and Hanus (2019) and Lingwual et al. (2020), map analysis and interpretation skills often over laps. Map interpretation is made after the learner has applied analytical skills when reading the map and evaluating/decoding messages from the provided map. For example, map scale cuts across map reading, map analysis, and map interpretation. Again, comparing spatial features employs map evaluation skills (Havelkova & Hanus ,2019).

In this study, the focus was primarily on map reading and interpretation skills. Thus, the study assessed students' ability to use of compass points to state direction, accuracy in using grid reference points, ability to calculate bearing, accuracy in measuring and calculating distance

between places using map scale, ability to use map key or legend, ability to judge gradient of the slopes using the proximity of contour lines, ability to calculate the gradient of the slope, ability to read contour interval, and to interpret features as they appear on the map (See Appendix A). Havelkova and Hanus (2019) associate map scale with map analysis and interpretation. For this reason, ability to calculate contour heights or gradient of the slope was also assessed as the component of map analysis and interpretation. The researcher assessed the aforementioned skills because these are the map-work skills assessed in ECOL examinations.

2.3.3 Factors affecting map skill level

A substantive number of studies in literature acknowledge that the students' map skill levels are affected by many factors which can be categorized into map characteristics, user characteristics, teaching and learning habits, and availability of map-based resources.

2.3.3.1 Map characteristics

Articulating on the map characteristics, Gulij (2013) states that the information within a map is amongst the factors that directly affect students' skills in map reading and interpretation. That is, the design of the map in terms of font size, colouring, map symbols size and density, contour lines, amount of road detail within a map can affect the student's ability (optimal performance in skill theory) in reading such a map (Gulij, 2003; Brychtova & Coltekin, 2016). Adding to the list, (Albert & Colledge, 2002) states that information overlays within that particular map can enable or hinder for easy reading of a map.

2.3.3.2 User characteristics

A study carried out by Tasgin and Tunc (2018) found out that positive attitude and motivation can improve student skills in mathematics. According to Tasgin and Tunc (2018), students who eagerly engage in a given task and invest a lot of their time in learning a task are at a higher chance of learning associated skills within the task. Therefore, it can be concluded that the high level of motivation (which can be correlated with positive attitude) encourages a student to go beyond what is required, thus develop extra competencies which they learn during the execution of task. In a map reading context, learners who are willing to frequently practice with maps stand a chance of developing map reading and interpretation skills than learners who dislike frequent use of maps.

2.3.3.3 Teaching and learning habits

According to Dixon et al (2010), hard skills are developed through formal training. Therefore, it is evident that students' map reading and interpretation skills can only be present if learners undergo map reading tasks, supervised by their teacher. In support of this view, Lingwal et al (2020) argue that constant practice and frequent teaching can develop students' skills.

In addition, teachers' knowledge regarding the use of maps can affect students' map reading and interpretation skills. This is because teachers act as the transmitters of knowledge (Lingwal et al., 2020). Therefore, if the teacher lacks knowledge about the properties of a map, it is likely that his or her learners will possess low levels of skills. I opine that in some cases, the teacher may possess knowledge about maps, yet use inappropriate teaching strategies to teach map concepts. This may result in missed learning opportunities and learners may fail the course.

Another factor that contributes to students' skill level is the frequency of map use. According to Albert et al (2016), frequent practice in map work, especially in distance and time estimation, map symbols, identification of places, results in better performance in map reading tasks. The same sentiments are shared by Gokce (2015) who states that practice opportunities, pared with the use technology such as GIS and Google Maps, can add to students' level of skills.

However, Alanazi (2019) is of the view that any learning activity that operates without guided instruction by the teacher may kill learners' motivation in the course. That is, they will feel no sense of belonging and lost as there will be no one helping them synchronise with the course (Alanazi, 2019).

In agreement with Alanazi's (2019) view, I believe that letting learners engage in map-work tasks without proper guidance and interactions with the teacher can result in lack of alignment between the intended curriculum and the attained curriculum. More importantly, this can contribute to student failure rates, inefficient use of skills and resources, and missed opportunities for student growth.

Therefore, constructivism principles such as proximal development, mediation, and scaffolding are necessary for students' growth or mastery of map-work skills. The former is a Vigotsky's (1978) theory which emphasizes that for learners to successfully complete the task, they must be assisted by a more knowledgeable other; in this case the teacher (Daniels, 2015; Gonulal, 2018).

On the same note, scaffolding is a concept emphasized by Bruner (1976) and it is closely related to zone of proximal development as it calls for adaptive and temporary support by the more knowledgeable other in ensuring a smooth educational process that accommodates every student (Gonulal, 2018).

2.3.3.4 Teaching and learning resources

Lastly, resources have been a centre of attention to some researchers who study factors affecting students' academic performance. Teaching and learning resources (TLR) refer to tools or materials that are used by the teachers and learners to support specific learning objectives (Adjei, 2015). In my view, teaching and learning resources can generally be described as teaching aids or tools, and facilities that can be utilized to support students' learning.

For Njore (2019), primary school students and secondary school students often depend on what they see and what they can touch to develop academically. Thus, TLR such as charts, maps, projectors, textbooks, audio-vidual aids can be utilized to advance learning opportunities offered to pupils (Okongo et al., 2015).

In as much as studies done to evaluate the importance of TLR in schools indicate that TLR have a positive effect on students' performance when made available, Adjei (2015) and Njoroje (2019) recognize that the quantity and quality of learning resources in schools is rarely satisfactory and these results in teachers avoiding learner centered methods and sticking to traditional methods such as lecturing. Consequently, the students are denied opportunities to develop and may lack certain skills and deeper understanding of certain concepts.

According to Adjei (2015), TLR do not only help teachers to address the anticipated challenge but also offer enjoyable lessons. The same sentiments are shared by Njoroge (2019) who asserts that TLR make lively classrooms, thereby extending the range of experiences of learning. Therefore, it is evident that teaching and learning without resources results in boring lessons and can influence the students to lose interest in the course. Once the learners get demotivated, they are likely to fail that particular course.

For Gokce (2015), a school that has poor physical infrastructures and lacks maps or other associated materials, experience low performances in map reading tests. Likewise, Lingwal et al

(2020) mentions availability of appropriate textbooks as one of the factors that affect students' map reading and interpretation skills.

In a nutshell, the aforementioned factors that affect students' level of skills illuminate that students will have better level of skills if the map design is easily accessible to every learner, and when the users' emotional state is positive towards map reading. Other factors that significantly impact on skills include resources and learning opportunities for learners to be taught and practice with map symbols, direction, scales, and identification of places using grid references.

2.4 Conceptual framework of the variables

Figure 21 illustrates how the variables used in the present study are connected.

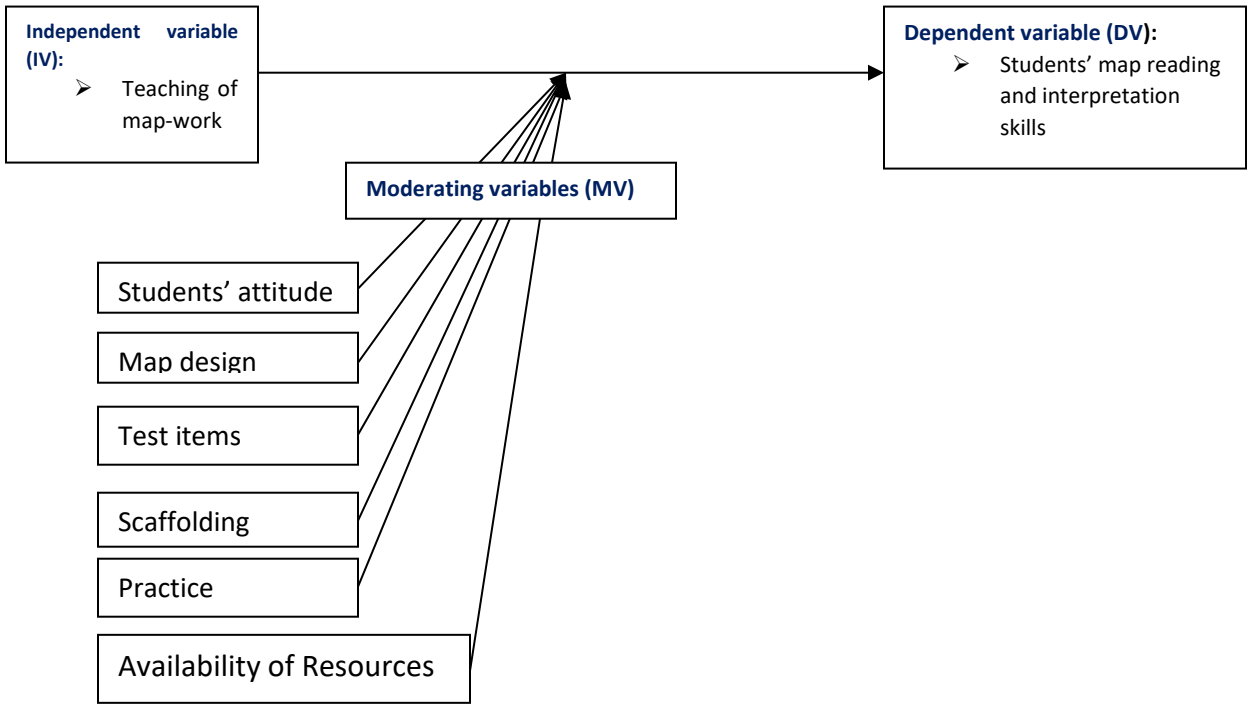


Figure 2: Conceptual framework for variables considered in this study

Figure 2 illustrates the interconnections among the variables utilised in this study. As depicted in the figure, the independent variable (IV) is the instruction of map reading and interpretation. The dependent variable (DV) pertains to students' map reading and interpretation skills, which hinge on whether learners received instruction or not. Lastly, the moderating variables encompass students' attitude, map design, test items, scaffolding, resource availability, and practice. These aforementioned variables possess the capacity to either diminish or enhance the link between the

teaching of map reading and interpretation and students' proficiency in map reading and interpretation skills.

2.5 Empirical literature

The primary objective of the present study was to evaluate the map reading and interpretation skills of Geography students and to examine the factors influencing their skill levels. This section delves into the prior research conducted on this subject. Consequently, the subsequent paragraphs explore the key findings from these studies.

2.5.1 Gáspár Albert et al. (2016)

Gasper Albert and colleagues conducted a study titled 'Testing the Map Reading Skills of University Students.' The study aimed to quantify map reading skills using the outcomes of an online test. The participants in their sample included both current and graduated students from higher education institutions in Hungary, Spain, Austria, Germany, Romania, and Bulgaria. The researchers employed a test that generated scores, consisting of multiple-choice questions and one open-ended question based on provided maps.

The study's findings revealed that participants performed better in questions related to distance and travel-time estimation, interpretation of map symbols, and distance estimation using the scale bar. The results indicated that over 70% of respondents provided correct answers in these areas. Additionally, the authors observed that frequent practice with map use correlated with improved average performance in distance and travel-time estimation, interpretation of map symbols, interpretation of geographic names, and cumulative correct answers.

However, the results also indicated that the lowest performance was evident in questions involving the interpretation of geographic names and topographic objects on the provided maps. Following score analysis, the participants were categorized into three groups: beginners (0-3 correct answers), intermediate (4-6 correct answers), and expert map readers (6 or more correct answers). The beginner group comprised individuals with lower education levels who infrequently used maps. They exhibited the weakest performance in tasks related to using the scale bar, distance estimation, interpreting hypsography and mental rotation, and time estimation.

Conversely, members of the intermediate group engaged with maps on a weekly or monthly basis. They encountered difficulties in tasks like using the scale bar, distance estimation, interpreting hypsography and mental rotation. However, the intermediate group displayed expertise in interpreting geographic names and topographic objects. The expert group, consisting of highly educated individuals who frequently used maps, displayed minimal errors, primarily in the interpretation of topographic names and objects.

Based on the findings of this study by Albert et al. (2015), it becomes evident that practice with maps leads to enhanced performance in distance and time estimation, interpretation of map symbols, and interpretation of geographic names

2.5.2 Uyar, Yayla and Zumber (2022)

Uyar, Yayla, and Zumber (2022) conducted a study focused on the map reading skills of Social Studies pre-service teachers utilising the Many-Facet Rasch Model. Their research is descriptive in nature, aiming to investigate the difficult levels of map reading skills among students. The 'track' method was employed to assess students' map reading skills through an orienteering activity. This activity encompassed basic map reading skills such as map handling, locating positions and directions, recognising signs and symbols, and identifying landforms.

The study's findings indicated a deficiency in map reading skills among Social Studies pre-service teachers. Specifically, Uyar, Yayla, and Zumber (2022) discovered that participants struggled even with fundamental map reading skills, including holding a map, determining directions, and locating positions using the map. Moreover, the results revealed challenges in recognising signs and symbols on the map. However, the authors also identified that participants found recognising landforms to be the easiest skill. The authors concluded that the lack of practical activities focused on imparting map reading skills contributed to the deficit in map reading abilities among Social Studies pre-service teachers. Consequently, they recommended the integration of practical map-related activities into curricula.

Uyar et al. (2022) argued that individuals should possess the ability to interpret map scales during spatial practices. They should be capable of translating scale values on the map to real-world measurements. Errors at this stage can lead to discrepancies in distance estimation.

2.5.3 Lingwal et al. (2020)

Lingwal et al. (2020) conducted a study examining students' map reading achievement in Social Science at the Upper Primary Level. The research involved Grade 8 students from government schools in Uttarakhand. The study also incorporated a teacher questionnaire to gather teachers' insights into the impact of resources on students' map reading skills. Overall, students displayed proficiency in map reading. For instance, a considerable portion of Uttarakhand students (70%) successfully identified information within a map by interpreting the map title.

Furthermore, a majority of the participants (81%) in the study comprehended the meaning of colours used on a map. The researchers found that 62.9% of students were capable of recognising railways on a map, indicating familiarity with the legend (key) that explains the significance of symbols and colors on the map. Additionally, the study revealed that 70.7% of Uttarakhand students were adept at using compass directions in various situations.

The study's outcomes demonstrated participants' competence in employing map scales, as they were able to calculate distances using the map scale. However, participants displayed limitations in areas related to grid references and time estimation. The findings also suggested that resources such as maps, globes, and the internet did not significantly impact teachers' attitudes in Uttarakhand government schools.

The researchers identified that only 37% of the surveyed teachers had received in-service training on map skills. This implies that a significant number of teachers lacked proper training in map work. Interestingly, the study's test results revealed that students possessed map reading skills despite their teachers' lack of training in this area. This indicates that a substantial portion of teachers did not receive adequate training in map reading and interpretation skills.

2.6 Evaluation and Identified Gaps

The preceding studies on this topic have offered valuable insights into students' map reading and interpretation skills. However, a notable gap emerges in terms of research focusing on secondary school Geography students, particularly within the context of Lesotho. Furthermore, these studies have not approached the issue through the lens of Skill Theory, which underscores the significance of assessing skills within the framework of individual-environment dynamics.

While the objective of the current study was to align students' skills with the requisite map reading and interpretation skills, the mentioned studies have not precisely aligned students' skills with the required map reading skills. Some studies that aimed to evaluate map reading skills have analysed students' abilities in isolation from the essential map reading and interpretation skills. In summary, I acknowledge the previous research's pivotal role in the empirical literature, which will be leveraged in the discussion of this study's findings.

The present study set out to evaluate students' map reading and interpretation skills in the specific context of Lesotho, an aspect that previous research did not adequately address. Lesotho differs substantially in terms of culture, educational structure, learner and teacher characteristics from the environments where the cited research was conducted. Although I am not aware of any study that specifically explores map reading and interpretation skills among Lesotho's secondary school students, this study endeavour to bridge this gap by assessing the map reading and interpretation skills of Grade 11 Geography students. The aim is to pinpoint areas where support can be provided.

2.7 Summary of the Chapter

The initial portion of this chapter critically examined the theory underpinning this study and established its relevance to students' map reading and interpretation skills. The subsequent section delved into the literature concerning students' map-work skills. The discussion within this literature encompassed key themes, including the conceptualization of skills, the essential skills for proficient map reading and interpretation, and the factors influencing students' map-work skills.

Among other factors, user characteristics, map characteristics, teaching and learning methodologies, and resource availability were explored as sub-themes within the broader context of factors affecting students' map reading and interpretation skills. The concluding section of this chapter outlined the empirical literature related to students' map reading and interpretation skills, while simultaneously highlighting the identified gaps that this study aims to address. Consequently, the forthcoming Chapter 3 outlines the researcher's methodological approach employed in conducting this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The primary objective of this study was to evaluate students' map reading and interpretation skills and identify the factors influencing their skill levels. While the preceding chapter explored the theory that underpins this research, the interplay among study variables, and the gaps present in the empirical literature, this chapter outlines the methodology employed for data collection and analysis, ultimately leading to the conclusions drawn. This section encompasses the research approach, study design, sampling techniques, data collection instruments, data collection procedures, data analysis methods, and ethical considerations.

3.2 Research Approach

The literature frequently discusses three research approaches: qualitative, quantitative, and mixed methods. The qualitative approach involves exploring non-quantifiable aspects such as participants' emotions, opinions, and thoughts (Daniel, 2016; Queirós, 2017). In contrast, the quantitative approach deals with observable, measurable, and quantifiable data. The mixed methods approach integrates both numerical and non-numerical data (Rahman, 2017). This study primarily adopts a mixed methods research approach. It aligns with the research questions posed in Chapter One, necessitating a blend of quantitative and qualitative methods, data collection tools, and analytical techniques.

3.3 Research Paradigm

A research paradigm encompasses philosophical assumptions about the nature of truth (ontology), knowledge acquisition (epistemology), and the researcher's stance toward addressing research problems (Halls, 2013). The emergence of pragmatism as a research paradigm offers a balanced perspective, moving beyond the positivism vs. interpretivism dichotomy (Ravez & Borges, 2018). Pragmatism acknowledges the role of both objective measures and social context in comprehending phenomena (Maarouf, 2019). This study embraces a pragmatist paradigm, as it assesses students' skills objectively and explores the factors influencing these skills interpretively.

3.4 Research Design

The research design refers to the overarching strategy that structures the study's progression in addressing the research problem (Asenahabi, 2019). It encompasses how data is collected, measured, analysed, and evaluated to derive conclusions (Ansari et al., 2022). Various research designs, including case study, causal, cohort, survey, experimental, exploratory, and longitudinal designs, exist. The case study is described by Lalor et al. (2013) as the study design in which a 'case' or 'particular' or 'phenomenon' is studied in a real life situation. This study aligns with elements of the case study design, thus is considered a mixed methods case study design.

According to Creswell and Clark (2018), the mixed methods case study design incorporates core designs (such as convergent, explanatory sequential, or exploratory sequential designs) within the context of a single or multiple case studies. Both quantitative and qualitative data are collected, resulting in the generation of one or more cases for comparison purposes (Creswell & Clark, 2018). For this study, the core design employed was the sequential explanatory design, which involves generating and analysing qualitative data to explain patterns observed in the quantitative data (Creswell, 2014). This approach guides the study's three-phase process: administering a test, conducting focus group interviews, and interviewing teachers, as depicted in the study's design framework.

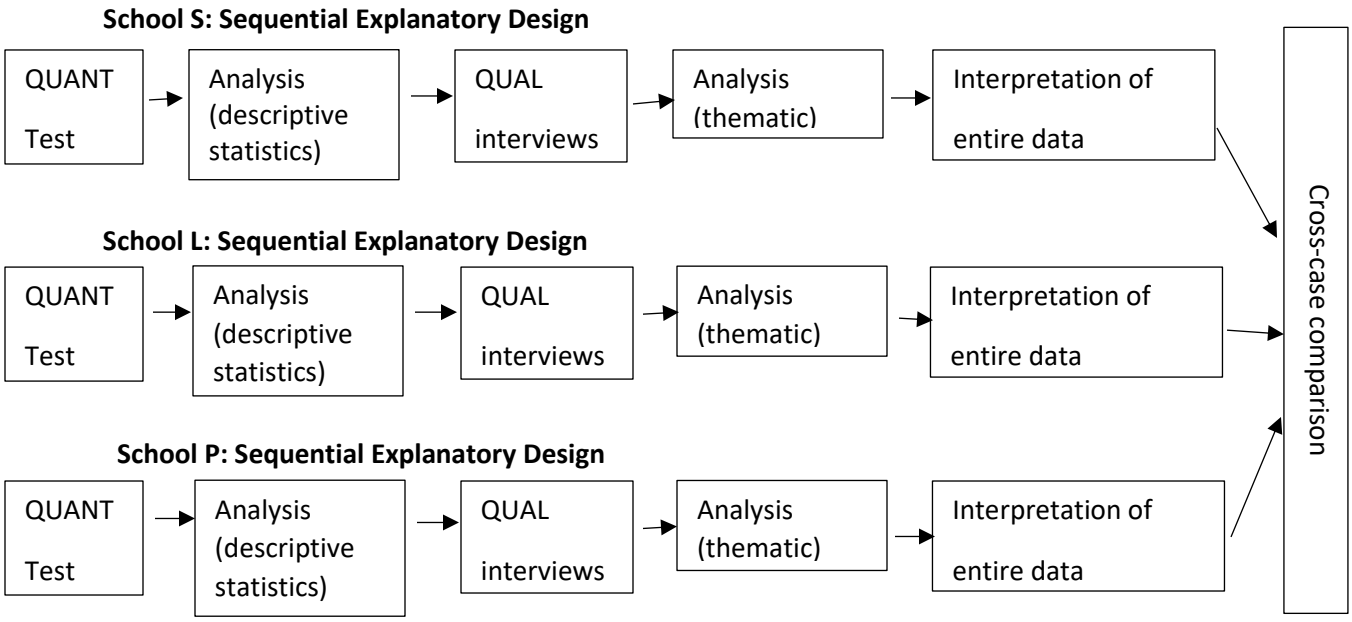


Figure 3: mixed methods case study design;Compiled based on the ideas of Cresswell (2014), Cresswell and Clark (2018), Maarouf (2019), Maarouf (2019), Leedy and Ormrod (2015)

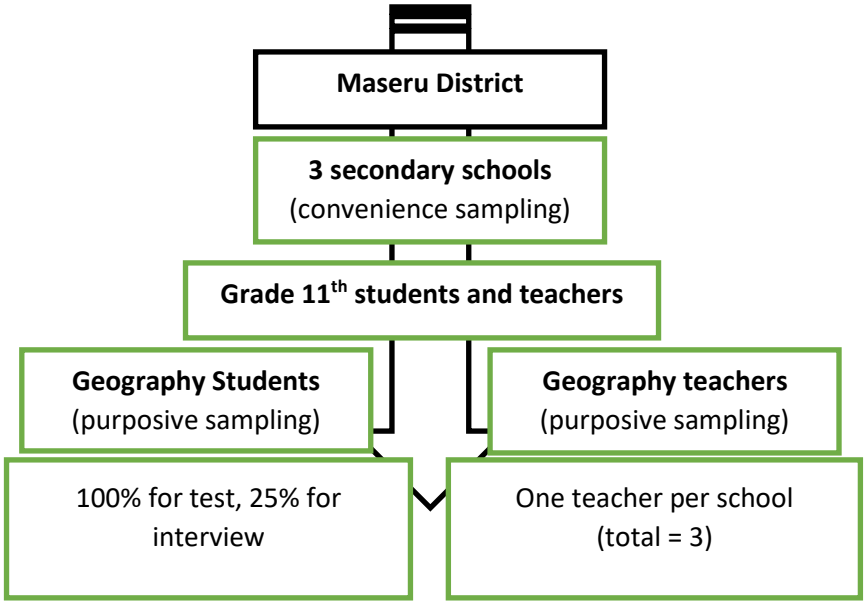
3.5 Study population and sampling technique

According to Etikan et al. (2017), the term "population" denotes the complete quantity of entities under study, which can encompass individuals, animals, or plant species. Sedgwick (2016) and other authors emphasise that the population size is inherently finite, rendering it impractical to encompass every member within a study. Consequently, sampling, the process of selecting a subset of subjects to represent the population, becomes an essential practice (Bhardwaj, 2019). Two primary sampling methodologies are recognised: probability sampling, wherein each population member has an equal likelihood of being selected, and non-probability sampling, characterised by unequal chances of inclusion (Datta, 2018; Sedgwick, 2013; Etikan et al., 2015). Various non-probability sampling types exist, including volunteer sampling, convenient sampling, purposive sampling, quota sampling, snowball sampling, matched sampling, and genealogy-based sampling (Datta, 2018).

In this study, non-probability sampling, specifically purposive and convenience sampling, assumed a pivotal role. Purposive sampling, as outlined by Etikan et al. (2015), entails selecting participants based on their specific attributes or expertise pertinent to the investigated phenomena. Therefore, this approach aligns well with the study's context, as Grade 11th Geography students, possessing considerable knowledge in map reading and interpretation, were chosen.

Conversely, convenience sampling, as defined by Farrokhi (2012), involves selecting participants based on their ready accessibility, typically determined by geographical proximity and availability at specific times. The present study employed convenience sampling to select secondary schools located within a 5-kilometer radius from the researcher's residence. The ensuing flowchart provides a succinct overview of the participant recruitment process for this study.

Sample: Three schools that were geographically close to the researcher (that offered Geography) were selected. **Geography students** were recruited on the basis of purposive sampling. For the test, the researcher aimed to include all students studying geography. To respond to the second research question, **about 25% (**in each school) of the students were recruited for focus group interviews. **Grade 11thGeography teachers** (one from each school) were recruited to generate data for the third research question.



3.6 Data Collection Methods

This study utilized two primary data collection tools: the Student Achievement Test (SAT) and interviews. The SAT was employed to address the first research question (See Appendix A), while interviews (See Appendix C) were conducted to explore the second and third research questions posed in Chapter One of this paper.

3.6.1 Student Achievement Test

A Student Achievement Test, as defined by Kara and Çelikler (2015), is an assessment tool designed to generate scores based on specific criteria. Iliscu and Bartram (2014) further elaborate that such tests serve to collect data aimed at evaluating individual variations in terms of skills, competencies, attitudes, emotions, and dispositions. These tests can be administered through various means, including paper-and-pencil, computerized, online, or even game-based formats. For this study, a paper-and-pencil test was administered to evaluate the map reading and interpretation skills of Grade 11 Geography students across three selected secondary schools in Maseru district. The test included a self-developed map attached to the question paper (See Appendix B), which the students referenced to answer the questions.

3.6.1.1 Test Validity and Reliability Measures

Validity, as outlined by researchers such as Creswell (2014), Creswell & Clarke (2018), and Leedy & Ormrod (2015), ensures that a data collection tool accurately measures the intended attributes. Reliability, on the other hand, pertains to the consistency of the tool's outcomes across different samples.

To ensure the validity and reliability of the test, an existing map reading and interpretation test developed by ECOL was adapted. Modifications were made to the test items to align with the desired skills. This process was informed by three key sources: existing literature delineating the required map reading and interpretation skills, input from an expert panel comprising two MA Ed Geography candidates and a Geography Professor, and "think-aloud protocols" from six undergraduate students who had previously taken a map reading test. Following the expert panel's evaluation, test items were refined and adjusted as necessary. The test was piloted to non-sample participants to gauge their reactions to the items, leading to further refinements.

3.6.2 Interviews

For the second phase of this mixed methods research, interviews were conducted to gather data for the second research question. Interviews serve as a means to elicit individual perspectives and insights on specific societal or economic issues (Alamri, 2019; Dilshad & Latif, 2013; Stuckey, 2013). These interviews can take the form of structured interviews, semi-structured interviews, or unstructured/narrative interviews (Stuckey, 2018). Structured interviews involve predetermined questions with respondents selecting answers from a predefined list of options (Easwaramoorhy & Zarinposh, 2009). In semi-structured interviews, key questions are planned in advance, yet responses are open-ended, allowing participants to elaborate on their answers (Alamri, 2019).

For this study, semi-structured interviews were deemed appropriate for addressing factors influencing Geography students' map work skills. Focus group discussions were held face-to-face, considering that secondary school students might find it more comfortable to share their thoughts in a group setting. This approach aligns with Ennis and Chen (2014) and Dilshad and Latif (2013), who advocate for focus group interviews when dealing with children who may be less accustomed to individual interviews. This method encourages candid discussions among peers. Furthermore, to facilitate open communication, respondents were permitted to answer in both Sesotho and

English. Translated data is presented in this paper, while original language responses are included in the appendices (See Appendix C).

In the exploration of opportunities available to teachers for enhancing map reading and interpretation skills, one-on-one interviews were conducted with Grade 11 Geography teachers. Voice recorders and note-taking were employed to capture the information shared by participants during the interviews. Table 1 summarizes the rationale for selecting the test and interviews as data collection methods for this research.

Table 1: Rationale for choosing a test and interviews

Tool	Reasons for use
Test	-Offered an advantage of including all students in the assessment of skills -Generated scores that were compared across samples -offered learners the practicality of map-work based assessment
Interviews (focus group)	-were more economical in terms of money and time -yielded a wide range of responses through group discussions -ability to engage even the shy participants for one-on-one interviews -potential to reveal participants' similarities and differences of opinion

3.7 Data collection procedure

The data collection process in this study spanned two weeks and involved three selected secondary schools. Through collaboration with Geography teachers, a test was administered, and students' responses were assessed. Their performance on individual test items was recorded using a Skill Matrix. Subsequently, learners lacking map reading and interpretation skills were identified, and focus group interviews were arranged to delve into the factors contributing to their weaker performance in specific skills.

Upon analysing the data gleaned from the focus group interviews, the researcher shared these findings with the teachers. Discussions were held to explore the potential opportunities available to enhance students' map reading and interpretation skills. Following this, the data collected from

the three schools was refined, interpreted, and compared, culminating in the preparation of the final report.

The conclusions drawn were based on the data obtained from the study, aligned with the insights provided by Skill Theory, and supplemented by relevant empirical literature on the subject. In light of these findings, recommendations were formulated to guide future actions and approaches in the realm of map reading and interpretation skills development.

3.8 Data Analysis

Data analysis is the process of organizing collected data into a comprehensible format for the audience, involving calculations and evaluations to extract meaningful information (Ibrahim, 2015; Teherdoost, 2020). For this study, mixed analysis was employed, combining qualitative and quantitative methods within the same framework. Quantitative data from the map work assessment task was analysed using descriptive statistics. Qualitative data generated from interviews underwent thematic analysis.

3.8.1 Descriptive Statistics

Descriptive statistics entails condensing extensive data into summarized forms, often presented through frequencies, percentages, means, medians, and modes (Mordkoff, 2016; Sarmento & Costa, 2017; Kaur et al., 2018). To assess students' skills and map them to required competencies, the Dynamic Skill Matrix, a recommended statistical tool by Skill Mapping theory, was used. This Excel-based tool utilizes frequency and percentage performance to analyse individual skills.

3.8.2 Thematic Analysis

For qualitative data gathered from interviews, thematic analysis was utilized. Thematic analysis involves examining non-numerical data to identify, analyze, and unveil recurring patterns or meanings that address research questions (Kiger & Varpio, 2020). This process entails familiarizing the researcher with the data, generating initial codes, identifying themes, reviewing these themes, defining and labelling them, and ultimately reporting participants' shared experiences or meanings.

3.9 Trustworthiness

Trustworthiness in research ensures that the presented data accurately reflects participants' true experiences (Connelly, 2016). Measures are taken to ensure credibility, confirmability, dependability, and transferability of findings (Rule & John, 2011).

3.9.1 Credibility

Credibility in research is defined as the process of ensuring that the findings presented in the research portray or reflect the true experiences of the participants (Stahl & King, 2020). On the same note, Cutcliffe and McKenna (2019) explain credibility as verification of data either by the participants themselves or by the expert qualitative researcher so as to ensure that interpretation of the data do not reflect the realities of the case under investigation.

According to Connelly (2016), Cutcliffe and McKenna (2019), and Stahl and King (2020), credibility can be assured by employing theoretical lenses to direct the study, by using more than one context to verify the findings, and by using experts or peers to verify the researcher's interpretations. As Cutcliffe and McKenna (2019) assert, two people may not interpret the data in the same way. Thus, allowing other people to interpret the raw data and subsequently verify the researcher's findings to approve the categorization of the data themes is better than one person's interpretation.

To address credibility of the findings, the tape recorder was used to capture responses and help in data transcription. Then, the literature and Fischer's Skill Theory were used to shape and strengthen the researcher's interpretation of the raw data. Doing so, deductive thematic analysis was primarily used to make sense of the data from students' responses. Fischer's Skill Theory framework was employed to identify and interpret similar patterns or meanings grounded in the qualitative data.

The researcher also kept contact with the Geography teachers so as to ask them to verify their responses. Verification was done through phone calls. The researcher also kept contact with some of the students who had cellphones. The verification of the data was done through WhatsApp and phone calls when need arose. For peer review and expert verification of the interpretations based on the data, support was solicited from two MA.Ed students and one professor to verify the accuracy of the interpretations. Thus, this debriefing and member checking process significantly reduced unintended unfair analysis and inconsistency in data interpretation. The discussion of the

findings was separated from the data presentation so as to allow the readers to make their own interpretations on the data as presented.

3.9.2 Confirmability

According to Chowdhury (2015), confirmability refers to the processes undertaken by the researcher to demonstrate that the findings emerged from the raw data not the personal interests or biases. In addition, Fredrick (2020) expounds confirmability as the description of how one person's perspective was minimized. To ensure confirmability in this research, the students' scores per map-work skill was presented through a table in the form of skill matrix. Again, images portraying students' mistakes were also included in the presentation of findings in order to strengthen credibility of the results. For qualitative data, direct quotations were used to present the data generated through the interviews. The researcher's opinions and judgement were clearly highlighted to establish personal evaluations of the data. In short, confirmability is established through the use of raw data, representative images, and direct quotations.

3.9.3 Dependability

Dependability can be defined as consistency of the study findings over time. As Fredrick (2020) explains, dependability is similar to reliability. However, dependability is affected by the conditions under which the study was conducted (Anney, 2014). Therefore, it would seem right to define dependability as the consistency of the study findings under certain conditions. Hence, the research processes undergone by the researcher in carrying out this study were reported in detail to enable future researchers to validate the empirical findings about students' map-work skills in the mentioned selected schools.

3.9.4 Transferability

Transferability is the concept that is widely used in qualitative research and is concerned with the extent to which study findings and conclusions can be generalized. According to Amankwaa (2016), the researchers need to provide a clear picture of the study and subsequently decide whether the conclusions drawn from the research findings may be transferred to other environments or similar study settings. However, Anney (2014) is of the view that transferability must be supported by a detailed description of study setting, study population, methods of data analysis so that the study provide a vivid picture that will resonate with readers.

In my own opinion thereof, transferability can be briefly explained as deciding whether the findings of the current study may be used to provide answers in other a similar or different study setting. That is, transferability is deciding whether the responses are everyone's story. In this study, transferability is enabled by providing comprehensive descriptions of settings, populations, and analysis methods to enable generalization within a specific context.

3.10 Research Ethics

Research ethics involve ensuring participants' anonymity and adhering to morally acceptable practices (Dooly et al., 2017; Parveen & Showkat, 2017). It encompasses both legal and moral obligations to conduct research in an ethical manner, which includes agreeing on rules of engagement with participants. The research ethics standards are summarized in the table below.

Table 2: Summary standards in research of ethical

Key consideration	Description
Permission to conduct the research	The researcher has to ask permission from the authority if the study deals with people from a certain organisation/institution. In cases where study deals with children under the age of 18, the researcher needs to consult with their parents first and explain the nature of research so that parents may agree or deny participation of the child in such a study. (Dooly et al., 2017)
Informed consent	After negotiating with the participants about the nature of research, the researcher must offer the participants consent forms to sign as proof that they agree to participate in the research out of their free will. (Mager et al., 2020)
Anonymity and confidentiality	Researcher need to explain to the participants and gate keepers how identifying information will be used. If the study will use names of participants, the researcher must explain this very well upon request to conduct the research. (Cresswell, 2009; Cresswell, 2014)

Freedom to participate	The researcher has to disclose how the data will be recorded and how such data will be used. Again, participants must be offered freedom to participate in the research and to withdraw if they wish to. (Leedy & Ormrod, 2015; Cresswell, 2014)

In the realm of literature, several key ethical standards are outlined for research, encompassing the need for permission from gatekeepers and participants, clear explanation of the research purpose, ensuring anonymity and confidentiality, granting the freedom to participate or withdraw, and obtaining consent through signed forms to validate voluntary participation (Creswell, 2009; Creswell, 2014; Dooly et al., 2017; Leedy & Ormrod, 2015; Mager et al., 2020).

3.10.1 Application in the Present Study

In this study, the researcher-initiated contact with school authorities to arrange for the research. A formal letter of introduction was submitted to school principals, seeking permission to conduct the research (See Appendix D). The letter elucidated the study's rationale. Upon obtaining approval, coordination was established with Grade 11 Geography teachers for scheduling assessments and interviews. Students were informed about the research's nature and were provided the choice to participate. A similar choice was extended to teachers for interviews.

Respondents were informed about the significance of their answers and encouraged to provide comprehensive and accurate responses. Permission was sought to use tape recorders for interviews, while alternative note-taking was employed if learners felt uncomfortable with recording devices. The researcher conveyed that all data from tests and interviews would be anonymized in the report, maintaining confidentiality. Except for the teachers involved in the data collection's initial phase, the data remained confidential. Participants willingly engaged, comprehending the research's nature.

3.11 Chapter Summary

This chapter delved into the methodological procedures undertaken to gather data addressing the research questions posed in chapter one. It initiated by elucidating the chosen research approach and paradigm. The research design was thoroughly expounded, outlining the setting and participant selection methods. The chapter went on to explain the employment of the student

achievement test and semi-structured interviews for data generation. Both quantitative and qualitative data analysis techniques were discussed. Lastly, the chapter elucidated the maintenance of trustworthiness and ethical considerations throughout the data generation and interpretation process regarding students' map-work skills. Chapter five proceeds to unveil the research findings.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The preceding chapter delved into a thorough discussion of the research approach, research design, sampling techniques, research tools, research procedures, data analytic methods, and ethical considerations. This chapter is dedicated to the presentation, analysis, and interpretation of the data sourced from both the assessment task, in the form of tests, and interviews. To convey the data effectively, tables and bar charts are employed. Quantitative data discussions utilize frequencies, percentages, and means. The findings of this study align with the research questions posed:

4. How do the skills possessed by Geography students compare with the required map reading and interpretation skills?
5. What do learners perceive as the factors affecting their skill level in map reading and interpretation?
6. What opportunities are available for the teachers to develop students' map reading and interpretation skills?

The chapter commences by presenting the demographic background of the schools and participants involved in the research. Inclusion of the participants' demographic background enriches data interpretation and final conclusions. To this end, the following table illustrates the distribution of students across the selected schools.

4.2 Demographic profile of the participants

Table 3: Distribution of geography students who participated in the study by school

School pseudonym	**Number of Grade 11 Geography Students**
SCHOOL A	13 (100%)
SCHOOL B	24 (100%)
SCHOOL C	25 (100%)
Total	**62**

Table 3 provides an overview of the participation of Grade 11 Geography students in this study. The table reveals that School A had thirteen (13) students, School B had twenty-four (24) students, and School C had twenty-five (25) students. In total, there were sixty-two (62) Geography students across the three selected schools who participated in this research. The educational background of the Geography teachers was also explored to guide the data analysis and draw conclusions from the study. The outcomes of this exploration are depicted in Table 4.

Table 4: Academic qualification of the Geography teachers in each school

Geography teacher from School;	Academic Qualification
A	Bachelor of Education
B	Bachelor of Education
C	Bachelor of Education

Table 4 displays the categorization of Geography teachers according to their educational qualifications. It is evident from the table that all participants held a Bachelor of Education degree. Furthermore, their tenure in teaching Geography was examined to facilitate the analysis of data and the discussion of findings. The subsequent table presents the years of experience participants have in teaching Geography.

Table 5: Participants' years of experience in the teaching of Geography

Years of teaching experience	School A	School B	School C
1-4 years	-	-	-
5-8 years	✓		✓
9 years and above		✓	

Table 5 presents the profile of the selected Geography teachers based on their tenure in teaching Geography. The categories shown are: 1-4 years, 5-8 years, and 9 years and above. The table reveals that no teachers had 1-4 years of teaching experience. Among the participants, two teachers (one from School A and one from School C) had been teaching Geography for 5-8 years.

Additionally, a Geography teacher from School B had over nine (9) years of teaching experience. This information contributed to enhancing the interpretation of the data and the conclusions of the study.

4.3 Comparison of learners' skills with the required map reading and interpretation skills

As mentioned earlier, the objective of this research was to evaluate the map reading and interpretation skills of Grade 11 Geography students. This was done to identify both their strengths and weaknesses, thereby highlighting areas where support is needed. To achieve this, a test was conducted in the three chosen schools in Maseru, and the resulting data was analysed using a Skill Matrix. The quantitative data collected from the three schools is depicted through a Skill Matrix. Subsequently, the subsequent section presents the quantitative data specific to School A.

4.3.1 DATA FROM SHOOL A

Table 6: Students performance per map reading and interpretation skill

	Map reading and interpretation skills																	
	Use of compass		Grid reference points		Reading contour interval	Judging gradient of slopes using contour lines		Calculation of gradient	Use of scale		Calculation of bearing		Feature interpretation	Use of key		
Marks per item	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		
Participants															**TOTAL SCORE**	**% SCORE**
01	1	1	1	1	1	2	2	0	2	0	1	1	0	1	14	78
02	0	1	1	1	1	2	2	0	2	1	1	1	0	1	14	78
03	0	0	1	0	0	2	2	0	2	1	1	1	0	1	11	61
04	1	1	1	0	1	2	2	0	2	1	0	0	0	1	12	67
05	1	1	1	0	1	1	1	0	0	0	0	0	0	1	7	39
06	1	1	1	1	0	1	1	0	2	1	0	1	0	0	10	56
07	1	0	1	1	1	2	2	0	2	1	1	0	0	1	13	72
08	0	0	1	1	1	2	2	0	2	1	1	1	0	1	13	72
09	1	1	1	0	1	0	0	0	2	1	1	0	0	1	9	50
10	0	0	1	0	1	0	0	0	2	0	0	0	0	1	5	28

11	0	0	1	0	0	1	1	0	2	1	1	0	0	1	8	44
12	0	1	1	0	0	2	1	0	2	0	1	0	0	1	9	50
13	0	1	0	0	0	2	2	0	0	0	0	0	0	1	6	33
TOTAL	6	8	12	5	8	19	18	0	22	8	8	5	0	12	131	
MEAN SCORE	0,46	0,62	0,92	0,38	0,62	1,46	1,38	0	1,69	0,62	0,62	0,38	0	0,92	10,08	

Training needed Can improve with practice Can train others

Table 6 presents the performance of students in relation to each assessed map reading and interpretation skill. The first column includes pseudonyms assigned to the participants, ranging from participant 01 to participant 13. Each row corresponds to the performance of a participant in a specific map-work skill. Participants who achieved a score below 50 percent are indicated in red, indicating their need for assistance in map reading and interpretation. Those who scored between 50 and 59 percent are categorized as part of the intermediate group, designated by the green color, suggesting potential for improvement with practice.

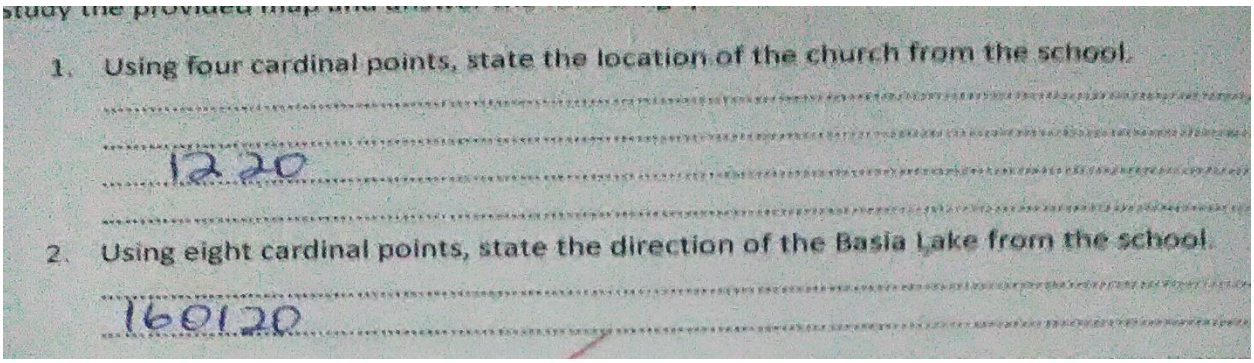
The blue color denotes the expert group, comprising participants who scored above 59 percent and are capable of instructing others to master map reading and interpretation skills. In Table 6, it is evident that 4 participants scored below 50 percent, 3 participants achieved scores between 50 and 59 percent, while the remaining 6 participants attained scores above 59 percent. Notably, the calculation of gradient and feature interpretation skills is highlighted in red, indicating that students require assistance in these specific map work skills.

4.3.1.1 Common mistakes

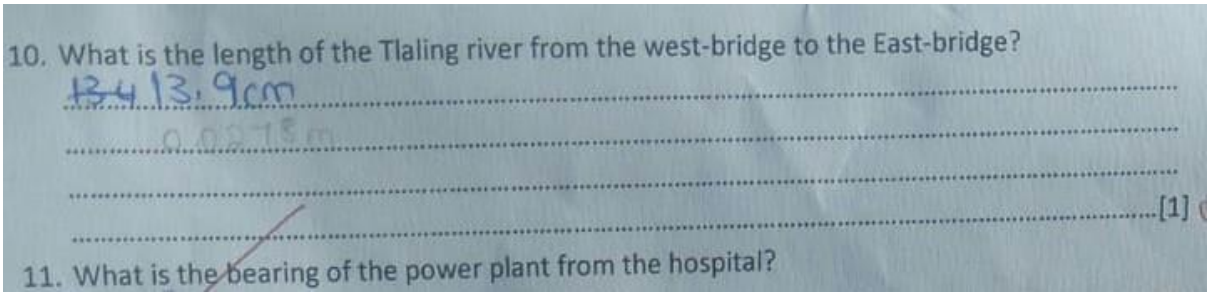
To address the first research question, a test was administered to 11th-grade students at School A. After collecting the answer sheets, each script was evaluated and marks were recorded. Subsequently, a thorough review of each script was conducted to identify common mistakes present in the answer sheets. The following recurring errors were observed across the dataset:

- Certain participants calculated bearings in the anticlockwise direction.
- Some participants incorrectly represented bearings as two-digit values instead of the required three digits. It's essential to calculate bearings clockwise and express them as three-digit values. For example, an angle of 50 degrees should be written as 050 degrees.

- Instances were noted where participants calculated the vertical interval (VI) but misconstrued it as the gradient of the slope.
- Some participants mistakenly associated cardinal points with grid reference points.



- In the context of writing grid reference points, certain participants began with the Northings rather than the Eastings. This resulted in grid reference points being recorded as, for instance, 2214 instead of the correct format, 1422.
- Among the participants, some accurately measured the length of the river, yet they failed to convert the measurement in accordance with the provided scale.



Lastly, a few participants exhibited confusion or an inability to differentiate between contour interval and vertical interval. This manifested in their calculation of vertical interval for a test item that actually required the calculation of contour interval.

4.3.2 DATA FROM SCHOOL B

Table 7: Students performance per map reading and interpretation skill

	Map reading and interpretation skills															
	Use of compass		Grid reference points		Reading contour interval	Judging gradient of slopes using contour lines		Calculation of gradient	Use of scale		Calculation of bearing		Feature interpretation	Use of key		
Marks per item	1	1	1	1	1	2	2	2	2	1	1	1	1	1		
Participants															**TOTAL SCORE**	**% SCORE**
01	0	0	1	1	1	2	2	2	0	0	1	0	0	1	11	61
02	0	0	1	1	1	2	2	1	2	1	1	0	0	1	13	72
03	0	0	1	1	1	2	2	1	1	0	0	0	0	1	10	56
04	1	1	1	1	1	0	0	2	0	0	1	0	0	1	9	50
05	0	0	1	1	1	2	2	2	2	1	1	0	0	1	14	78
06	1	1	1	1	0	2	2	2	2	0	0	0	0	0	12	67
07	1	1	1	1	1	0	2	0	0	0	0	0	0	1	8	44
08	0	1	1	1	1	2	2	1	0	0	1	0	0	1	11	61
09	0	1	1	1	0	0	0	1	0	0	0	0	0	0	4	17
10	0	0	0	1	1	2	2	1	0	0	0	0	0	1	8	39
11	1	1	1	1	0	2	2	1	0	0	0	0	0	1	10	56
12	1	1	1	0	1	0	0	1	0	0	0	0	0	1	6	33
13	0	1	1	0	1	0	0	2	0	0	0	0	0	1	6	33
14	1	1	0	1	0	2	2	0	0	0	0	0	1	1	9	50
15	1	1	1	1	0	2	2	2	0	0	0	0	0	1	11	61
16	1	1	1	1	0	2	2	0	1	0	0	0	0	1	10	56
17	0	1	1	0	1	2	2	0	0	0	0	0	1	1	9	50
18	1	1	0	0	1	2	2	0	0	0	0	0	0	1	8	44
19	0	0	1	1	1	0	0	0	0	0	1	0	0	1	5	28
20	1	1	1	1	1	2	2	2	2	0	1	0	0	1	15	83
21	0	0	1	0	1	2	2	0	0	0	0	0	0	1	7	39
22	0	1	1	1	0	0	0	0	0	0	1	0	0	1	5	28
23	0	0	1	1	1	2	2	0	0	0	1	0	0	1	9	50
24	1	1	0	0	1	1	1	0	0	0	1	0	0	1	7	39

TOTAL	11	16	20	18	17	33	35	21	10	2	10	0	2	22	217	
MEAN SCORE	0,46	0,67	0,83	0,75	0,71	1,38	1,46	0,88	0,42	0,08	0,42	0	0,08	0,92	9,04	

Training needed Can improve with practice Can train others

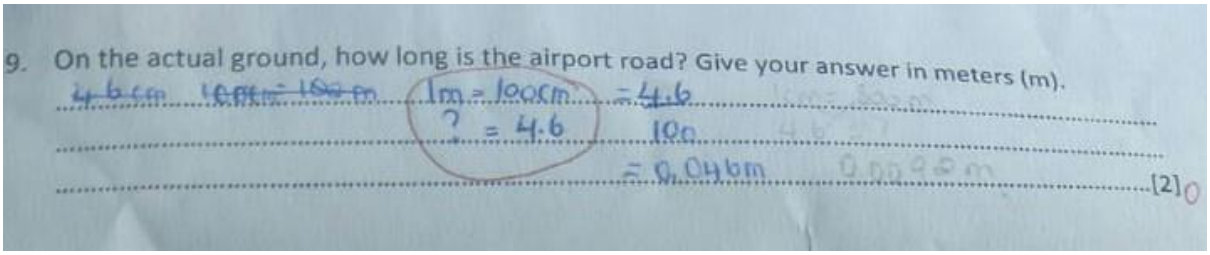
Similarly, Table 7 illustrates the individual performance of each participant based on the required map reading and interpretation skills. The table reveals that there were 24 participants who took the map reading test. Among them, 10 participants scored below 50 percent and were color-coded in red, signifying their need for training in map reading and interpretation. The intermediate group, consisting of 7 participants, were color-coded in green, indicating their potential for improvement with practice. Additionally, 7 participants constituted the expert group, designated with the blue colour, symbolizing their capability to train others in mastering map reading and interpretation skills. Among the identified skills, the most deficient areas were the use of map scale, calculation of bearing, and feature interpretation.

4.3.2.1 Common mistakes

While evaluating the answer sheets from School B, the following recurring errors were identified throughout the dataset:

- Certain participants calculated bearings in the anticlockwise direction, contrary to the required clockwise direction.
- Additionally, some participants recorded bearings as two-digit values instead of the necessary three digits.
- Moreover, instances were observed where participants provided grid reference points instead of the required cardinal points.
- In terms of writing grid reference points, certain participants began with the Northings, leading them to write "2214" instead of the correct "1422".

Furthermore, despite the presence of a provided map scale, some participants disregarded it and utilized their own self-determined scales. For instance, certain participants employed scales like 1cm = 100m, while others adopted typical mathematical conventions such as 100cm = 1m.



Another recurring error noticed was that certain participants accurately measured lengths, but neglected to convert them according to the provided map scale, leaving them in centimeters (cm).

4.3.3 DATA FROM SCHOOL C

Table 8: Students performance per map reading and interpretation skill

	Map reading and interpretation skills															
	Use of compass		Grid reference points		Reading contour	Judging gradient of slopes		Calculation of gradient	Use of scale		Calculation of bearing		Feature interpreta	Use of key		
Marks per item	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		
Participants															**TOTAL SCORE**	**% SCORE**
01	0	0	0	0	1	1	2	0	0	0	0	0	0	1	5	28
02	0	1	0	1	1	0	1	0	1	0	0	0	0	1	6	33
03	1	0	0	0	1	0	0	0	1	0	0	0	0	1	4	22
04	0	0	1	1	1	2	2	0	0	0	1	1	0	1	10	56
05	1	1	1	1	0	0	0	0	2	0	0	0	0	1	7	39
06	1	1	1	1	1	2	2	0	2	1	1	0	0	1	14	78
07	0	1	1	0	0	1	1	0	0	0	0	0	0	1	5	28
08	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	6
09	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	6
10	1	1	1	1	1	2	2	0	2	1	1	0	0	1	14	78
11	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	6
12	1	0	1	1	0	2	0	0	1	0	0	0	0	1	7	39
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	11
15	1	1	1	1	1	2	2	0	2	0	1	0	0	1	13	72
16	0	0	1	1	1	2	2	0	2	0	1	1	0	1	12	67
17	0	0	1	0	0	1	1	0	0	0	0	0	0	1	4	22
18	1	1	1	1	1	2	2	0	2	1	1	1	0	1	15	83
19	1	1	1	1	1	2	2	0	2	0	1	0	0	1	13	72
20	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	11
21	0	0	1	1	1	2	2	0	1	1	0	0	0	0	9	50

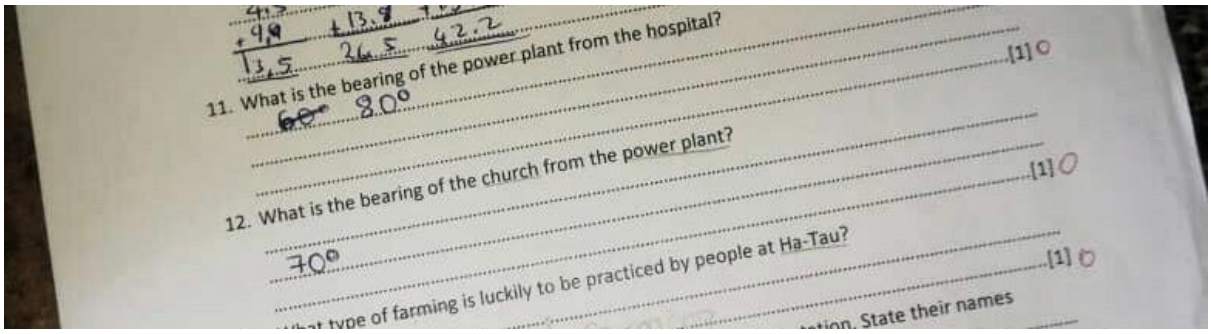
22	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	11
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	11
25	0	0	0	1	0	2	2	0	0	0	0	0	0	1	6	33
TOTAL	10	9	13	12	12	23	24	0	19	4	7	3	0	19	155	
MEAN SCORE	0,4	0,36	0,52	0,48	0,48	0,92	0,96	0	0,76	0,16	0,28	0,12	0	0,76	6,2	

Training needed Can improve with practice Can train others

Table 8 displays the performance of students in relation to the required map reading and interpretation skills. Similarly, those participants who scored below 50 percent were categorized with the red colour code, signifying their need for assistance in map reading and interpretation. This category encompassed 17 participants. Two participants comprised the intermediate group, representing those who achieved scores between 50-59 percent. They were color-coded with green, symbolizing their potential for improvement with further practice. Six participants formed the expert group, denoted by the blue colour code, indicating their capability to mentor others in map reading and interpretation. The skills that were most deficient among participants included the use of a compass, calculation of gradient, calculation of bearing, and feature interpretation.

4.3.3.1 Common mistakes

- During the evaluation of scripts from School C, a thorough examination was conducted to identify prevalent errors within the data. The subsequent mistakes were observed:
- A number of participants recorded bearings as two-digit values instead of three.



- There were instances where certain participants wrote "bearing" as "150oC," as if it were a temperature value.

- Several participants responded with grid reference points on a test item that required cardinal points.
- Some participants confused vertical interval (VI) with gradient; they calculated vertical interval and treated it as the correct answer for gradient.
- In specific cases, participants provided 6 grid reference points in their response to a test item that required a bearing.
- In their responses to items 6 and 7 of the test, two participants used the term "contour interval" to refer to contour lines.
- A number of participants used a mathematical formula [(y_2 - y_1) / (x_2 - x_1)] to calculate the slope gradient, rather than using the correct formula, Gradient = VI / HE.
- Some participants inserted points between numbers when writing 6 grid reference points, for example, writing 14.6.21.5 instead of 146215.
- When calculating distances, some participants failed to convert their measurements according to the scale. For example, they correctly measured the length of the airport road as 4cm / 4.1cm but wrote it as 4.1m.

Despite the compass provided having 8 cardinal points, some participants used 16 cardinal points to respond to item 2. For instance, they wrote "South South East" (SSE).

4.4 Factors that affected students' skills in map reading and interpretation

The researcher administered the test in three selected secondary schools located in Maseru, specifically in Roma. Subsequently, the scores obtained from the test were recorded within a Skills Matrix, allowing easy identification of participants who performed poorly. As a result, those participants who exhibited lower performance were selected for participation in a focus group interview. The aim of this interview was to delve into the factors influencing their skill level in map reading and interpretation. Employing a semi-structured interview format, the subsequent paragraphs detail the outcomes of this investigation.

During the interviews, participants were given the flexibility to respond in either Sesotho, English, or a combination of both languages. This approach was adopted to enhance the response rate and to create an environment where participants felt free to express themselves openly. As a result, the data presented within this chapter has been translated for clarity. The original language data, in its

transcribed and recorded form, has been appended to this report for reference. What follows is the presentation of the data collected from School A.

4.4.1 DATA FROM SCHOOL A

4.4.1.1 Students' attitude towards map reading and interpretation

During the focus group interview, the participants were engaged with semi-structured questions to explore the factors impacting their performance. The initial question aimed to uncover the participants' motivation and attitudes towards map reading and interpretation. As a result, it was revealed that a majority of the students within the sample displayed a positive attitude towards these skills. The subsequent extracts highlight some of their responses:

> Participant 1: *''I like map-work test because answers are already there on the map. We do not have to think as we do with other non-mapwork test''* (See Appendix C, line 14).
>
> Participant 2: *''I like map-work because I think I will be able to use a map, perhaps I will be [travelling] in cities like the [United States of America]''* (See Appendix C, line 17).

However, one of the participants seemed to have a negative attitude towards map-work tests. One of the participants said the following when interviewed;

> Participant: *''I personally do not like map reading because I find it difficult. Even if I was to be taught again and again, I still think I would not perform well''* (See Appendix C, line 24).

4.4.1.2 Effect of test items and map characteristics

Another question was posed to inquire whether the performance was influenced by the test items or the provided map. All participants concurred that the test items were easily understandable and that the overall design of the map did not pose any reading difficulties for them.

4.4.1.3 Teaching and learning habits

Given this situation, they were subsequently inquired whether they had previously completed a map-work test. In response, the participants indicated that they had not undergone a map-work test previously; rather, they had engaged in a classroom activity on one occasion. This was substantiated by the following response:

Participant*: ''I cannot say we were given a test before. What I remember is that [Madam X] only gave us an activity which we completed in the class. The test you gave us was the first test we wrote on map reading and interpretation''* (See Appendix C, line 46).

Furthermore, the participants were requested to recount their experiences regarding the instruction and acquisition of map-work skills since Grade 9, as outlined in the syllabi. Subsequently, the findings indicated that the participants had not received instruction in map reading and interpretation during Grade 9; rather, such instruction took place around Grade 11, spanning a period of approximately two weeks at the most. Presented below are excerpts from their responses:

Participant 1: ''*[Madam X] did not teach us map reading at Grade 9''* (See Appendix C, line 51).

Participant 2: ''*We were taught this year [2023] and it was for the first time''*(See Appendix C, line 52)

Participant 3: ''*I am sure we were taught about a week and some few days; two weeks maximum. Then she proceeded [to other topics]''* (See Appendix C, line 53).

After listening to their responses and detailed explanations, they were then additionally questioned about whether they had been provided with chances to engage in practicing map reading and interpretation. The results uncovered that the participants had not been able to practice map reading due to the absence of available maps and question papers. One of the responses provided was as follows:

Participant1: ''*I do not practice map reading and interpretation because I do not have a map or question papers to practice with. The only practice I got was during the classroom activity we were given''* (See Appendix C, line 56).

Participant 2: *''I think practice is important to master map reading and interpretation. I believe most of us failed because we do not have our own maps. Since we do not have our own maps, I think we need more tasks here at school in order to pass''* (See Appendix C, line 64).

Nevertheless, one of the participants mentioned that he finds a way to practice using his personal map at home. This was supported by the subsequent response:

Participant: ‘‘*I manage to practice with the personal map I have at home. It helps me remember how to read a map’’* (See Appendix C, line 62).

Another query was posed to examine whether the participants had received any form of scaffolding assistance from either their peers or teachers. Consequently, it was revealed that the participants had indeed received scaffolding support from their peers. In relation to seeking guidance from their teacher for clarification on unclear concepts, the participants conveyed that they had not approached their teacher for scaffolding assistance. One of the participants offered the subsequent response, elucidating the reasons behind their decision not to consult their teacher:

Participant: ‘‘*We do not go to [Madam X] because she does not explain concepts in a way that we can understand’’* (See Appendix C, line 75).

Another participant: *[Madam X] marked me wrong on the contour interval and when I asked her why I got it wrong, she did not explain well to me. But I knew I got it right’’* (See Appendix C, line 76).

Other participants appeared to concur that their teacher was ineffective in providing scaffolding support. Consequently, they were queried about the reasons behind their choice to not seek guidance from a different Geography teacher for clarification. The results unveiled that the participants refrained from seeking assistance from another Geography teacher due to the perception that she does not readily provide answers to their queries. This viewpoint was shared by one of the respondents:

Participant: ‘‘[*Teacher Y] is even worse! You can say Madam X is better. [Teacher Y] can only impose a series of questions on you until you get lost for good’’* (See Appendix C, line 79).

Another participant: ‘‘[*Teacher Y] makes me hate map-work because she does not make enjoyable lessons and she explains concepts in a difficult way’’* (See Appendix C, line 81).

4.4.1.4 Other emerging factors

A general inquiry was made regarding the reason behind their inability to achieve scores exceeding 50%, despite having received instruction and expressing comprehension of the demands of each test item. As a result, the findings demonstrated that the participants' subpar performance could be

attributed to insufficient practice. Furthermore, certain test items were unfamiliar to them due to their teacher's omission of such questions from their instruction. Additionally, their performance suffered as a consequence of forgetting some of the concepts taught during their map work lessons. Presented below are excerpts from their responses:

> Participant 1: ‘‘*I think I failed because I had forgotten half of the things that I learnt on map reading and interpretation. Some of the items in the test were new to us. For example, the question that required us to state the type of farming was new to me. When we practiced in the class there were no questions like that”* (See Appendix C, line 91).

> Participant 2: ‘‘*I think I failed because we did not spend enough time doing map reading and interpretation. A week on map reading was too short for us to perform well. We need to be taught map reading and interpretation again’’* (See Appendix C, line 96).

4.4.2 DATA FROM SCHOOL B

4.4.2.1 Students’ attitude towards map reading and interpretation

Likewise, students from School B were chosen to participate in a focus group interview aimed at exploring the factors influencing their proficiency in map reading and interpretation. Employing semi-structured interviews, the group was presented with a set of open-ended and closed-ended questions. Among various aspects, the study delved into the participants' motivation regarding map work, and the collected responses were favourable. During the interviews, the participants expressed the following:

> Participant 1: ‘‘*I like map-work because it gives more marks and the answer is already there for us to figure it out’’* (See Appendix C, line 103).

> Participant 2: ‘‘*I like map reading because it integrates content from other subjects. For example, it features [Mathematics concepts] such as bearing’’* (See Appendix C, line 105).

> Participant 3: ‘‘*I like map-work test because I do not get to think a lot to answer questions’’* (See Appendix C, line 107).

4.4.2.2 Effect of test items and map characteristics

A different query was posed to ascertain whether the performance was influenced by the nature of the test items or the design of the map. It appeared that all participants were in consensus that they

did not encounter difficulties with the test items. Similarly, they appeared to concur that the map's design did not impede their proficiency. This was substantiated by the following provided response:

> Participant 1: ‘‘*The map was clear and portable as compared to those that are huge; those ones that you have to unfold and unfold [when using them]’’* (See Appendix C, line 117).
>
> Participant 2: ‘‘*The map was clear and beautiful. I was able to find every symbol shown on the key’’* (See Appendix C, line 120).

4.4.2.3 Teaching and learning habits

Consequently, they were further inquired if they had previously taken a map-work test. They collectively affirmed that they had indeed taken a map-work test prior to this assessment. In an attempt to explore additional factors contributing to the students' unsatisfactory performance in the test, the respondents were requested to recount their experiences in the instruction and learning of map-work since Grade 9. Consequently, it was revealed that map reading wasn't taught during Grade 9 and 10. The participants received map work instruction in Grade 11, with the lessons spanning approximately a week.

Upon being questioned about the teacher's efforts to help them grasp map reading and interpretation skills, there appeared to be differences of opinion within the group regarding the teacher's commitment to teaching these concepts. The participants expressed that their teacher didn't invest sufficient effort and attention in teaching them map work principles. During the interview, a participant shared the following information:

> Participant: *[Madam Z]taught us how to use a protractor and pair of dividers but she did not emphasise that bearing should always be clockwise and should always be a three digits value, especially putting zero in front if the angle is a two digit value’’* (See Appendix C, line 142).

To explore whether the participants received assistance in the form of scaffolding during their map-work learning, they were questioned about whether they engaged in discussions and provided aid to each other when facing challenges with certain concepts. As a result, it was discovered that the participants indeed supported one another by providing scaffolding when confronted with

unfamiliar concepts. Nevertheless, their responses indicated that some peers were hesitant or unwilling to offer assistance.

They were subsequently inquired if they sought guidance from their teacher when seeking help from someone more knowledgeable. It was revealed that the participants did not seek scaffolding assistance from their teacher. The students appeared to hold the belief that receiving support from their peers was more effective than approaching their teacher for clarification on complex concepts. This perspective is illustrated by the following response:

> Participant: ‘‘*We do not consult with [our teacher] because we do not understand what she sometimes teaches. We believe that our peers who understood her may explain [such concepts] better’’* (See Appendix C, line 154).

After listening to their responses, they were inquired about whether they had opportunities to engage in practicing map reading and interpretation. The primary discovery was that the participants had access to map work textbooks, enabling them to practice these skills. Concluding the interview session, the participants were invited to share any information that hadn't been discussed during the interview but might have influenced their subpar performance in map reading and interpretation. As a result, the findings indicated that some participants might have struggled with measuring curved distances, which could have contributed to their test performance. Furthermore, it was revealed that certain participants encountered challenges in applying knowledge they had acquired from other related topics. Presented below are excerpts from some of the responses:

> Participant 1: ‘‘*I do not like the part where we have to measure curved distances using a thread because I struggle to measure accurately using it’’* (See Appendix C, line 166).

> Participant 2: ‘‘*I think I have a problem with questions that are related to [feature interpretation] such as that question which required us to state the type of farming. If we can be given enough practice on such questions, we can perform well’’* (See Appendix C, line 170).

4.4.3 DATA FROM SCHOOL C

To investigate the factors impacting students' proficiency in map reading and interpretation, focus group interviews were conducted with a group of 8 students from School C who demonstrated subpar performance in the test. Consequently, this section will expound on the results exclusively obtained from the focus group interview conducted at School C.

4.4.3.1 Students' attitude towards map reading and interpretation

Initially, the students' motivation and attitude toward map work were examined. As a result, it was discovered that a majority of the sampled participants held an unfavorable view of map work. The sources of this negative attitude were traced back to the methods employed by teachers and decisions made by the curriculum committee regarding elective courses. One of the participants expressed the following sentiment:

Participant 1: ''*I seriously do not like map work. In fact, I do not like Geography entirely. I was forced to do it yet I wanted to do Biology. I was absent when elective courses were picked, that is when a decision was made on my behalf without my approval''* (See Appendix C, line 183).

> Participant 2: ''*[Sir Y] does not make us enjoy Geography. His lessons are not lively due to the way he speaks''* (See Appendix C, line 187).
>
> Participant 3: ''*I do not like some aspects of map reading such as [measuring curved distances] using a thread, and use of scale. In fact, Mathematics bores me!''* (See Appendix C, line 190).

However, there were two participants who seemed to like map reading and interpretation. This was evidenced by the following response;

> Participant 1: ''*I want to start reading [map reading and interpretation] so that I can pass Geography to make Sir Y proud''* (See Appendix C, line 189)
>
> Participant 2: *When I compare the way I was taught map work in my previous school and the way [Sir Y] is teaching us, I would say he is trying his best because I now understand [some map work concepts I never understood before]''* (See Appendix C, line 213).

4.4.3.2 Effect of test items and map characteristics

Secondly, a different inquiry was posed, focusing on the test items and map design. It came to light that certain participants had difficulty comprehending the questions or test items. When queried about their reasons for not seeking clarification from the invigilator, they explained that they felt apprehensive, particularly since they were in the midst of the test. Presented below are excerpts from their responses:

> Participant 1: ‘‘*We were afraid’’* (See Appendix C, line 197).
>
> Participant 2: *‘‘our peers were going to say we want to be given answers’’* (See Appendix C, line 198).

Upon being requested to identify the specific test items that were unclear, they did not provide a response to the query. Subsequently, a follow-up question was posed to determine whether the participants were unable to comprehend the test items or whether they simply lacked knowledge of the answers to those questions. Consequently, it was ascertained that the participants indeed comprehended the questions; their challenge lay in not possessing the correct answers to those particular test items

4.4.3.3 Teaching and learning habits

Additional inquiries were conducted to determine whether the students' skills were influenced by the design of the map. All of the participants in the sample concurred that the map was well-defined and devoid of excessive details. Consequently, they were invited to recount their encounters in the instruction and learning of map work starting from Grade 9. It was revealed that the participants had not received instruction in map work during Grade 9 or 10. Furthermore, they had not undertaken a test prior to this assessment. This was substantiated by the ensuing response:

> Participant; *‘‘[Sir Y] taught us [map reading] recently. We have not written a test or exercise on map work before this assessment’’* (See Appendix C, line 207).

Thirdly, the participants were questioned regarding the consistency of their practice in map reading and interpretation. In response, the participants conveyed that they were unable to engage in regular practice of map reading due to the absence of Teaching and Learning Resources (TLR) such as maps and past question papers related to map work. Additionally, they indicated a lack of available time for practice.

Participant 1: ‘‘*We do not have question papers so we forget [some of the map work concepts]. We need to practice so that we can be familiar with questions that are frequently asked’’* (See Appendix C, line 209).

Participant 2: ‘*‘I do not have time to practice so that I can master map work skills. I normally tell myself that I will practice when we approach the examinations’’* (See Appendix C, line 214).

When inquired whether they sought assistance for concepts they found challenging, the participants mentioned that they did not approach their teacher for help. Their reasoning was rooted in the fact that they were not provided with any tests or exercises pertaining to map reading that would allow them to identify their strengths and weaknesses. Consequently, they did not perceive the need to consult their teacher, as they believed they already had a grasp of map work concepts.

Participant; *‘‘Since we were not given any exercise on map reading to recognise or test our understanding, we thought we understood everything on map reading until we failed in this test’’* (See Appendix C, line 211).

Likewise, the participants at School C were prompted to discuss additional factors they believed had influenced their overall performance. All of the participants appeared to concur that engaging in regular practice of map reading and interpretation is imperative for achieving mastery of these skills

4.5 Opportunities and constraints for the teachers to develop students’ map-work skills

The final stage of this research focused on exploring the opportunities that are accessible to teachers for enhancing students' map reading and interpretation skills. During the interviews, the Geography teachers conveyed that they encounter more constraints than opportunities.

4.5.1 Opportunities

4.5.1.1 Resources

While the responses from the teachers highlighted the detrimental impact of a shortage of Teaching and Learning Resources (TLR) like maps and question papers on Geography teachers, it was discovered that certain resources remain untapped which could contribute to enhancing students' map reading and interpretation skills. Despite the fact that some of these resources have yet to be

utilized, they hold the potential to alleviate the challenges arising from the lack of maps and previous question papers. Notable resources include the map-work books available at School A, computers and internet access at School B, and the geographical features such as mountains, valleys, and rivers surrounding School C. These findings were substantiated by the following responses from the teachers:

> Teacher from School A; ‘‘*As for books, they are available for use’’*
>
> Teacher from School B; ‘‘*What can work for us here in [School B] is that we have computer as a subject at Grade 8. We can start teaching map reading […] taking advantage of the internet. We can work hand-in-hand with the Computer teacher. Therefore, we would have started on time with enough access to resources’’*
>
> Teacher from School C; ‘‘*Our school is situated in an area that is surrounded by mountains. We can use the physical contour lines to explain gradient of the slopes and to identify steep, gentle, or flat slopes. Again, we are situated near a valley, a river and its tributaries. Map reading also features rivers, thus we can use these streams to develop students' understanding of map reading’’*

4.5.1.2 Time factor

The Geography teacher at School B indicated that there exists a possibility to incorporate teaching of map reading and interpretation into the Grade 8 curriculum. However, this inclusion would come at the cost of reducing the teaching time allocated for Economic World and Sustainable Development. Consequently, during the interview, the Geography teacher at School B provided the following statement:

> Teacher from School B; ‘‘*We can start teaching map reading at Grade 8 in Social Science. That is, instead of doing […] Economic World and Sustainable Development, we can teach map reading, taking advantage of the internet […]. Therefore, we would have started on time’’*.

Furthermore, the same Geography teacher pointed out that they have the potential to collaborate with action researchers who can assist them in teaching map reading and interpretation at the Grade 9 level.

Teacher from School B; *''Maybe the [action researchers] can help us in teaching map reading from Grade 9, though it is too difficult to do so''*

Finally, the Geography teacher from School C remarked that they could effectively teach map reading by incorporating it towards the conclusion of Grade 11, as the national examinations draw closer.

4.5.2 Limitations

The open-ended interviews with the Grade 11 Geography teachers revealed that the teachers are challenged by quite a number of limitations in the teaching of map reading and interpretation. The following paragraphs discuss these limitations.

4.5.2.1 Lack of teaching and learning resources

The open-ended interviews conducted with Geography teachers unveiled that these educators encounter difficulties in their efforts to teach map reading and interpretation, primarily due to the absence of essential teaching and learning resources such as maps and past question papers. Presented below are excerpts from the statements made by the Geography teachers:

Teacher from School A; ''*I think we would help them if we had a computer laboratory [where they would] make their own research, [and] a library where they [would] have access to question papers and maps. Unfortunately, none of these is available to us''*

Teacher from School B; *''Another challenge is that analysis and interpretation are hard to teach because we do not have lots of material to refer to''.*

Teacher from School C; ''*Our main challenge in the teaching of map reading is the shortage of resources such as maps and previous question papers. If you want to [assess] using the previous question papers, you will have to organise learners into groups so that they can access such materials''.*

4.5.2.2 Student calibre

Once more, the feedback provided by Geography teachers from the three chosen schools indicated that the quality of students posed challenges for the teachers in their attempts to foster mastery of map reading and interpretation skills. Specifically, the teachers perceived that their students held

an unfavorable view of map reading and interpretation. Furthermore, the students were perceived as exhibiting laziness and a lack of enthusiasm for learning. The Geography teachers expressed the following sentiments during the interviews:

Teacher from School A; *''Our students are [academically weak] and are just lazy. Map reading requires hardworking students, especially now when we have a very limited time''*

> Teacher from School B; *''The attitude the students have […] towards numbers [is a challenge]. The moment you put numbers on the board […] it is like they totally shutdown. When they do this, even the easiest concepts become hard to teach when the learners totally stop paying attention''*
>
> Teacher from School C; ''*Again, we are challenged by the caliber of students […] They seem to be hesitant to consult, either amongst themselves or with me or with another Geography teacher. They just seem not willing to learn. When these students are given individual tasks to do, they do not push themselves to complete such tasks unless you force them to submit on a particular day''.*

4.5.2.3 Bulky syllabus

The extent of the syllabus emerges as a factor impeding the successful instruction of map reading and interpretation in the three selected schools. Through individual interviews with Geography teachers, it became evident that the Geography syllabus contained an excessive amount of content. Consequently, the teachers often prioritize the teaching of other subjects before delving into map reading and interpretation. During the interviews, the teachers from School A and School B explained that they tackle other topics initially because these topics carry higher marks and serve as prerequisites for map reading and interpretation (owing to content integration). This was supported by the responses provided below:

Teacher from School A; *''The syllabus is bulky and we choose to focus more on topics that will award the students more marks. We tend to teach map reading towards the examinations when we have covered a lot of topics''*

> Teacher from School B; ''*Like we always say, the syllabus is bulky, the content is overloaded […] but we do not have time. Another challenge is that map reading*

incorporates content from other topics. As a result, we often wait until such topics are covered so that we can transit well into map reading''.

4.5.2.4 Limited time

The impact of content overload not only influences the teaching methodologies of the educators but also governs the duration required by Geography teachers to address a given topic. During the interviews, the teachers disclosed that there exists either no time or only limited time available to cover the entirety of the syllabus. Consequently, they expressed the belief that the teaching of map reading and interpretation is adversely affected by the constraints of time for syllabus coverage. Specifically, Geography teachers from School A and School C mentioned that the allocated class periods for Geography are insufficient to effectively teach map reading and interpretation. Presented below are excerpts from the responses provided by the teachers:

> Teacher from School A; ''*Geography periods are limited, and this forces [us] to move too fast leaving the students behind. Unfortunately, there is no time to revise so that they can catch up where I had left them''.*
>
> Teacher from School B; ''*Another issue is the time factor. Like we always say, the syllabus is bulky, the content is overloaded […] but we do not have time.*
>
> Teacher from School C; *''Map reading and interpretation demands a lot of time and attention. I think the lessons catered for Geography per week are short and the lesson duration is also short to teach map-work effectively. I only have single lessons and each lesson takes forty (40) minutes. Therefore, it is challenging to teach map-work effectively in 40 minutes. I think we need some double lessons so that we can cover many map work concepts''.*

4.5.2.5 Other impediments

During an open-ended interview with the Geography teacher from School A, it was revealed that challenges in teaching map work arose due to the teacher's lack of proficiency in Mathematics. As a result, the strategies or techniques employed by this teacher might have posed difficulties for the students in comprehending certain concepts related to map reading and interpretation. In the interview, the Geography teacher from School A conveyed the following information:

Teacher from School A; *''I myself do not understand converting according to scale. Thus, I believe the approach or the way we deliver content as teachers is also too difficult, especially myself. I am not good with Mathematics''.*

Hence, it becomes apparent that the teacher will encounter challenges when instructing mathematical concepts such as bearing, map scale, and gradient of the slope. If this issue remains unresolved, the learners will persist in having weaknesses in mathematical aspects, consequently hindering their progress in the related skills.

In summary, the responses from the teachers affirm that the constraints obstructing the enhancement of students' map work skills outweigh the potential opportunities for skill development in map reading and interpretation. Consequently, it can be argued that the current circumstances, characterized by a lack of resources and students who lack motivation to learn map reading, may overshadow the limited opportunities available to the teachers in the three selected schools that were part of this study.

4.6 CROSS CASE COMPARISON

4.6.1 Quantitative data

In this section, the collected data from three schools (School A, School B, and School C) is consolidated and contrasted. Subsequently, an analysis of the performance across the three schools is presented.

4.6.1.1 Comparison of learners' performance

Table 9: Comparison of performance per school

SCHOOL	Total number of participants	Those who obtained 50% and above	Those who scored below 50%
A	13	9 (69%)	4 (31%)
B	24	14 (58%)	10 (42%)
C	25	8 (32%)	17 (68%)

Table 9 provides a comparison of the students' performance across the three chosen schools. As depicted in Table 9, 9 students (69%) from School A achieved scores of 50% and above, 14

students (58%) from School B achieved scores of 50% and above, and 8 students (32%) from School C achieved scores of 50% and above. Table 9 further reveals that 4 students (31%) from School A, 10 students (42%) from School B, and 17 students (68%) from School C scored below 50% on the map reading and interpretation test.

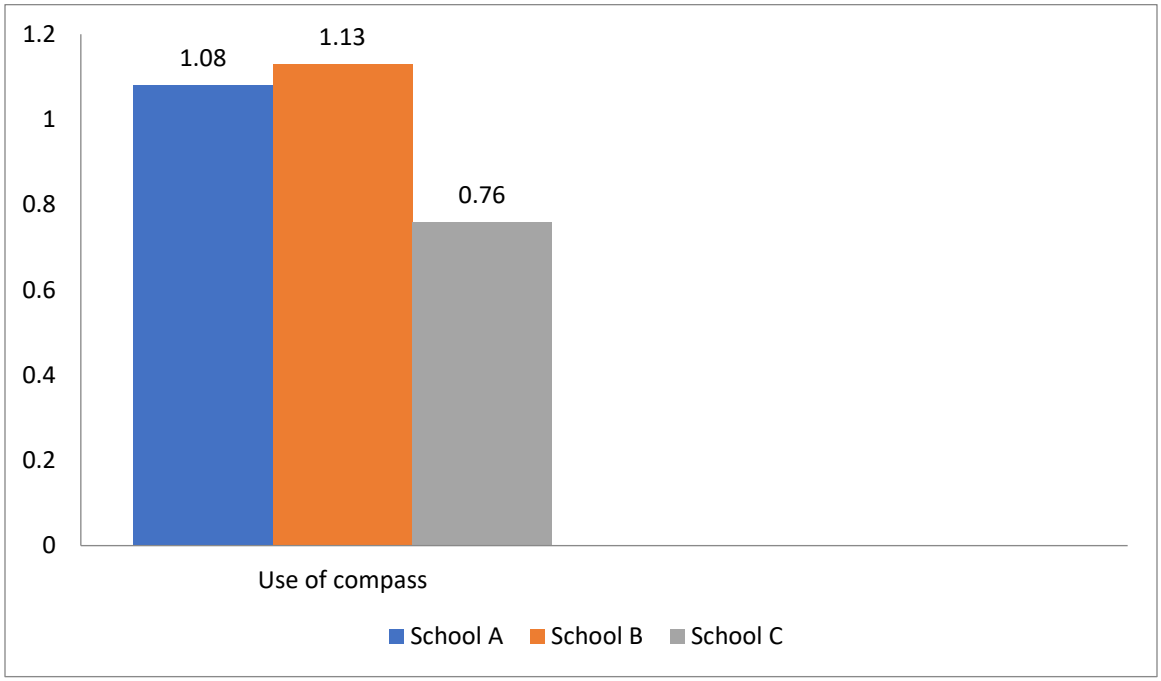


Figure 4: comparison of performance based on the use of compass

Figure 4 illustrates the students' performance in relation to the use of a compass. Mean scores from both schools were utilized for this comparison. As indicated in the bar chart, the highest performer was observed in School B, attaining a mean score of 1.13. Following that, School A obtained a mean score of 1.08. School C exhibited the lowest performance, recording a mean score of 0.76

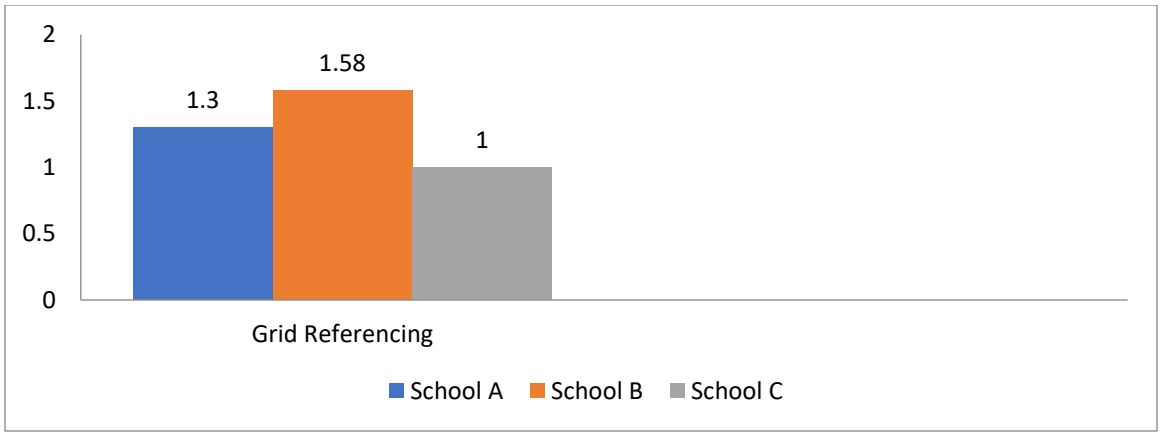


Figure 5: comparison of performance based on grid referencing

Likewise, a comparison of students' performance across the three chosen schools was conducted, focusing on grid referencing. As depicted in Figure 5, School B demonstrated the highest performance, achieving a mean score of 1.58. School A followed closely with a mean score of 1.3. School C exhibited the lowest performance, with a mean score of 1.

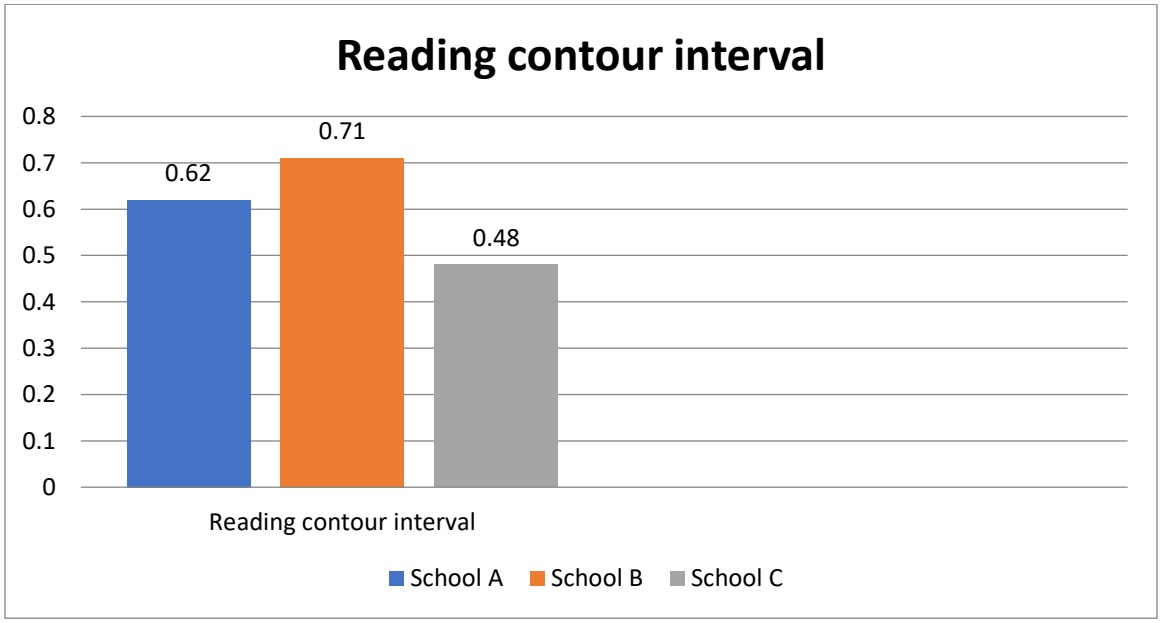


Figure 6: comparison of performance based on the reading of contour interval

Furthermore, an assessment of students' performance was conducted across the three selected schools, focusing on their ability to read contour intervals. As illustrated in Figure 6, School B

exhibited the highest level of proficiency in this skill, achieving a mean score of 0.71. School A came next with a mean score of 0.62. The lowest performer in terms of reading contour intervals was School C, with a mean score of 0.48. Thus far, School A has demonstrated the highest proficiency across the map reading and interpretation skills discussed, while School C has exhibited the lowest performance.

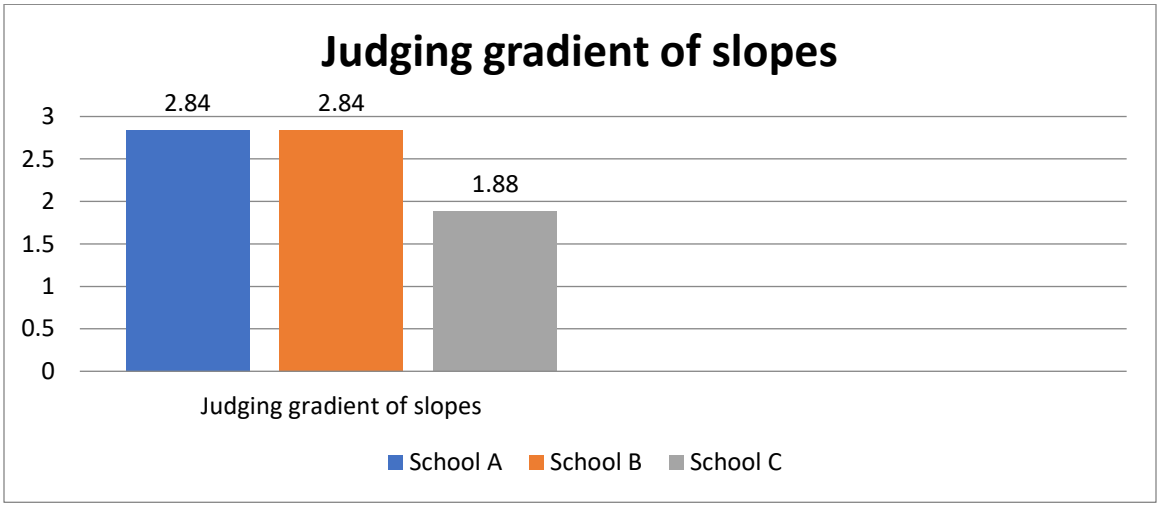


Figure 7: comparison of performance based on the judgement of gradient of the slopes

Figure 7 presents the comparative outcomes derived from the assessment of gradient of slopes. As depicted in the bar chart, both School A and School B achieved an equal mean score of 2.84. School C exhibited the lowest performance in terms of judging gradient of slopes, recording a mean score of 1.88.

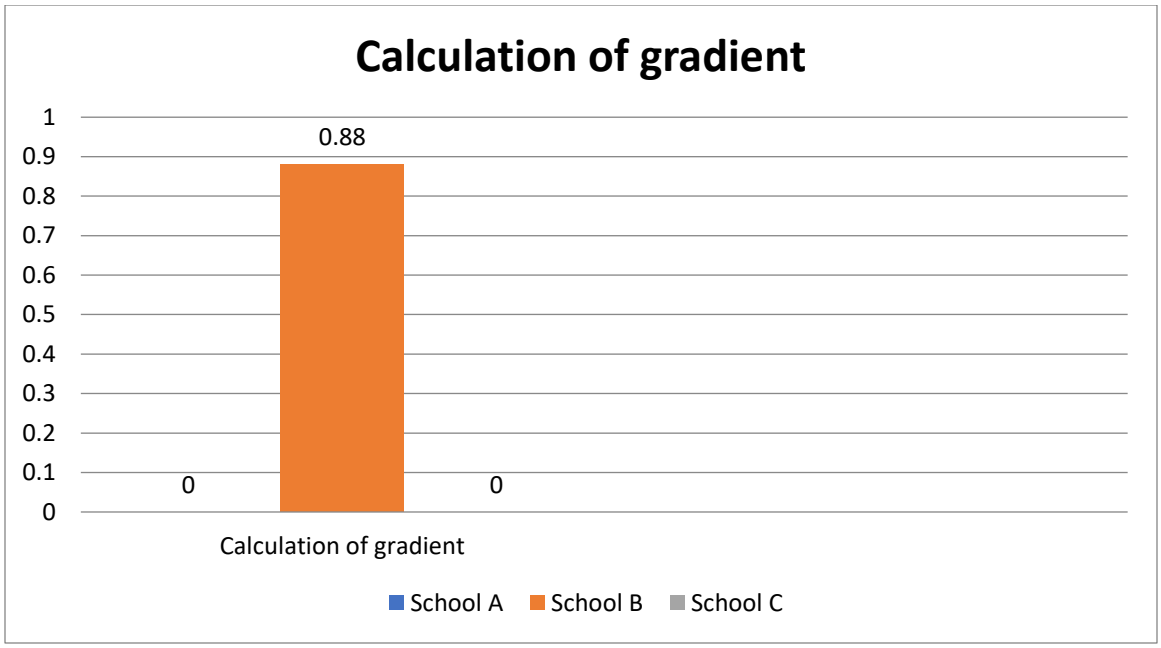


Figure 8: comparison of performance based on the calculation of gradient

The performance of students in calculating gradients was compared across the three chosen schools. As illustrated in Figure 8, School B achieved the highest performance with a mean score of 0.88. School A and School C share the same mean score of 0. Thus far, among the three selected schools, School B has consistently demonstrated the highest performance

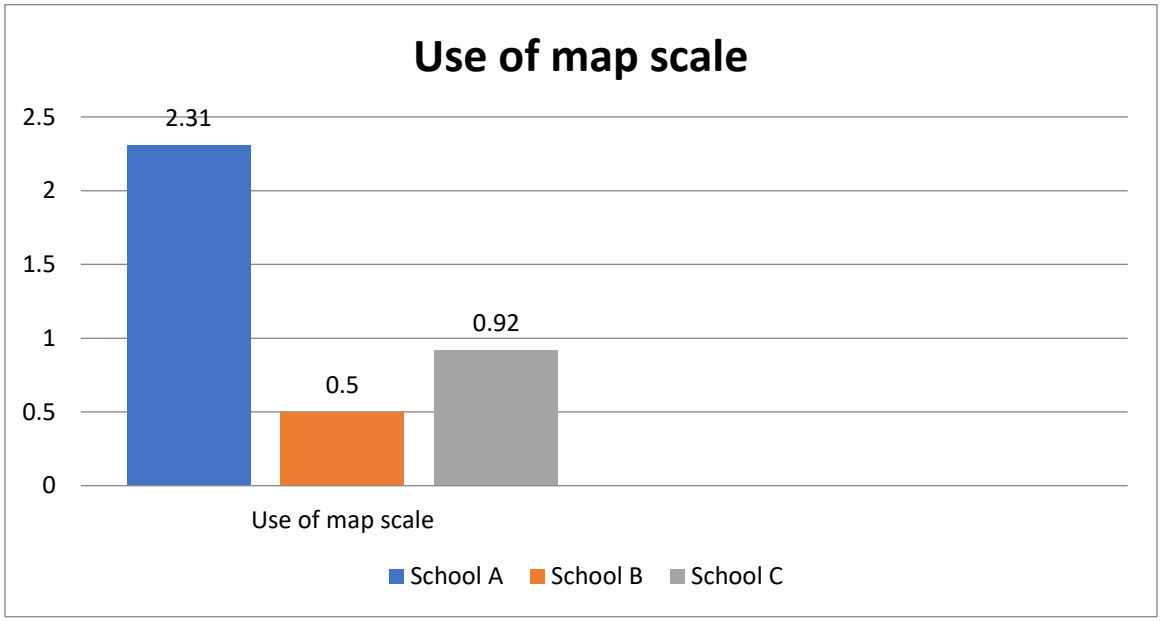


Figure 9: comparison of performance based on the use of map scale

Figure 9 provides a comparison of students' performance in utilizing map scales. As depicted in the figure, School A exhibited the highest performance with a mean score of 2.31. School C followed closely with a mean score of 0.92. Interestingly, School B emerged as the lowest performer in terms of using map scales, achieving a mean score of 0.5. This marks the first instance where School B has demonstrated the lowest performance in a map reading and interpretation skill.

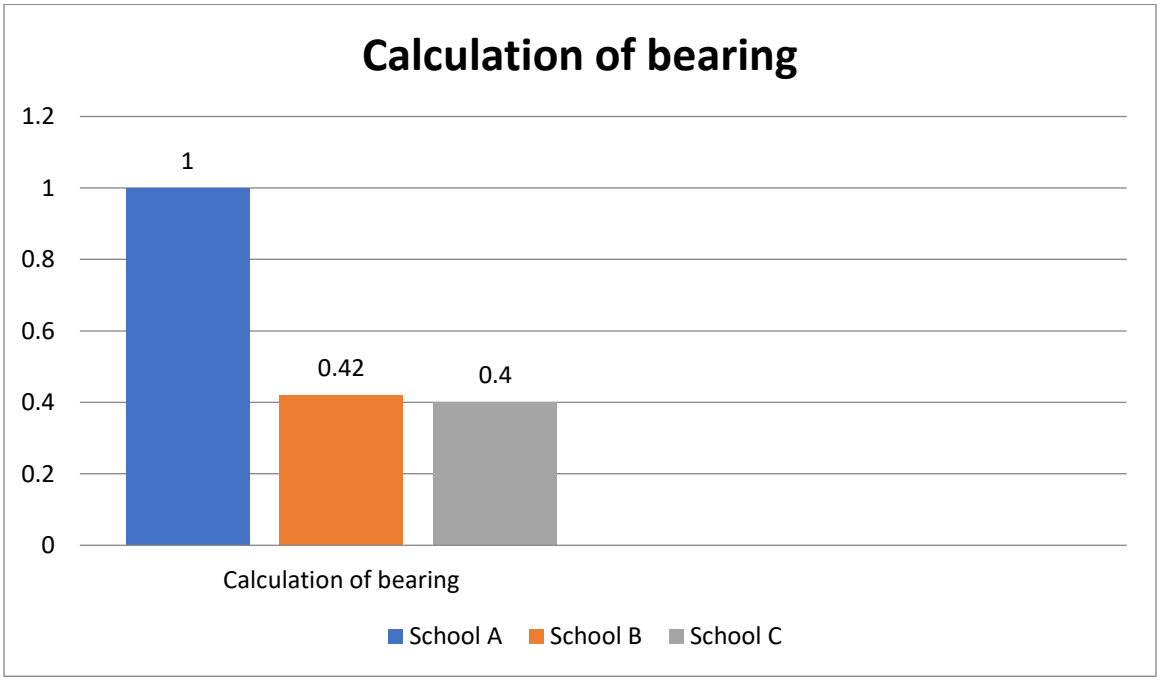


Figure 10: comparison of performance based on the calculation of bearing

In a similar vein, Figure 10 illustrates the students' performance in calculating bearings. As depicted in the bar chart, School A displayed the highest performance with a mean score of 1. School B followed with a mean score of 0.42. School C exhibited the lowest performance in bearing calculation, achieving a mean score of 0.4. Notably, this marks the second occasion where School A has demonstrated the highest performance among the three selected schools.

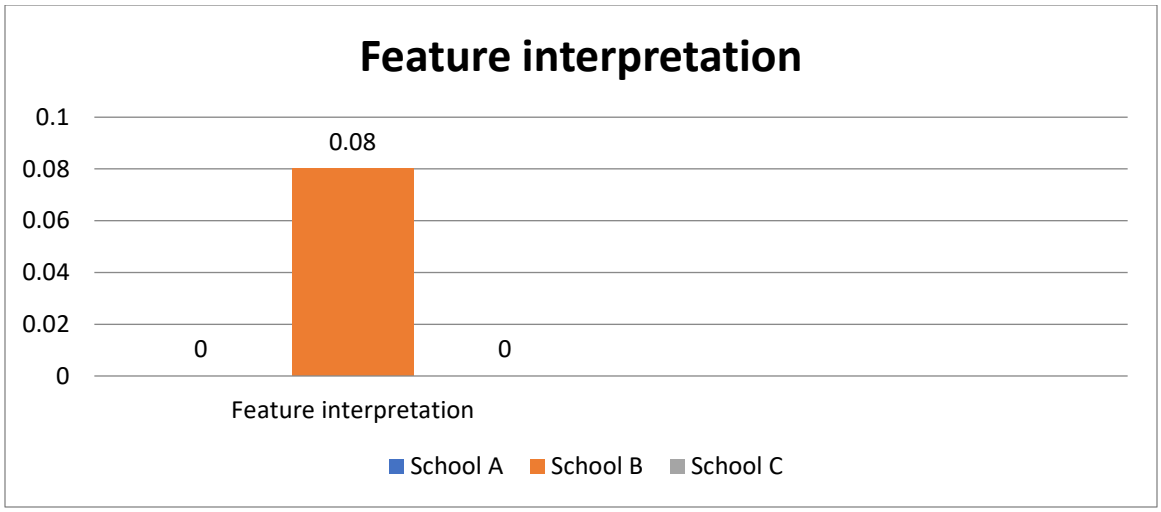


Figure 11: comparison of performance based on the feature interpretation

The schools' performance in feature interpretation was subjected to comparison. The outcomes of this comparison are presented in Figure 11. It is evident from the bar chart that School B was the sole school that achieved exceptional results among the three selected schools. School B emerged as the highest performer, attaining a mean score of 0.08. In contrast, both School A and School C had mean scores of 0, rendering them the lowest performers in this particular map reading and interpretation skill

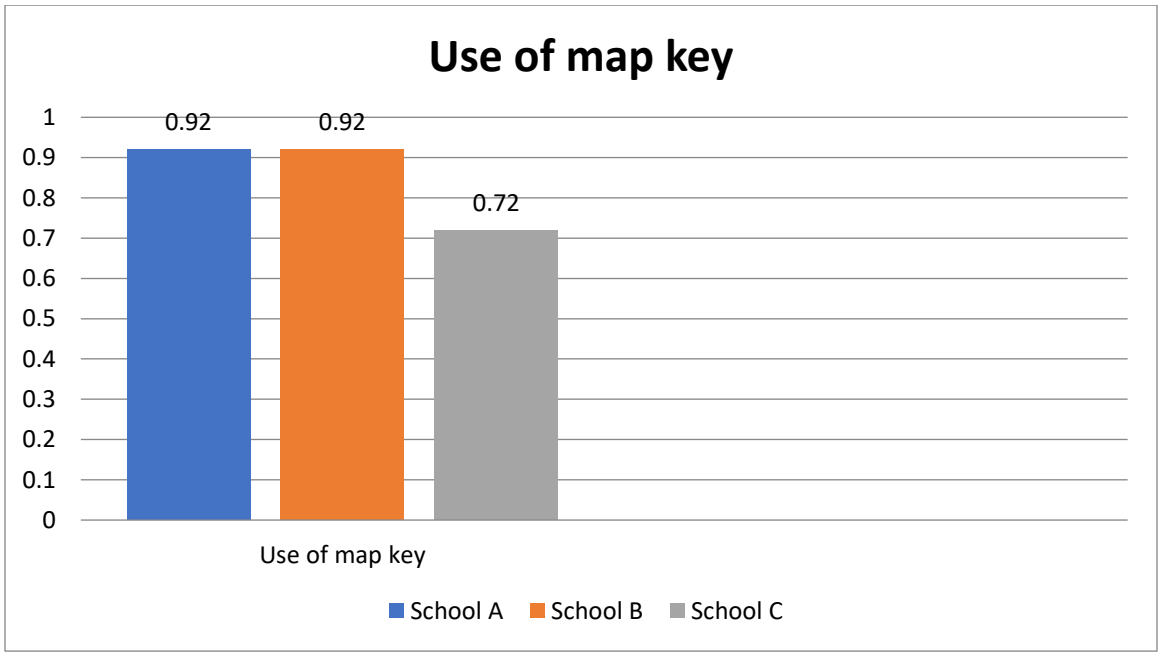


Figure 12: comparison of performance based on the use of map key

Lastly, the evaluation of schools' performance in utilizing map keys was undertaken among the three schools under scrutiny. The outcomes of this evaluation are portrayed in Figure 12. As depicted in the figure, School A and School B achieved identical mean scores of 0.92. The lowest performer in terms of using map keys was School C, with a mean score of 0.72.

Drawing from the data presented across Figure 4 to Figure 12, a conclusion can be drawn that School B exhibited the highest proficiency across the aforementioned map work skills. School A followed suit in terms of performance. Consequently, among the three selected schools, School C emerged as the least proficient. This underscores the observation that a significant majority of students in School C lacked map reading and interpretation skills.

Finally, an assessment of schools' performance regarding the utilization of map keys was conducted among the three schools under examination. The results of this assessment are depicted in Figure 12. As illustrated in the figure, both School A and School B attained identical mean scores of 0.92. The lowest performance in terms of map key utilization was observed in School C, which obtained a mean score of 0.72.

Drawing insights from the data presented across Figures 4 to 12, a decisive observation can be made: School B showcased the highest level of proficiency across the mentioned map work skills. School A closely followed in terms of performance. As a result, within the trio of selected schools, School C surfaced as the least proficient. This observation underscores the fact that a substantial majority of students at School C lacked adequate map reading and interpretation skills.

4.6.2 Qualitative Findings

The examination of factors influencing students' proficiency in map reading and interpretation was also conducted across the three selected schools. This was achieved by identifying commonalities and disparities in the students' feedback. The ensuing paragraphs provide an account of the outcomes stemming from this comparative analysis.

4.6.2.1 Students' Attitude and Motivation towards Map Work The majority of students in School A and B expressed a favorable inclination towards map reading and interpretation. Nonetheless, a few participants from these schools revealed their lack of enthusiasm for map work. Conversely, the findings disclosed that a significant number of participants in School C held a negative attitude towards map work.

4.6.2.2 Impact of Test Items

Analysis revealed that participants from School A and B encountered no issues with the test items. They collectively acknowledged a clear understanding of the question requirements. On the contrary, students from School C reported difficulties with the test items. However, a closer examination revealed that these participants grasped the questions; they simply lacked the correct answers.

4.6.2.3 Influence of Map Design

Upon querying the participants about the influence of map design, unanimous agreement emerged from all three selected schools. Participants concurred that the provided map was easily comprehensible and user-friendly.

4.6.2.4 Influence of Teaching and Learning Approaches

All participants across the three schools revealed a common absence of map work instruction in Grade 9 and 10. It was uncovered that map work was introduced in Grade 11, with map reading lessons spanning approximately one week. Additionally, participants from School A and School C did not undertake a test on map reading and interpretation. Conversely, only participants from School B acknowledged having previously taken a test prior to their participation in this assessment. In terms of learning, participants from both schools acknowledged receiving peer-based scaffolding. However, they refrained from consulting their teachers for enhanced understanding of map work concepts.

4.6.2.5 Resource Availability vs. Consistent Practice

Insights from School A and School C participants highlighted a lack of access to teaching and learning materials such as maps and question papers. Consequently, this lack of resources translated into limited opportunities for practicing map reading and interpretation. In contrast, participants from School B affirmed their access to map work books, enabling them to engage in consistent practice.

4.6.2.6 Opportunities for Teachers to Enhance Students' Skills

Geography teachers, each representing one of the schools, were asked to identify available opportunities to enhance students' proficiency in map reading and interpretation. A summary of the interview outcomes is presented in Table 10 for comparative reference.

Table 10: A comparison of opportunities available to Geography teachers from the three selected schools

	School A	School B	School C
Resources	-Books are available -No computer labs and library -No access to question papers and maps	-Do not have lots of material to refer to. -Have access to computer lab and internet	-Shortage of resources such as maps previous and question papers - Can use the mountains, valleys, and rivers to boost students' understanding of some map=work concepts
Student caliber	-Are academically weak -Lazy students -Not exposed to technology so they can't search for material on their own	-Students have negative attitude or seem not to like map reading	-They are lazy -Not willing to learn -they lack English proficiency -Cannot push themselves to complete tasks -students do not consult with their teachers or amongst themselves

Syllabus	-Bulky syllabus	-Affected by bulky syllabus; content overload -Wait to cover other topics so that they can transit well into map reading and interpretation	
Time factor	-The time to cover the syllabus is limited -Periods for Geography are limited -Teach Map reading towards the examination because they will have covered topics which award more marks	-Can start teaching map reading at Grade 8 and Grade 9, though it is difficult to do -Affected by limited time, which is not enough to cover all the content thoroughly	-40 minutes period not enough -They lack double lessons -Affected by limited time, which is not enough to cover all the content thoroughly -Teachers normally teach map reading towards the examination

The data compared in Table 10 reveals that both schools lacked access to maps and previous question papers. Examining the opportunities available for teachers to enhance students' map reading and interpretation skills, the data indicates that each school possessed distinct opportunities unique to them. For instance, the data shows that the Geography teacher in School A could employ map-work textbooks to foster students' skills, while the Geography teacher in School B had the advantage of utilizing computers and the internet for teaching map reading. The Geography teacher in School C could capitalize on locally available resources such as mountains and rivers. In

comparison, School C appeared to be the most resource-disadvantaged school, whereas School B seemed to have the most abundant resources.

Furthermore, the Geography teachers from School A and School C perceived their students as lacking motivation, resulting in difficulties in developing students' map-work skills. The Geography teacher noted that her students exhibited an aversion to mathematical map-work concepts, consequently demotivating the teachers from offering extensive help.

Similarly, the Geography teachers from School A and School B struggled with the dense syllabus, which needed to be covered within a limited academic timeframe. These teachers believed that teaching map reading closer to examinations was advantageous as they would have already covered topics that carried higher marks and were prerequisites for map-work. One of the Geography teachers suggested introducing map reading instruction in Grades 8 and 9 to allow students more time to practice map reading and interpretation skills.

Finally, both the Geography teachers from School A and School C highlighted limited Geography lesson durations as an obstacle to effectively nurturing students' map reading and interpretation skills. The Geography teacher from School C specified that they had only single lessons of forty minutes each. This teacher emphasized that longer, double lessons would afford adequate time to comprehensively cover map reading and interpretation.

4.7 Chapter summary

This chapter has presented the findings related to students' map reading and interpretation skills. It has also detailed the factors influencing students' performance in the mapwork test. Moreover, the chapter has presented the teachers' responses regarding available opportunities. Furthermore, a comparative analysis was performed between the quantitative and qualitative data collected from the three selected schools. The upcoming chapter will delve into discussions centered around the research questions posed at the outset of this chapter.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

This chapter delves into a comprehensive discussion of the findings presented in the previous chapter. The focus is on aligning these findings with the research questions and exploring both convergence and divergence from existing research. Furthermore, the discussion aims to validate the assertions of Fischer's Skill Theory, which forms the theoretical foundation of this study. The ensuing sections will provide an in-depth examination of the data generated to address each research question.

5.2 Comparison of Students' Skills with Required Map Reading and Interpretation Skills

To address the first research question, a test was administered in the selected schools to gauge students' proficiency in map reading and interpretation. Test scores were analyzed using a skills matrix, with an objective to identify strengths and weaknesses. The analysis revealed prominent errors in calculating bearing and gradient. Some participants inaccurately calculated bearing in an anti-clockwise direction and represented it with a two-digit figure. This suggests that these participants lacked sufficient exposure to bearings in their Mathematics lessons or were not adequately supported to master this skill. Similarly, a prevalent error was observed in gradient calculation, with many participants calculating vertical interval (VI) and interpreting it as gradient. This highlights a lack of understanding in calculating slope gradient.

Furthermore, participants struggled with distance estimation, particularly in using the provided scale for conversions. Consequently, it can be concluded that a significant portion of participants from both schools lacked proficiency in using map scale for estimating distances. This finding contradicts Albert et al.'s (2016) results, which suggested that participants were adept at distance estimation and scale use. Additionally, the analysis indicated that the most proficient skills among participants were the use of map key, grid referencing, judgment of gradient using contour lines, and reading contour intervals. This suggests prior exposure and mastery of these skills.

However, difficulties emerged in using compass points to indicate direction. Similar findings were noted by Uyar and Zumber (2022), where participants struggled with fundamental map reading skills such as direction and location. An assessment of quantitative data across the three schools highlighted feature interpretation as the most challenging skill. Participants were tasked to

determine the type of farming practiced near a labelled pasture on the provided map. Only two students from School B answered correctly, revealing a widespread inability to employ information from broader geographical concepts in answering map-related questions.

5.3 Learners' Perceptions of Factors Affecting Their Skill Level

Environmental and personal factors can impact students' skill levels, according to Banik and Kumar (2019). Fischer's Skill Theory similarly emphasizes the role of attitude, practice, task nature, and contextual support. Thus, this study explored the cause-and-effect relationship between skills and influencing factors. The contextual factors affecting Geography students' skill levels in the selected schools were investigated.

Initially, the emotional state's impact on performance, as emphasized by Arthurs et al. (2021) and Fischer (1980), was considered. The investigation centered on students' attitudes towards map reading and interpretation and whether motivation affected skill levels. The findings indicated a positive attitude among most participants from Schools A and B. This challenges the assertions of Fischer's Skill Theory and Arthurs et al. (2021) that a positive attitude enhances performance. Additionally, it contrasts with Tasgin and Tunc's (2018) study, which found that positive attitudes correlated with improved skills. Notably, students in School C who disliked map work might align with Fischer's (1980) assertion that negative attitudes towards tasks could hinder optimal performance.

Additionally, the correlation between ease of information extraction and comprehension of test items and map design, as stated by Gulij (2013) and Arthurs (2021), was investigated. The results demonstrated that participants from both schools found the test items clear and the map design accessible. This ease of extraction and comprehension likely facilitated successful performance.

Furthermore, the study explored the impact of consistent practice and teaching on skill mastery, echoing the concepts of Gokce (2015), Albert et al. (2016), and Lingwal et al. (2020). The participants revealed that map work was not taught in Grades 9 and 10, with focused instruction commencing in Grade 11. Limited practice was evident, as participants from Schools A and B had some exposure to map reading exercises, while those from School C had none. These findings highlight the importance of regular practice and teaching for skill development. However, lack of teaching and learning resources (TLR) such as maps and question papers constrained constant practice. The correlation between resource availability and consistent practice emerged as critical.

Furthermore, the lack of teacher scaffolding emerged as a hindrance. Dixon et al. (2010) and Fischer's Skill Theory stress the importance of a supervisor in skill development. The study revealed that students were hesitant to seek help from their teachers, resulting in missed learning opportunities. Inadequate teacher-student relationships affected skill acquisition.

Moreover, participants cited memory lapses in applying map-work concepts as a factor affecting skill levels. This mirrors Erol's (2017) findings that students may memorize concepts without effectively applying them. Therefore, memorization might hinder skill application in decoding map-related information.

5.4 Opportunities for Teachers to Develop Students' Map Reading and Interpretation Skills

The examination of opportunities available for teachers to enhance students' map reading and interpretation skills revealed distinctive scenarios in the selected schools. Despite possessing a B.Ed degree and over four years of teaching experience in Geography (see Table 4 and 5, p.41), the Geography teacher from School A struggles with effective map scale instruction due to a lack of competency in Mathematics. This suggests that the teacher has not actively pursued mastery of scale use or sought assistance from Mathematics teachers. The administered test in School A indicated that students faced difficulties with scale use, including inaccurate conversions and the creation of unconventional measurement units. The teacher's limited understanding of map scale likely influenced students' performance in this aspect, potentially leaving them with insufficient knowledge in map scale use and related Mathematical concepts.

Interestingly, data gathered from interviews with Grade 11 Geography teachers in Schools A and B indicated a belief in students' negative attitudes towards map reading and interpretation. However, this perception diverged from students' actual attitudes, as revealed in focus group interviews. The majority of students in both schools displayed positive attitudes and expressed willingness to practice when provided with necessary resources like maps and question papers. This divergence highlights an opportunity that teachers can leverage to enhance students' map work skills.

In School C, the Geography teacher noted that they primarily rely on locally available resources such as mountains, valleys, and rivers to explain map reading concepts. While this approach can be beneficial, it may consume valuable time that teachers consider limited for effective map

reading instruction. Therefore, sourcing maps and previous question papers and making them accessible to students could significantly enhance their map reading skills through practice.

Additionally, in School B, the Geography teacher mentioned the possibility of teaching map reading in Grade 8 using internet resources. While this could enhance students' mapwork proficiency, it might also divert attention from other subjects. Conversely, the same teacher recognized the advantage of starting map reading instruction in Grade 9, allowing students ample time for practice and revision.

5.5 Chapter Summary

Chapter 5 thoroughly discussed the research findings, aligning them with the research questions. The discussion encompassed both convergence and divergence within the study's results. Comparative analysis with prior research on students' map reading and interpretation skills was also undertaken. The identified gaps between findings and theoretical perspectives, specifically Fischer's Skill Theory, were examined to validate or refute its key assertions. The subsequent chapter provides a comprehensive summary of the entire study, concluding with empirical findings and the researcher's recommendations. Future research directions will also be explored in the following chapter.

CHAPTER SIX

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 Introduction

The preceding chapter extensively deliberated on the research findings, aligning them with relevant literature on students' map reading and interpretation skills. The discourse also interconnected these findings with the fundamental principles of Fischer's Skill Theory. As the final chapter of this study, it serves to encapsulate the research through five distinct sections: the study's objectives and purpose, a concise overview of the findings, the conclusions drawn from these findings, recommendations derived from the study, and avenues for further exploration.

6.2 Aim and Purpose of the Study

The primary aim of this study was to evaluate Geography students' proficiency in map reading and interpretation, while simultaneously exploring the factors influencing their skill levels. The study intended to uncover strategies for enhancing learners' spatial communication using topographic maps. Focusing on a sample of students and Geography teachers from three Maseru-based schools, the study addressed three key research questions:

1. How does the skill level of Geography students compare to the required map reading and interpretation skills?
2. What factors do learners perceive as influencing their map reading and interpretation skill level?
3. What opportunities are available for teachers to cultivate students' map reading and interpretation skills?

6.3 Summary of the Study Findings

The quantitative analysis of students' map reading skills revealed that certain challenges existed in deciphering information from maps. Qualitative insights further unveiled barriers in students' map reading learning, as well as similar challenges experienced by Geography teachers during instruction. Key findings include:

6.3.1 Comparison of Learners' Skills with Required Map Reading and Interpretation Skills

Quantitative data from map-work tests highlighted areas of weakness, including bearing calculation, gradient determination, map scale utilization for distance estimation, and feature interpretation. Conversely, strengths encompassed effective utilization of map keys, grid referencing, gradient assessment through contour lines, contour interval interpretation, and compass-based direction indication.

6.3.2 Factors Influencing Students' Skills in Map Reading and Interpretation

Qualitative focus group interviews illuminated several factors impeding students' map reading and interpretation skills. Key barriers included limited access to teaching and learning resources, inadequate scaffolding support from teachers, and lack of consistent practice opportunities.

6.3.3 Opportunities for Teachers to Develop Students' Map Reading and Interpretation Skills

Teacher interviews disclosed that while some opportunities existed to enhance map reading skills, such as internet access and teaching at specific grades, challenges outweighed benefits. These challenges included inadequate teaching and learning resources, students' negative attitudes, and a congested syllabus.

6.4 Conclusions Drawn from the Findings

6.4.1 Skills Comparison and Evaluation

Upon comprehensive analysis, it was concluded that certain weaknesses persisted in students' bearing calculation, gradient understanding, map scale utilization, and feature interpretation skills. Conversely, their strengths included efficient utilization of map keys, grid referencing, gradient interpretation through contour lines, contour interval comprehension, and direction indication using compass points.

6.4.2 Factors Influencing Skills

The study confirmed that students' skills in map reading and interpretation were negatively impacted by inadequate scaffolding, limited access to resources, and inconsistent practice. It also revealed students' preference for peer assistance over teacher guidance.

6.4.3 Teaching Opportunities and Constraints

Teachers encountered difficulties in effectively teaching map reading due to limited resources, syllabus congestion, and students' negative attitudes. While a few opportunities were identified, such as access to the internet, availability of text books, and utilizing local resources, challenges were predominant.

6.5 Recommendations

Drawing from the study's findings, several recommendations emerged:

- The Ministry of Education and Training should reconsider the weighting of map reading and interpretation in assessments to motivate teacher attention.
- Strategic collaboration between the ministry and school administrators should ensure the availability and accessibility of teaching and learning resources.
- Geography teachers should prioritize teaching map reading skills in Grade 9, leveraging alternative methods such as orienting and flipped classrooms.
- Stakeholder engagement, including parents, administrators, and churches, could boost students' positive attitudes towards Geography through initiatives like map-work competitions.
- Curriculum developers should organize workshops for teachers to address challenges related to syllabus volume and teaching methods.

6.6 Areas for Further Research

The current study assessed the Geography students' map-work skills in three selected schools in Maseru, Roma. In addition, this study also investigated the factors that affect students' map reading and interpretation skills. This was done by employing focus group interviews. The study was guided by Fischer's Skill Theory, thus the data generated was delimited by the key assertions of this theory. That is, the study only focused on students' attitude, clarity and difficulty of the test items, influence of map design, and teaching habits. Other aspects such as socio-economic background of students were not included in the research. Different findings may be found if another theory is used to investigate students' poor performance in map-work.

The teachers were also interviewed concerning the opportunities available to them to develop students' map reading and interpretation skills. The findings revealed that teachers are challenged by lack of resources and bulky syllabus. It is still not clear from the findings how the teachers are coping with such mishaps. Thus, further research needs to be done to investigate how teachers manage the effects of lack of resources when teaching map reading and interpretation.

The findings also revealed that majority of the students failed a test despite having positive attitude towards map-work. As a result, the study concluded that positive attitude towards a course may not always improve students' performance in a course. However, this is just hypothesis, it needs to be tested by carrying out an investigation into the students' attitude towards map reading to find the relationship between attitude and performance.

The results of the teacher's response in School A revealed that the teachers may have insufficient knowledge of some map-work concepts. Thus, further research seems necessary to assess the pre-service teachers' map-work skills in the teacher training institutions. This may help the institutions to ensure that their students graduate college with necessary skills that could be transferred to secondary school students.

Lastly, this research was carried out in one part of the Maseru region. Since it is impossible to transfer the findings of this research to other settings, the researcher recommends other researchers to carry out this kind of research using a different environment or context.

6.7 Chapter Summary

This chapter encapsulated the entire study on students' map reading skills. It summarized empirical findings, derived conclusions, offered recommendations for various stakeholders, and outlined avenues for future research. The study's findings and insights contribute to a deeper understanding of students' map reading and interpretation skills and offer practical suggestions for improvement. The chapter also sets the stage for the subsequent reference list that underpins the research's arguments and statements.

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Appendix A

MAP WORK TEST

Grade 11 Geography: Map reading and interpretation

NAME:_____ MARKS: 18

Study the provided map and answer the following questions

1. Using four cardinal points, state the direction of the church from the school.

   ……
   ……
   ……
   ……
   ……[1]

2. Using eight cardinal points, state the direction of the Basia Lake from the school.

   ……
   ……
   ……
   ……
   ……[1]

3. Using four figure grid reference points,state the location of the hospital.

   ……
   ……
   ……
   ……
   ……[1]

4. Give the location of the power plant using six figure grid reference points.

   ……
   ……
   ……

……

……[1]

5. What is the contour interval shown on the map?

……

……

……

……

……[1]

6. Study the contour lines at Mt Kuma. Is the slope shown gentle or steep? Explain your answer

……

……

……

……

……

……

……[2]

7. What is the type of slope shown at Thabana-Misi (Is it steep or gentle?). Explain your answer

……

……

……

……

……

……

……[2]

8. Study the contour lines at Thabana-Misi and calculate the gradient of the slope from point X to point P.

……

……

……

……

……

……

……..[2]

9. On the actual ground, how long is the airport road?

……

……

……

……

……

……

…….[2]

10. What is the length of the Tlaling river from the west-bridge to the East-bridge?

……

……

……

……

…….[1]

11. What is the bearing of the power plant from the hospital?

……

……

……

…….[1]

12. What is the bearing of the church from the power plant?

……

……

……

…….[1]

13. What type of farming is likely to be practised by people at Ha-Tau?

……

……

……

……..[1]

14. Two of the villages shown on the map do not have a police station. State their names.

……

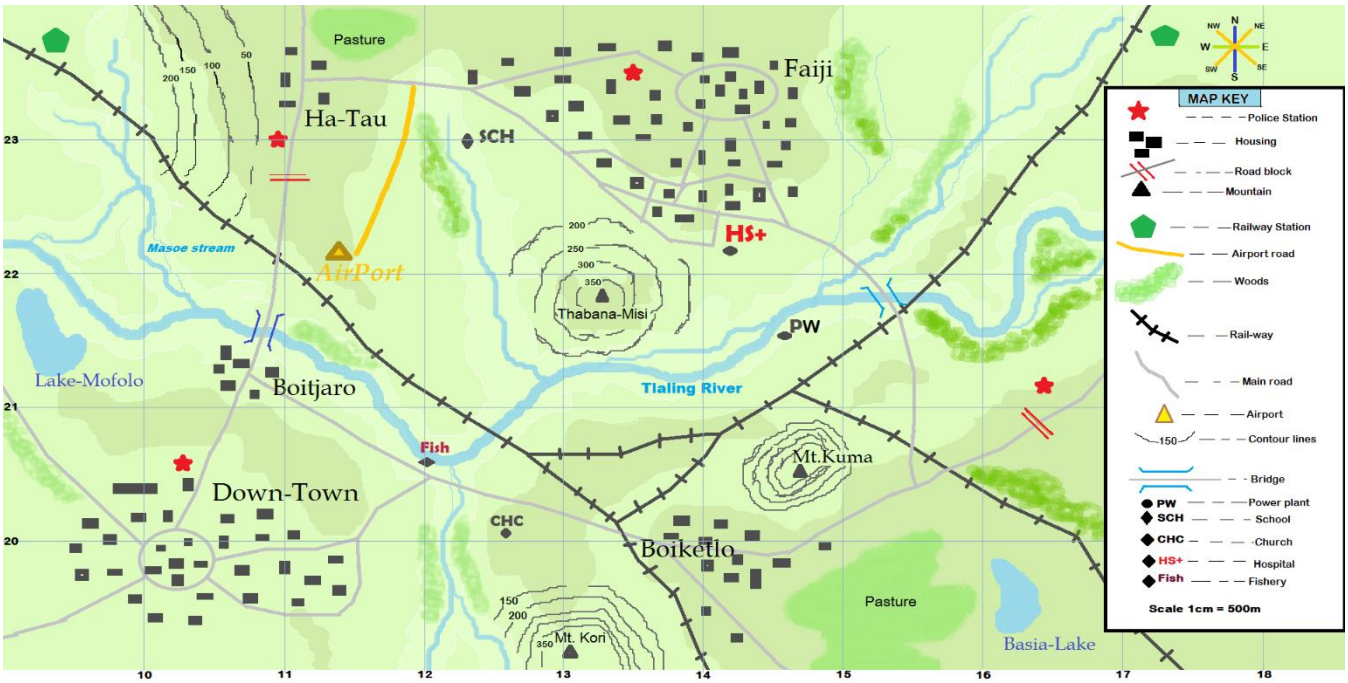
……

……

……..[1]

Appendix B

PROVIDED MAP



Appendix C

FOCUS GROUP INTERVIEWS

(School A)

Motivations

Parti; eea sir rea o rata map reading

Parti;2 ka ‘nete

Parti3; le ‘na

Researcher; uena madam? What do you say? How do you feel ka map reading and interpretation?

Parti; aa sir! Ai! ‘na ha ke o rate map reading.

Researcher; lona le reng la o rata map reading, what do you like about it? Le uena o sa o rateng u bo re hlalosetsa why do you feel that way. Hare qale ka wena, you said you like map reading am I right? Parti; Yes sir

Researcher; then please explain to us why you like it

Parti; (laughs) ‘na ka ‘nete ke o rata hobane likarabo li sentse li le teng ‘mapeng. Ha re nahane ka thata joalo ka ha re araba testing tseo eseng tsa map reading

Researcher; wena?

Parti; ‘na I like map reading because I think I will be able to use a map sir, mohlomong se ke le bo States koana

Parti2; or Dubai (laughter)

Researcher; what about you madam?

Parti; le ‘na ke o rata hobane likarabo li sentse li lle ‘mapeng

Researcher; ok, is there any other reason why you like mapwork? (no response)

Researcher; let us hear you madam, why do you dislike map reading he?

Parti; ‘na kannete sir ha ke rate map reading hobane kee utloi o le thata. Lipotso tsa teng! Joo! Le ha ho ka thoe ke o rutoa hape ha ke nahane ke tla o pasa

Test items and map design

Researcher; okay I see most of you like map work. Now let us talk about questions in that test. Is there any question that you can think of that was not clear to you?

Participants; no sir

Researcher; do you all agree hore questions were clear?

Participants; yes sir

Researcher; what about the design of the map? Did you experience any problems while using it to answer questions? (silence) researcher; anyone? please speak up!

Parti; ‘na sir ke bone o le hantle ka ‘nete o sena mathata

Researcher; thank you, lona? What do you think?

Parti; o no sena mathata sir, o no le hantle o bonahala ntho engoe le engoe

Teaching and learning habits

Researcher; alright, please tell me about the tests you have written before this assessment. If you remember, how many have you written?

Parti; ha re so ngole test ntle leo u re fileng eona

Researcher; really?

Parti2; aabo re la ka ra ngola (quarrel)

Others; neng [T]?

Response; eane, ha na e ne le neng? eane eo madam [Th] a na re file ka classing (quarrel)

Researcher; don’t fight, if you disagree, just tell me what really happened

Parti; ‘na nke se re re ngotse test. Ke hopola hantle madam [Th] o la re fa exercise re e etsetsa ka classeng. Test eo u re fileng e ne le eona ea pele on map reading sir

Others; yes!

Researcher; thank you for sharing. Let's move on. I believe le rutuwe mapwork in Grade 9. Can you please tell me how it was interms of nako e le inkileng ntse le etsa map-work

Parti; aabo sir Madam [Th] ha re ruta map reading Grade 9

Parti2; yes, o re rutile lemong sena ene e le hona a qalang

Parti3; le teng ha se nako e telel. Ke sure ke beke le matsatsinyana. Be ke tse peli ha so thoe. Ea ba o sa feta.

Researcher; then tell me, do you guys manage to practice map reading and interpretation

Parti; ho bua 'ne, ha ke practice sfapano hobane I don't have a map and question papers to practice with.

Participants; ka 'nete ha lieo

Parti; le 'na ha kena tsona

Parti; le 'na, practice e re e fumaneng ke activity eno e ene re etse ka classing eaba ke phetho

Parti; 'na sir kea practica (quarell) parti; kang? U lethetsi [T]

T; kena le 'mapa heso 'na. sir ke na le 'mapa, che le ha o le mong fela o nthusa hore ke hopole naa ho shebuoa mapa joang

Parti; ehlile ke nahana ho practice ho important. Ke nahana re feilisoa ke ho hloka li mapa tseo e leng tsa rona sir. Joale ka ha ha re li fuoe hobetere re fuoe exercise tse ngata hona skolong mona he! Re tsebe ho pasa

Researcher; where do you get help on mapwork concepts that you do not understand?

Parti; I do not understand sir researcher; I mean le ee battle thuso moo e bang le ea be le sa utloa ha ntse le rutoa map work?

Parti; re na le ho discuss map work re thusane, le ha e se mehaena

Researcher; ho 'me [Th] teng naa le ee lee to ask for her help?

Parti; (laughs) Joo!

Parti2; no sir ha re ee

Researcher; why not?

Parti; sir keu joetse! Haik! Ha re ee ho madam [Th] hobane ha hlalose lintho hantle ho re re utloisise

Parti; me [Th] ‘na sir o na nfosissi contour interval ke engotse hantle. Eaba ha a nhlalosetse hantle hobaneng ke fositse. Fela ‘na ne ke tseba hore ke e nepile

Rseacher; then ha le sa mo utloisis, why don’t you consult with other teachers?

Parti; joale ‘me [Mot] o pele (laughter) u k aba re ‘me [Th] o betere. ‘Me [MT] o tla u botsa lipotso u bo lahlehe hofeta

Another parti; joale ‘na he ke ena a nyontsisang mapa. Oa hopola mohlang ola a na re ruta ona? Ha rute ha monate, ha qeta o hlalosa ka bothata

Participants; ka ‘nete

<u>Other emerging factors</u>

Researcher; I see! You said you guys were only taught map reading this yea?

Parti; yes sir

Researcher;and you said the map and questions were clear? Parti; yes sir they were clear. Mapa o no le motle ka ‘nete

Researcher; then please tell me before re arohanang; le nahana keng e le affectileng hore ebe le qetelletse le fumane below 50% boholo?

Parti; ke nahana ke feitsi hobane ne se ke lebetse lintho tse ngata tseo re li rutuweng on map reading. Hape sir ntho tse ling ne li le ncha joalo ka potso e la ea type of farming. Ha ntse re etsa classwork ho no sena lipotso tse joalo.

Parti2; conversions are tricky for me sfapano. Ke ‘metse o thata and ka nete metse oa nhlola ‘na

Researcher; that’s all?

Parti; ‘na ke nahana re feitsi hobane re sa fuwa nako e ngata ha ntse re rutoa mapa. Beke eo e nyanyana sir hore re ka pasa hantle. Re hloka ho rutoa hape

(School B)

Attitude

Participants; yes sir we like map reading

Researcher; all of you?

Participants; yes

Parti: I like map work test because it gives more marks; the answer is already there you know! For us us to figure it out

Parti2; ‘Na ke rata map reading because o kenyelletsa ntho tsa subject tse ling. Mohlala, bo bearing joalo

Parti3; I like it because ha o re nahanisi ka thata ha re araba lipotso

Test items and map design

Researcher; Did you guys find any question that you did not understand?

Participants; no sir

Researcher; meaning all of you understood what the questions required?

Parti; ‘na sir ke ne ke utloisisa potso engoe le engoe

Researcher; lona?

Participants; le rona re ne re utloisisa na ho batloang

Researcher; ‘mapa ona? Did you experience problems when using it?

Parti; o no le motlee

Parti2; o no le clear ka ‘nete and o le monyane hantle as compared to the huge ones, yes sir, those ones that you have to unfold and unfold

Parti3; U bone li drawuoe hasesane ho le ntho li ngata feela

Parti4; ke re o no le motle, o le clear ntho engoe le engoe o e bona, hau sheba key then u ea mapeng ono bona every symbol shown.

Teaching and learning habits

Researcher; okay, so you all agree that the map was clear and easy to use?

Participants; yes sir

Researcher; now can you tell me about your learning of map reading since grade 9? How was it?

Parrti; no sir ha rea rutoa mapa Grade 9

researcher; Really? Why?

Parti; we don't know sir (laughs). Re rutuwe this year

Researcher; for how long?

Parti; nako e telele

Participants; aabo [Li]!

researcher; butleng if you have something different say it hantle

parti; akholoa ke beke sir eaba re ngola test bekeng e hlahlamang

parti2; yes

parti1; eaba se etsa revision ea test eno that's all?

researcher; guys, is that right

participants; yes sir

Researcher; okay; but can you say your teacher gave you enough attention and made enough effort when teaching you map reading?

Parti; yes sir she did (quarrel)

parti2; sir keu joetse Mistress o re rutile but hona le moo a saeang ka botebo ha hlalosa

parti3; for example sir, o re rutile ho sebelisa protrector le pair of deviders

participants; yes

parti3 continues; but ea hore bearing e tlameha hoba only clockwise and ebe three digits, especially ea ho kenya zero ka pele ne re qala ho e utloa

Researcher; ka ‘nete?

Participants; yes sir (laughter)

Researcher; tell me, how do you overcome challenges moo ebang le ea be le sa utloa ha Mme [Mot] a le ruta?

Parti; re ea thusana

Parti2; but ase kaofela ba re thusang, yes sir

Parti3; ba batla ho pasa ba le bang (laughter)

Researcher; then if they don’t help you, why don’t you got to your teacher to ask for help?

Parti; sir! Haik sir (laughter) ha re consult ho Mistress because rea be re sentse re sa mo utloa ua utloa sir researcher; yes

Parti continues; so re nahana ha re botsa our peers who understand then baka hlalosa beterenyana

Researcher; really? participants; yes sir

Reasearcher; tell me he! Do you guys have a way to practice map reading? Please explain that to me

Participants; yes sir ra practicer researcher; with what?

Parti; mistress o re recommendetse libuka tsa maps and ka nete ke tsona tse rethusang

Reasearcher; what about the rest of you? Kapa le lumellana le eena le lona

participants; yes sir

<u>Other emerging factors</u>

Researcher; this is the last question he. Generally, what do you think contributed to your level of performance in this test?

Parti; ‘na ka ‘nete sir ha ke rate mane moo re measurang curved distances ka bo khoele hobane ea nsokolisa ho measure hantle

Parti2; khoele e betere, tracing paper eona khilik

Parti1; ka ‘nete

Parti3; ‘na ke nahana bothata baka ke lipotso tse mona tse amanang le analysis, yes ke analysis, joalo ka eane e ne bua ka type of farming. If re ka fuoa enough practice ka lipotso tse joalo ka ‘nete sir re pasa

Parti; he lithata tseno sir (laughter)

Parti; sir! Oa bona ha re ka rutoa ho sebelisa protractor le pair of dividers hantle, re ka pasa

Another parti; che ‘na ke tseba ho e sebelisa

Parti; oho! (laughter)

Parti; le hae le mona re rutuoe map work this year, Grade 11 sir, but ke nahana re batla re na le kutloisiso ea ona haholo ka ‘ne, joale ho ja re lahla ra rutoa map reading khale koana re ka be re pasitse sir

Participants; ka ‘nete

Group interview (School C)

<u>Attitude</u>

Parti; ‘Na ho bua nete ha ke rate map work. In fact, ha ke rate Geography entirely. Ke tlameletsoe ho etsa yet ne ke batla Biology. Joale ka ha ne ke le siko ha ho khethoa eaba kea khetheloa.

Parti; Le ‘na ke ntho e tshoanang ea [TL].

Parti; Ke hore Sir honna mona ho t’soana le ha so qale. Ke re ha kea utloa nex

Parti; Sir [Y] ka ‘nete ena ha ratisi batho Geography. O tla be a buoa ka mokhoa o joang joang o monyebe, kore!

Parti; ‘na ehlile ke batla ho qalella ke bale ke lebohe Sir [Y] ka ho pasa Geography.

Parti; ‘Na hona le moo ke sao rateng map reading; moo mo u sebelisang khoele le nthoane…scale, ache! ‘na ebile ‘metse o so ntso mbora

Test items and map design

Parti; Mm! ne re sa li utloisisi lipotso

Researcher; can you please tell me which questions were not clear? Silence

Researcher; Why didn’t you ask for explanation, yet I told you that you can ask where you didn’t understand?

Parti; ‘ne re t’saba Sir

Parti 2; Hek! Haqeta ba ne batlo re li re khamme re batla ho fuoa likarabo

Researcher; Did you have problems understanding the questions kapa you understood but you just didn’t know the right answers? Help me understand

Parti; Yes Sir we didn’t know the answers

Researcher; so it means you understood what the question wanted?

Parti; Nka cho joalo he Sir!

Parti; Helek aaa! Ona o no hlakile, o no le hantle

Parti; Ono le hantleeee! Sir u o nkile kae? Hau sa re siela? (laughter)

Teaching and learning habits

Parti; Sir [Y] o re rutile hona haufinyane tjena. Test ha re so e ngole, ena eo u re fileng eona ke ea pele. Ke re le exercisenyana ea map work ha re so e bone

Parti; Sir ha rena li question paper joale motho oa li lebala ntho tsena. Hau na tsona u ko re fe Sir? Ehlile motho o hloka hore u ko practice u shebe na ho botsoang hangata

Parti; Ua utloa Sir ha re so ngole letho! Kore letho on map reading. Ne ntse re nahana rea utloa, aa! Testing ra bona hore mm! (laughter)

Parti; ‘Na ha ke compare tsela eo ke neng ke rutoa Geography ka teng in my previous school le tsela eo Sir [Y] a nrutang ka teng, ke utloa a le ‘moja ebile ke utloisisa. Just that motho hau fumane

nako ea ho practice hore u be ‘moja. Ke ntho e mona ea hore u ntso re aa! Ke tla ‘ne ke li bone ha se ntse ke lo ngola.

Appendix D

LETTER OF INTRODUCTION

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Lesotho

Africa

FACULTY OF EDUCATION

Date 05/04/2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

A Letter of introduction to undertake research

This letter serves to introduce Mr. Besele Mphekeleli, who is a Master of Arts in Education (M.A.ED) student in the Faculty of Education at the National University of Lesotho (NUL). The student is undertaking research which involves interviews with geography teachers and classroom observations. Kindly accord him the necessary assistance and support in this important activity.

Your cooperation is highly appreciated.

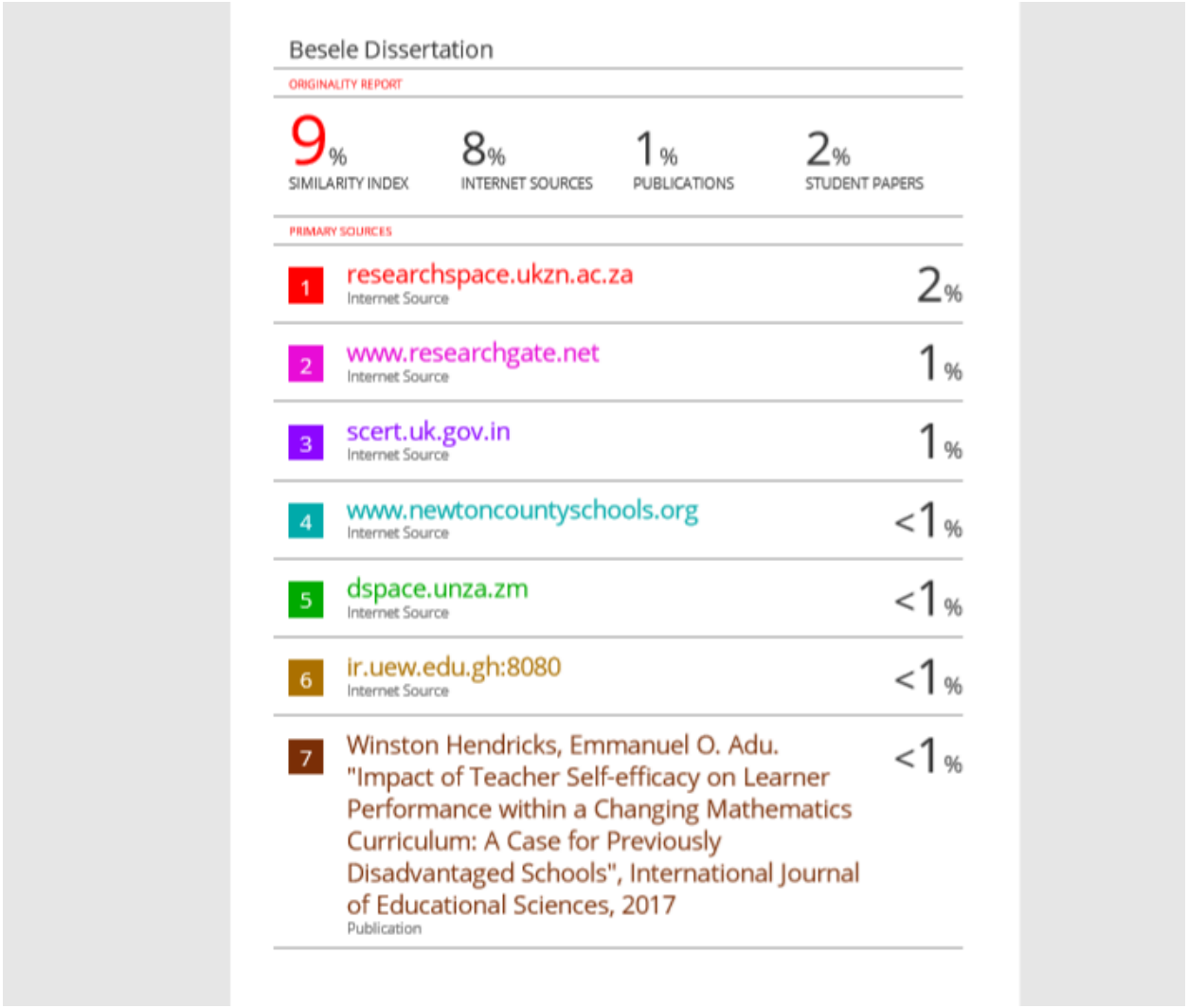
Yours sincerely,

Associate Professor M. Raselimo (Supervisor)

NATIONAL UNIVERSITY OF LESOTHO
FACULTY OF EDUCATION
05 APR 2023
LASED DEPARTMENT
P.O. ROMA 180

Appendix E

TURNITIN PLIGIARISM REPORT



Besele Dissertation

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