

Exploring Geography Education Learners` Misconceptions in the Theoretical Interpretation of Map Work in Mopani District, Rakwadu Circuit, Limpopo Province, South Africa

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ABSTRACT

This study explores the misconceptions held by Grade 11 learners regarding map work in the Rakwadu Circuit of Mopani District, Limpopo Province, South Africa. Many learners struggle to interpret geographical maps, which negatively impacts their performance in Geography and overall academic achievement. The study employed a mixed methods approach to understand the nature and causes of these misconceptions. A total of 200 learners participated in the quantitative phase, while 20 learners and 10 teachers were involved in qualitative interviews. Quantitative data were analysed using descriptive statistics, while qualitative data from semi-structured interviews were analysed thematically. Findings revealed significant misconceptions in key areas, including scale, contour lines, and map symbols. These challenges were linked to factors including language barriers, inadequate learning resources, and insufficient teacher training. Learners often struggled to grasp geographic concepts due to poor instructional support and limited exposure to practical map-work activities. The study recommends targeted interventions to address these challenges. These include hands-on learning experiences, enhanced teacher training focused on map skills, and bilingual teaching strategies to address language-related challenges. Strengthening these areas is essential for developing geographic literacy and spatial reasoning among learners. The research highlights the importance of enhanced teaching strategies and better resource allocation in improving learners' understanding of map work. Curriculum planners, educators, and policymakers must collaborate to create supportive learning environments that foster deeper engagement with geographic content.

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INTRODUCTION

Geography education often encounters challenges with learners' interpretation of maps, as this skill requires both spatial thinking and an understanding of theoretical geographical concepts. Misinterpretations in map reading can stem from cognitive biases, insufficient familiarity with spatial representations, and the diverse ways geographical theories are taught worldwide. Examining these misconceptions through an international lens highlights the importance of aligning map work with theoretical principles to enhance students' geographical literacy. Geography is a vital subject that enables learners to understand various aspects of the Earth, including its physical and human processes. At the core of geography is the ability to interpret maps, a skill necessary for understanding spatial relationships and geographical phenomena. Map interpretation involves reading and analysing different types of maps, such as synoptic weather maps, orthophotography maps, and topographic maps, which are crucial for understanding geographical landscapes (Kunze & Budke, 2025; Rhoda, 2019). However, many Grade 11 learners in Mopani West District face considerable difficulties when interpreting these maps, which impacts their overall performance in the subject.

This study aims to explore the challenges these learners encounter, to propose strategies to improve their map interpretation skills, thereby enhancing their academic performance in Geography (Swinton et al., 2023; Mwenesongole, 2020). For learners to excel in map work, they must grasp several theoretical concepts, including the interpretation of symbols, understanding scale and orientation, reading contour lines, and applying various map-related calculations. These skills are critical not only for academic success but also for developing lifelong geographic competencies. However, despite the importance of map work in the South African school curriculum, many learners, especially those in rural areas like the Mopani District's Rakwadu Circuit, struggle with these theoretical aspects. Several factors, including resource limitations, teacher preparedness, and socio-economic challenges, have been found to exacerbate these difficulties (Swinton et al., 2023; Mnguni, 2018).

The South African education system has undergone significant transformation in the post-apartheid era, with policies aimed at improving access to education and rectifying historical inequalities. The Curriculum and Assessment Policy Statement (Ramsaroop & Kwayi, 2024; CAPS) has been introduced to standardize education across the country, ensuring that all learners receive a comprehensive and balanced education. Geography is an integral part of the CAPS curriculum, with a particular emphasis on map work as a core component of geographic literacy. According to CAPS, Grade 11 learners are expected to master various skills in map interpretation, including calculating real-world distances using the scale, understanding contour lines to interpret elevation, and recognizing map symbols (Karaca & Yalcinkaya, 2021; Department of Basic Education, 2020). However, despite these curricular reforms, the reality on the ground, particularly in rural areas, presents significant challenges that continue to hinder learners' success in geography.

One of the most pressing issues in rural education is the scarcity of resources. Schools in the Mopani District, particularly in the Rakwadu Circuit, often operate with minimal infrastructure, outdated materials, and limited access to technology. For map work, which relies heavily on the use of physical maps, atlases, and other geographic tools, this lack of resources can significantly impair learners' ability to engage with the subject matter effectively (Swinton et al., 2023; Mopani Education Department, 2020). Many rural schools lack the necessary teaching aids, such as topographic maps, digital mapping tools, and geography-specific textbooks, which are essential for understanding abstract concepts in map interpretation. In addition to resource constraints, rural schools face a shortage of qualified educators. Teachers in these areas are often underqualified or unprepared to teach complex subjects, such as geography. Many teachers may lack formal training in geographic education or may have received only limited exposure to advanced map work skills during their professional development. Consequently, their instructional strategies may be insufficient for addressing the conceptual difficulties learners face when interpreting maps (Tunç, 2021; Nxumalo &

Magano, 2016). This gap in teacher training has a direct impact on learners' comprehension of theoretical map work, as the instructional techniques used may not be adequately aligned with CAPS standards or may fail to address the unique learning needs of students in these contexts.

Numerous studies have documented the prevalence of misconceptions in geographic education, particularly in the domain of map work. Misconceptions refer to the incorrect or incomplete understanding of geographic principles that learners develop, often due to cognitive overload or inadequate instruction. In map work, common misconceptions include misunderstanding the concept of scale, confusing contour lines with physical representations of elevation, and misinterpreting map symbols (Karaca & Yalcinkaya, 2021; Pereira, 2019). These misconceptions can persist over time and significantly hinder learners' ability to apply geographic concepts in both academic and real-world settings. For instance, learners may struggle to understand the concept of scale, which is a fundamental aspect of map interpretation. When learners struggle to understand the relationship between a map's scale and the corresponding real-world distances, they are likely to misinterpret spatial data. Similarly, confusion regarding contour lines can prevent learners from accurately visualizing terrain and elevation changes on topographic maps, which are crucial skills for understanding physical geography (Karaca & Yalcinkaya, 2021; Palmer & Hill, 2015). These misconceptions are not unique to South African learners but are observed in geographic education globally. However, in contexts like the Mopani District, where instructional quality and resource availability are limited, these misconceptions are often more pronounced and harder to rectify.

Geography, as a subject, plays a crucial role in educating learners about the Earth's physical processes and human-environment interactions. Geography develops critical thinking, spatial reasoning, and problem-solving skills (Karaca & Yalcinkaya, 2021; Nxumalo & Magano, 2016). Central to the geography curriculum, especially in secondary education, is map work, which requires learners

to interpret spatial data, utilize maps as tools for analysis, and apply geographical knowledge in real-world contexts (Kunze & Budke, 2025; Kimber & Pillay, 2017). Map work is particularly important as it equips learners with the ability to make sense of abstract spatial concepts, a skill necessary for understanding a wide range of geographic phenomena, from urban planning to environmental management (Karaca & Yalcinkaya, 2021; Palmer & Hill, 2015). In rural areas, learners' socio-economic backgrounds also play a significant role in shaping their educational experiences. Many learners in the Rakwadu Circuit come from low-income households, where access to educational resources outside of school is limited. These learners may not have the opportunity to engage with supplementary learning materials, such as online tutorials, geographic software, or even personal study maps, which could reinforce classroom learning. As a result, their exposure to geographic concepts is restricted to what is available in the classroom, further exacerbating their misconceptions and hindering their academic performance (Tunç, 2021; Thulare, 2021).

PROBLEM STATEMENT

The inability of Grade 11 learners to interpret geographical maps has become a significant problem at Kgapane High School. This challenge affects not only their performance in geography but also their overall academic achievement, as mapwork plays a crucial role in both the theoretical and practical aspects of the subject (Ramsaroop & Kwayi, 2024; Rhoda, 2019). During an investigation, learners were given an activity requiring them to interpret synoptic weather maps and topographic maps, which included questions related to determining the temperature and coordinates of specific areas. The results showed that most learners were unable to complete the tasks accurately, suggesting a deeper problem in their understanding of basic map concepts (Havelková & Hanus, 2022; Rebecca, 2019). This study aims to investigate the causes of these challenges, which may include factors such as inadequate teacher training, insufficient resources, ineffective teaching strategies, and learners' poor foundational knowledge (Thulare, 2021; Luscombe, 2019).

LITERATURE REVIEW

Map-work challenges for learners in rural schools in South Africa

The educational challenges faced by rural schools in South Africa, particularly in the Limpopo Province, are well documented. Rural schools often operate with minimal resources, outdated materials, and underqualified teachers, all of which contribute to learners' difficulties in mastering complex subjects, such as geography (Tunç, 2021; Mopani Education Department, 2020). Geography education, and map work specifically, require access to specialized materials such as topographic maps, atlases, and geographic information systems (Karaca & Yalcinkaya, 2021; GIS). However, many rural schools lack these resources, making it difficult for learners to engage with the subject matter effectively (Ramsaroop & Kwayi, 2024; Thulare, 2021).

In addition to resource constraints, rural schools face significant teacher shortages, particularly in specialized subjects like geography. Many teachers in rural areas lack formal training in geography or may not possess the pedagogical skills necessary to teach map work. As a result, learners are often taught using outdated methods or incorrect information, which can reinforce their misconceptions (Ramsaroop & Kwayi, 2024; Nxumalo & Magano, 2016). Furthermore, the professional development opportunities available to teachers in rural areas are limited, resulting in many educators not receiving the ongoing support they need to improve their teaching practices (Havelková & Hanus, 2022; Mnguni, 2018).

Map interpretation is a core skill in geography, but one that requires a combination of spatial awareness, visual literacy, and critical thinking (Havelková & Hanus, 2022; Wiegand, 2015). Learners must be able to understand symbols, scales, and projections on maps, while also visualizing the spatial relationships between geographical features (Swienton et al., 2023; Kersten, 2017). Unfortunately, many Grade 11 learners struggle with these tasks due to inadequate training in earlier grades (Havelková & Hanus, 2022; Rhoda, 2019). As Luscombe (Swienton et al., 2023; 2019) suggests, spatial reasoning—a key component of map interpretation—is a skill that requires regular practice and development. Without proper exposure

to maps and spatial activities in earlier years, learners are less likely to succeed in mapwork at the high school level.

One of the most pressing issues in rural education is the scarcity of resources. Schools in the Mopani District, particularly in the Rakwadu Circuit, often operate with minimal infrastructure, outdated materials, and limited access to technology. For map work, which relies heavily on the use of physical maps, atlases, and other geographic tools, this lack of resources can significantly impair learners' ability to engage with the subject matter effectively (Havelková & Hanus, 2022; Mopani Education Department, 2020). Many rural schools lack the necessary teaching aids, such as topographic maps, digital mapping tools, and geography-specific textbooks, which are essential for understanding abstract concepts in map interpretation.

In addition to resource constraints, rural schools face a shortage of qualified educators. Teachers in these areas are often underqualified or unprepared to teach complex subjects, such as geography. Many teachers may lack formal training in geographic education or may have received only limited exposure to advanced map work skills during their professional development. Consequently, their instructional strategies may be insufficient for addressing the conceptual difficulties learners face when interpreting maps (Havelková & Hanus, 2022; Nxumalo & Magano, 2016). This gap in teacher training has a direct impact on learners' comprehension of theoretical map work, as the instructional techniques used may not be adequately aligned with CAPS standards or may fail to address the unique learning needs of learners in these contexts.

Teachers' perspectives on map-work instruction

Many teachers express that time constraints within the curriculum restrict their ability to address misconceptions effectively. There is limited time dedicated to map skills, and teachers feel pressured to move through content quickly, which hinders thorough instruction in map interpretation (Tunç, 2021; Lanegran & Natoli, 2008). Limited access to high-quality maps, digital mapping tools, and field-based learning opportunities is a frequently cited

challenge. Research suggests that schools with fewer resources often rely on outdated or inadequate materials, which can reinforce misconceptions rather than clarify them (Ramsaroop & Kwayi, 2024; Bednarz, Heffron, & Huynh, 2013). Many teachers report a lack of professional development focused specifically on teaching map interpretation skills, which they see as essential to help students overcome misconceptions. Professional training workshops and resources tailored to map-related instruction can help teachers improve their confidence and effectiveness in teaching these skills (Kunze & Budke, 2025; Bednarz & Bednarz, 2004). Teacher quality is a crucial factor in learners' academic success, particularly in complex subjects such as geography. Research has shown that well-trained teachers are better equipped to identify and address learners' misconceptions, provide effective instruction, and create a supportive learning environment (Kunze & Budke, 2025; Pereira, 2019). However, in rural areas like the Mopani District, many teachers lack formal qualifications in geography or have not received adequate training in teaching map work. This gap in teacher training contributes to learners' struggles with geographic concepts, as teachers may not be able to explain abstract ideas in a way that is accessible to learners (Tunç, 2021; Kimber & Pillay, 2017).

In recent years, there have been efforts to improve teacher training in South Africa, particularly in under-resourced areas. Professional development programs designed to enhance teachers' understanding of geography and map work have been implemented in certain districts. However, the reach of these programs is limited, and many rural teachers are unable to participate due to logistical challenges or a lack of funding (Karaca & Yalcinkaya, 2021; Nxumalo & Magano, 2016). As a result, teachers in rural schools often continue to rely on traditional, lecture-based teaching methods, which may not be effective for teaching the spatial reasoning skills required for map work (Ramsaroop & Kwayi, 2024; Thulare, 2021).

Pedagogical Content Knowledge (Karaca & Yalcinkaya, 2021; PCK) is the integration of subject expertise and teaching strategies, which enables educators to convey complex concepts effectively (Havelková & Hanus, 2022; Shulman, 1986). In geography, teachers with high PCK are better

equipped to simplify abstract map concepts, such as spatial relationships and topography, for learners (Tunç, 2021; Firth & Biddulph, 2009). Firth and Biddulph's (Kunze & Budke, 2025; 2009) study found that teachers who possess strong PCK in geography tend to use a variety of approaches to engage students in map interpretation, such as interactive discussions, hands-on activities, and real-world examples. Such approaches help students develop a practical understanding of geographical concepts, which is critical for map interpretation. Teachers' content knowledge directly impacts their ability to teach map interpretation effectively. Those with a deep understanding of geography are better equipped to explain map elements, such as symbols, scale, orientation, and elevation, accurately (Ramsaroop & Kwayi, 2024; Ball et al., 2008). Ball and colleagues (Kunze & Budke, 2025; 2008) assert that content knowledge allows teachers to anticipate students' misconceptions and provide precise explanations, which are crucial in tasks that require spatial reasoning. A study by Kent et al. (Havelková & Hanus, 2022; 2018) similarly found that teachers with strong geographical knowledge could facilitate meaningful discussions that encourage students to think critically about spatial data, resulting in improved map interpretation skills.

Instructional strategies play a crucial role in how well learners interpret maps, and these methods vary based on teachers' familiarity with pedagogical practices specific to geography. According to Roberts (Karaca & Yalcinkaya, 2021; 2013), effective strategies in geography include inquiry-based learning, spatial reasoning exercises, and the analysis of real-life maps. Inquiry-based learning, for instance, allows students to engage actively in interpreting map data, fostering skills such as critical thinking and spatial awareness (Karaca & Yalcinkaya, 2021; Roberts, 2013). Such strategies are particularly effective when teachers integrate them with geographical theories, helping learners make connections between theoretical concepts and practical map interpretation. The ability of learners to interpret geographical maps accurately is significantly influenced by the quality of instruction they receive, which hinges on teachers' knowledge and methods of content delivery. Teachers with a solid understanding of geographical concepts

and effective pedagogical strategies can enhance learners' map interpretation skills. This literature review examines the impact of teachers' content knowledge and teaching approaches on learners' success in geographical map interpretation, with a focus on studies that address pedagogical content knowledge (Kunze & Budke, 2025; PCK), instructional strategies, and teacher expertise.

The use of technological tools, such as Geographic Information Systems (Tunç, 2021; GIS) and digital maps, has been shown to improve students' map interpretation abilities. However, teachers must be proficient in these tools to use them effectively in the classroom (Havelková & Hanus, 2022; Demirci, 2009). Demirci (Havelková & Hanus, 2022; 2009) found that teachers who lack expertise in GIS or digital mapping tools often struggle to teach map interpretation, as they cannot fully demonstrate or explain the applications of these tools. Conversely, teachers with high proficiency in GIS provide students with hands-on learning experiences that enhance their spatial skills and understanding of geographical data representation.

Teacher attitudes towards geography as a subject and the relevance of map interpretation in the curriculum also impact content delivery. Lambert and Morgan (Ramsaroop & Kwayi, 2024; 2010) argue that teachers who value map skills as essential for geographical literacy are more likely to emphasize map interpretation in their lessons. This positive attitude encourages them to adopt engaging teaching methods, which can increase learners' motivation and interest in mapwork tasks. Such enthusiasm for teaching map skills helps to create a learning environment where students feel encouraged to explore maps and practice interpretation skills, leading to better learning outcomes.

The literature suggests that teachers' knowledge of geography and their chosen instructional strategies have a significant impact on learners' map interpretation skills. Learners taught by teachers with high PCK and strong content knowledge tend to perform better in interpreting maps, as these educators are more likely to use effective pedagogical techniques. Moreover, the use of technology and inquiry-based strategies allows students to engage with maps practically, reinforcing their understanding

of spatial data and geographical concepts (Swienton et al., 2023; Kent et al., 2018). In sum, teachers who possess robust geographical knowledge and utilize diverse teaching methods can enhance learners' proficiency in map interpretation, a critical skill in geography education.

The role of language in learners' understanding of map-work

Several challenges hinder students' mastery of mapwork interpretation. One common issue is symbol complexity, as many students find it difficult to interpret intricate map symbols and legends (Ramsaroop & Kwayi, 2024; Montello, 2002). According to Montello (Havelková & Hanus, 2022; 2002), this challenge can be alleviated by initially simplifying map symbols in teaching materials and providing a clear legend. Another recurrent difficulty is scale comprehension, which many students struggle with, particularly in calculating real-world distances from map scales (Havelková & Hanus, 2022; Mathewson, 1999). Mathewson (Havelková & Hanus, 2022; 1999) suggests that introducing scale-related exercises early in geography education can help students develop an intuitive understanding of distance and proportion, improving their overall map interpretation skills. Therefore, geography education learners often encounter challenges in interpreting maps, as this skill requires both spatial thinking and an understanding of theoretical geographical concepts. Misinterpretations in map reading can stem from cognitive biases, insufficient familiarity with spatial representations, and the diverse ways geographical theories are taught worldwide. Examining these misconceptions through an international lens highlights the importance of aligning map work with theoretical principles to enhance students' geographical literacy.

The integration of Geographic Information Systems (Ramsaroop & Kwayi, 2024; GIS) into geography education has transformed the way students engage with map data. GIS enables students to explore spatial relationships, visualize changes over time, and analyze layered data (Karaca & Yalcinkaya, 2021; Baker & White, 2017). According to Baker and White (Swienton et al., 2023; 2017), students exposed to GIS technology perform better in spatial reasoning and interpretation tasks due to the interactive nature of

digital mapping. Furthermore, GIS encourages a more dynamic approach to learning, allowing students to manipulate data and test hypotheses, which fosters critical thinking in mapwork (Swienton et al., 2023; Baker & White, 2017). Interactive map applications, such as Google Earth and ArcGIS, also offer substantial benefits for students' understanding of maps. These tools provide a virtual environment where students can view real-world topographies and distances in a visually engaging manner (Swienton et al., 2023; Patterson & Hanley, 2018). Research by Patterson and Hanley (Swienton et al., 2023; 2018) suggests that such applications are particularly useful for visual learners, as they allow for the exploration of complex geographic data in a format that is both intuitive and accessible. By enabling students to "zoom" in and out, measure distances, and view real-time maps, these tools bridge the gap between abstract symbols on traditional maps and real-world spatial awareness.

The literature on learners' misconceptions in map work reveals several consistent themes. First, learners often struggle with interpreting scale, contour lines, and map symbols, leading to significant misconceptions that can impede their understanding of geographic concepts (Swienton et al., 2023; Palmer & Hill, 2015; Pereira, 2019). These misconceptions are influenced by cognitive factors, such as the abstract nature of map work, as well as pedagogical factors, including the quality of instruction and access to resources (Tunç, 2021; Mnguni, 2018). The socio-economic context of learners, particularly those in rural areas, also plays a crucial role in shaping their experiences with map work, with poverty, resource limitations, and teacher shortages contributing to learners' difficulties (Kunze & Budke, 2025; Thulare, 2021). Technological interventions, such as GIS and virtual globes, offer promising solutions for addressing learners' misconceptions; however, their implementation in rural schools remains limited due to a lack of infrastructure and inadequate teacher training (Ramsaroop & Kwayi, 2024; Kimber & Pillay, 2017). International research highlights the value of experiential learning and hands-on activities in helping learners overcome their misconceptions, but these approaches are often underutilized in the South African context due to resource constraints

(Kunze & Budke, 2025; Liben & Downs, 2017; Taylor & Freeman, 2016). While the CAPS curriculum provides a solid framework for teaching geography, its implementation in rural schools is often hampered by a lack of resources and inadequate teacher training. There is a clear need for further curriculum reforms and targeted interventions that address the specific challenges faced by learners in rural areas (Ramsaroop & Kwayi, 2024; Nxumalo & Magano, 2016)

The gaps identified in the literature suggest that more research is needed to explore context-appropriate solutions for improving geography education in rural South Africa. Specifically, there is a need for studies that investigate the effectiveness of low-cost technological interventions, professional development programs for teachers, and experiential learning opportunities that can help learners overcome their misconceptions in map work.

THEORETICAL FRAMEWORK

Theoretical frameworks within geography, such as Tobler's First Law of Geography, which advocates that "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970), help students understand spatial relationships. Learners who understand such theories can apply them to interpret geographical patterns on maps, contributing to higher academic performance. According to Bednarz and Bednarz (2008), introducing theoretical frameworks in geography helps students make sense of spatial data, thereby enhancing their skills in map interpretation and their ability to achieve academic success. The authors argue that learners who are well-versed in these frameworks develop a more nuanced understanding of maps, which translates to higher performance in assessments.

Teachers' approaches to teaching geographical theory have a significant impact on learners' map interpretation skills and academic outcomes. Inquiry-based learning and spatial thinking exercises allow students to actively engage with geographical concepts and apply them to map interpretation tasks (Jo & Bednarz, 2009). Jo and Bednarz (2009) found that when students are encouraged to explore spatial concepts through hands-on mapwork, they are more likely to retain theoretical knowledge and

perform better academically. Inquiry-based learning fosters critical thinking skills by prompting students to question and analyze spatial information, linking theory with practical interpretation.

Integrating geographical theory in map interpretation has been shown to improve learners' academic performance by enhancing their comprehension of spatial patterns and data representation. According to Favier and van der Schee (2012), students who can apply geographical theories to map interpretation tasks develop critical thinking skills that are essential for academic success. Their study highlights that students who understand and can apply theories such as central place theory and spatial distribution perform better on assessments because these theories enable them to draw inferences from spatial data. Furthermore, Roberts (2013) suggests that theoretical knowledge enhances learners' abilities to interpret complex maps, resulting in improved academic outcomes across various geographical topics.

Spatial literacy, which encompasses the skills needed to interpret and make sense of spatial information, is greatly enhanced by a strong grasp of geographical theory. Solem et al. (2013) argue that spatial literacy is integral to academic performance in geography, as it allows learners to analyze and communicate about spatial information effectively. Their research found that students who are proficient in spatial literacy, often due to their understanding of geographical theory, tend to excel in map interpretation tasks. This, in turn, positively influences their academic performance, as they are better equipped to address complex geographical problems.

METHOD

Design

Research design is the plan or framework that guides the researcher in collecting and analyzing data (Yin, 2018). This study adopts a mixed-methods approach, combining both qualitative and quantitative data collection methods. The decision to use a mixed-methods approach stems from the desire to gain a holistic understanding of learners' misconceptions in map work, which requires exploring both the

depth of the learners' experiences (qualitative) and the extent or prevalence of these misconceptions (quantitative) (Tashakkori & Teddlie, 2010). A sequential explanatory design was chosen, starting with the quantitative phase, followed by a qualitative phase (Creswell, 2014). The quantitative phase involved administering a questionnaire to learners, which enabled the researcher to gather measurable data on the prevalence of specific misconceptions in map work. The subsequent qualitative phase involved conducting interviews with both learners and teachers to gain deeper insights into the reasons behind these misconceptions and the challenges faced in teaching map work in the context of the Mopani District. This design is appropriate because it allows the study to address the research questions comprehensively. The quantitative data provides an overview of the issue's scope, while the qualitative data enriches the findings by providing detailed explanations of the underlying causes of the misconceptions (Plano-Clark & Ivankova, 2016).

Sampling

The population for this study includes Grade 11 learners and their geography teachers from schools in the Rakwadu Circuit, Mopani District, Limpopo Province. The choice of Grade 11 learners is deliberate, as this grade is critical for map work, which forms an integral part of the geography curriculum and is heavily tested in both internal and external examinations (Nxumalo & Magano, 2016). The Rakwadu Circuit was selected due to its rural context, which presents unique challenges in terms of resources, teacher training, and learners' socio-economic backgrounds, all of which are hypothesized to influence learners' misconceptions in map work.

A multistage sampling technique was used to select participants. In the first stage, purposive sampling was employed to select schools within the Rakwadu Circuit. Schools were chosen based on criteria such as geography results from the previous academic year and the availability of qualified geography teachers. A 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. Purposive sampling ensures that schools facing the typical challenges of rural education are included in the study (Palinkas et al., 2015). In the second stage, a stratified random sampling technique was used to select learners from each school. Stratified sampling helps to ensure that different subgroups within the population (e.g., male and female learners) are adequately represented, making the sample more representative of the population (Taherdoost, 2016). A total of 200 learners participated in the quantitative phase of the study, while 20 learners and 10 teachers were involved in the qualitative interviews. The selection of the 200 learners for the quantitative phase did not rely solely on purposive sampling in the strict statistical sense. Instead, a two-stage approach was applied. First, schools were purposively selected based on their relevance to the study context, including rural location, availability of Geography as a subject, and alignment with the study focus on map-reading challenges. Within these selected schools, learners were then selected using a more inclusive approach, where all available and consenting learners in the relevant grades were invited to participate, resulting in a sample of 200 learners. This approach was adopted to ensure adequate sample size for quantitative analysis while maintaining contextual relevance. This sample size was chosen to balance breadth and depth in understanding the issue at hand.

Instruments

A research Instrument can be defined as a measurement tool intended to obtain data on a topic of interest from research subjects (Maxwell, 2013). The instrument that the researcher used in the study is a semi-structured interview guide. An interview guide allows a researcher to work with a set of prearranged questions asked during the interview session (Aurini, Heath & Howells, 2016). For this study, the interview guide was used as a data-

gathering instrument; the researcher probed where necessary for transparency and in search of more information. Moule and Goodman (2014) defined pre-testing as the copying of the data collection process on a small scale. To test the practical aspects of a research study, the researcher can conduct a pre-test. Pretesting aims to investigate the feasibility of the study and to detect possible flaws in the methodology, and inaccessibility to the sample of the proposed study (Brink, Van der Walt & Van Rensburg, 2012). A pre-test study was conducted to assess the competence of an interview schedule, and the researchers aimed to uncover any practical difficulties that could derail the main study. Three teachers were selected purposefully for the exercise. To ensure the validity and reliability of the assessment, an existing map-reading and interpretation test developed by ECOL was adapted for this study. The test items were modified to align with the specific skills targeted in the research. This adaptation process was guided by three sources: relevant literature outlining essential map-reading and interpretation competencies, feedback from an expert panel consisting of two MA (Education) Geography candidates and a Geography professor, and think-aloud protocols obtained from six undergraduate students who had previously completed a similar map-reading test. Based on the expert panel's evaluation, the items were reviewed and revised where necessary. The revised instrument was then piloted with non-sample participants to assess item clarity and difficulty, and their responses informed further refinement of the test.

While a mixed-methods approach was employed, only a limited number of instruments were deliberately selected to maintain coherence with the study's objectives and to avoid overburdening participants. The quantitative component required a standardized measure of learners' map-reading and interpretation skills, which was best addressed through the adapted ECOL test. The qualitative component focused on understanding learners' experiences and challenges, which was sufficiently captured through the selected qualitative instruments. Additional tools such as questionnaires or further observational schedules were not included because they were unlikely to yield substantially different data beyond what was already obtained through the chosen instruments, and their

inclusion could have resulted in data redundancy. Moreover, time constraints within the school context and the need to minimize disruption to teaching and learning also influenced the decision to limit the number of instruments. These considerations guided the methodological choices, ensuring that the selected instruments were both appropriate and sufficient for addressing the research questions while maintaining methodological rigour and feasibility.

Data collection methods

The data collection method refers to the systematic way towards the collection of collecting data so that information can be obtained (Gray, 2009). The study employed two primary methods of data collection: questionnaires and semi-structured interviews. Each method was chosen for its appropriateness in answering the research questions and gathering both quantitative and qualitative data. Before the process of data collection, the researcher had obtained ethical clearance from the University, and then participants were identified and asked to participate in the study. The researcher also explained to the participants about the study, and they participated voluntarily without being forced or intimidated. Participants were allowed to choose their preferred and comfortable places for the interviews. The researcher had made an emphasis that participants should talk freely about all the topics in the guide; the interviews ranged from 30 to 60 minutes. Interviews were conducted in English, and the researcher had simplified questions where necessary for participants to understand. Data collection tools included tape recording and taking notes during interviews.

Questionnaire

Questionnaires were used to collect quantitative data from the learners regarding their understanding and interpretation of map work. The questionnaire was designed to identify specific misconceptions, such as confusion about scale, contour lines, and the interpretation of map symbols (Leedy & Ormrod, 2015). The questions were adapted from existing literature on common misconceptions in map work and were pretested to ensure clarity and reliability. The questionnaire included both closed-ended and open-ended questions. Closed-

ended questions allowed for the quantification of learners' responses, providing statistical data on the prevalence of different misconceptions (Taherdoost, 2016). For example, learners were asked to identify the correct interpretation of a contour line map, choose the correct map scale from a list, and explain what certain map symbols represented. Open-ended questions were included to allow learners to explain their reasoning in their own words, which provided richer data on their thought processes and misconceptions. The questionnaire was administered to learners in a controlled environment, with the researcher present to clarify any questions. This ensured that the learners understood the questions and provided accurate responses. The quantitative data from the questionnaires were used to establish the prevalence of specific misconceptions among the learners (Tashakkori & Teddlie, 2010)

Semi-structured interviews

Following the quantitative phase, semi-structured interviews were conducted with a smaller subset of learners and teachers. The purpose of the interviews was to explore in greater depth the reasons behind the misconceptions identified in the questionnaire data and to understand the challenges faced by both learners and teachers in teaching and learning map work (Creswell, 2014). Semi-structured interviews are flexible and allow the researcher to ask follow-up questions based on the responses given by the participants (Yin, 2018). This method was chosen because it facilitates a more nuanced exploration of learners' cognitive processes and the educational context in which misconceptions arise. The interview guide included questions about learners' experiences with map work, their understanding of specific map-related concepts, and the instructional methods used by their teachers. Teachers were asked about their experiences in teaching map work, the challenges they face in doing so, and their perceptions of learners' difficulties with the subject. The interviews were recorded, transcribed, and analyzed thematically. This approach allowed the researcher to identify recurring themes and patterns in the data, which provided insights into the underlying causes of learners' misconceptions (Braun & Clarke, 2006).

Data analysis

Data analysis involved both quantitative and qualitative techniques, reflecting the mixed-methods design of the study. The analysis was conducted in two phases: first, the quantitative data from the questionnaires was analyzed, followed by the analysis of the qualitative data from the interviews.

Quantitative data analysis

The quantitative data from the questionnaires were analyzed using descriptive statistics. Descriptive statistics, such as frequencies and percentages, were used to summarize the learners' responses to the closed-ended questions (Field, 2013). This provided an overview of the prevalence of specific misconceptions, such as the percentage of learners who struggled with interpreting contour lines or map scales. Inferential statistics were used to explore relationships between different variables, such as the correlation between learners' socio-economic background and their performance in map work (Cohen, Manion & Morrison, 2018). Statistical tests, such as chi-square tests and t-tests, were conducted to determine whether the differences observed between groups (e.g., male and female learners, urban vs. rural learners) were statistically significant (Pallant, 2016).

Qualitative data analysis

The qualitative data from the interviews were analyzed thematically using the six-phase approach proposed by Braun and Clarke (2006). This approach involves familiarizing oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report (Braun & Clarke, 2006). Thematic analysis was appropriate for this study because it allows for the identification of recurring patterns and themes in the qualitative data, which helps to explain the learners' misconceptions and the challenges

they face in learning map work (Nowell et al., 2017). The transcripts were coded manually, and recurring themes were identified, such as the role of teachers in perpetuating misconceptions, the impact of resource limitations on learners' understanding of map work, and the cognitive difficulties learners face in interpreting abstract geographic concepts. The thematic analysis helped to provide a deeper understanding of the factors contributing to learners' misconceptions and the educational context in which these misconceptions arise (Creswell, 2014).

FINDINGS

Findings from the questionnaire

The quantitative data were collected using a structured questionnaire, which aimed to assess learners' understanding of map work and identify common misconceptions. A total of 200 Grade 11 learners from six schools in the Rakwadu Circuit participated in the survey. The questionnaire focused on key areas of map work, including scale, contour lines, map symbols, and the interpretation of geographic features.

Misconceptions about map scale

One of the critical aspects of map work is the understanding of scale, which allows learners to convert distances on a map to actual distances on the ground. However, the results revealed significant misconceptions in this area. Table 1 below shows the learners' responses to questions related to the map scale.

The data shows that only 34% of learners could correctly interpret a basic map scale of 1:50,000, which is a fundamental skill in geography (Ramsaroop & Kwayi, 2024; Thulare, 2021). Many learners confused the representation of distance on the map with the actual distance, indicating a misunderstanding of proportional reasoning. This finding aligns with the work of Palmer and Hill (Havelková & Hanus, 2022; 2015),

Table 1: Learners' understanding of map scale

Question	Correct Responses (%)	Incorrect Responses (%)
Convert map distance to ground distance (simple)	56%	44%
Interpret scale 1:50,000	34%	66%
Identify the appropriate scale for a given task	40%	60%

who identified similar difficulties in scale interpretation among learners in other contexts.

The confusion about scale could be attributed to the abstract nature of this concept. As noted by Liben and Downs (Swinton et al., 2023; 2017), learners often struggle with tasks that require them to mentally convert two-dimensional information into real-world dimensions. In the Mopani District, where resources like detailed maps are scarce, learners may not have had sufficient practice working with different scales. This highlights the need for more practical, hands-on activities in teaching map work (Swinton et al., 2023; Pereira, 2019).

Misconceptions about contour lines

Contour lines, which represent elevation and topography on a map, are another area where misconceptions were prevalent. The questionnaire asked learners to interpret a simple contour map and to describe the landscape represented by a series of contour lines. Table 2 summarizes the responses.

The results indicate that only 29% of learners understood how contour lines represent the steepness of a slope, while a larger percentage (Karaca & Yalcinkaya, 2021; 52%) were able to distinguish between flat and hilly terrain. This suggests that while some learners grasp the general concept of elevation, they struggle with more detailed interpretations of contour intervals and slopes. These findings are consistent with studies by Mnguni (Ramsaroop & Kwayi, 2024; 2018) and Pereira (Tunç, 2021; 2019), which highlighted contour lines as one of the most challenging aspects of map interpretation for learners.

Several factors may contribute to these misconceptions. First, contour lines require abstract thinking, as learners must visualize three-dimensional terrain based on two-dimensional representations (Karaca & Yalcinkaya, 2021; Kimber & Pillay, 2017). Second, the lack of hands-on experience with physical models or digital tools like GIS may hinder learners' ability to connect map representations with real-world geography. In rural areas like Rakwadu, where access to such resources is limited, teachers often rely on verbal explanations, which may not be sufficient for learners to fully grasp these concepts (Swinton et al., 2023; Nxumalo & Magano, 2016).

Misconceptions about map symbols

Map symbols are used to represent various physical and man-made features, and understanding these symbols is crucial for accurate map interpretation. The survey included questions on common map symbols, such as those representing rivers, roads, and vegetation. The results, shown in Table 3, indicate that learners had mixed success in interpreting these symbols.

While 78% of learners could correctly identify the symbol for a river, only 42% recognized the symbol for vegetation, suggesting that some map symbols are more intuitive than others. The symbols for human-made features, such as roads, were more easily understood, while those for natural features posed greater challenges. This is consistent with findings by Pereira (Ramsaroop & Kwayi, 2024; 2019), who noted that learners often struggle with symbols representing natural landscapes, possibly due to limited exposure to such features in their daily lives.

Table 2: Learners' understanding of contour lines

Question	Correct Responses (%)	Incorrect Responses (%)
Identify whether an area is flat or hilly	52%	48%
Interpret contour interval and elevation changes	38%	62%
Understand how contour lines represent slope	29%	71%

Table 3: Learners' understanding of map symbols

Question	Correct Responses (%)	Incorrect Responses (%)
Identify river symbol	78%	22%
Identify road symbol	65%	35%
Identify symbol for vegetation	42%	58%

The difficulty in interpreting map symbols could also be linked to the way these symbols are introduced in the curriculum. If learners are not given ample opportunities to practice using maps and interpreting symbols in a variety of contexts, they may fail to develop a robust understanding of these representations (Karaca & Yalcinkaya, 2021; Liben & Downs, 2017). The rural setting of the study further exacerbates this issue, as learners in the Mopani District may have fewer opportunities to engage with detailed, up-to-date maps due to resource constraints (Havelková & Hanus, 2022; Thulare, 2021).

Overall performance in map work

In general, learners' performance in the map work section of the questionnaire was lower than expected, with an average correct response rate of 52%. Table 4 summarizes the overall results across the different areas of map work.

Table 4: Summary of learners' overall performance in map work

Map Work Area	Average Correct Responses (%)	Average Incorrect Responses (%)
Scale	43%	57%
Contour lines	39%	61%
Map symbols	62%	38%
Overall map work performance	52%	48%

These results indicate that learners in the Rakwadu Circuit face significant challenges in map work, particularly in interpreting scale and contour lines. The relatively better performance in interpreting map symbols suggests that learners are more familiar with symbols, which are often more concrete and visible in real-world settings. However, the overall low performance highlights the need for more targeted interventions to address learners' misconceptions and improve their map interpretation skills.

Findings from semi-structured interviews

The second phase of the study involved semi-structured interviews with 20 learners and 10 teachers. The qualitative data provided deeper insights into the reasons behind learners' misconceptions, as well

as the challenges faced by teachers in delivering effective instruction on map work.

Map-work challenges for learners in rural schools in South Africa

Interviews with learners revealed several recurring themes regarding their experiences with map work. One of the most common themes was the difficulty in connecting abstract map concepts with real-world geography. Many learners reported that they struggled to understand how maps represent physical landscapes, particularly contour lines and elevation.

One learner explained, "When I look at the contour lines, I don't understand what they mean. I can see the lines, but I don't know how they show mountains or valleys" (Tunç, 2021; Learner 3). This statement highlights a common challenge identified in the literature: learners often fail to visualize three-dimensional terrain based on two-dimensional map representations (Swienton et al., 2023; Kimber & Pillay, 2017).

Another theme that emerged from the interviews was the lack of practical, hands-on learning opportunities. Learners expressed a desire for more interactive lessons, where they could physically engage with maps and geographic tools. One learner said, "We learn about maps from the textbook, but we never actually use real maps in class. It would help if we could do more activities with maps, like using compasses or doing fieldwork" (Tunç, 2021; Learner 7). This finding aligns with Pereira (Ramsaroop & Kwayi, 2024; 2019), who emphasized the importance of experiential learning in helping learners develop a deeper understanding of geographic concepts.

Teachers' perspectives on map work instruction

The interviews with teachers revealed that they faced several challenges in teaching map work, particularly in the context of rural schools. One of the primary challenges identified was the lack of resources, such as up-to-date maps, atlases, and technological tools like Geographic Information Systems (Karaca & Yalcinkaya, 2021; GIS). One teacher explained, "We don't have enough maps for all the learners, and the ones we do have are outdated. This makes it hard to

teach the learners how to interpret maps properly” (Kunze & Budke, 2025; Teacher 4).

Teachers also noted that the curriculum does not allocate sufficient time for in-depth instruction on map work. One teacher remarked, “The curriculum is very packed, and we have to cover a lot of content in a short time. As a result, we can’t spend as much time on map work as we would like” (Kunze & Budke, 2025; Teacher 2). This finding is consistent with the work of Nxumalo and Magano (Karaca & Yalcinkaya, 2021; 2016), who argued that time constraints in the geography curriculum often prevent teachers from addressing learners’ misconceptions effectively.

Another theme that emerged from the teacher interviews was the lack of professional development opportunities. Several teachers reported that they had not received adequate training on how to teach map work, which made it difficult for them to address learners’ misconceptions. One teacher explained, “I was trained as a geography teacher, but we didn’t focus much on map work in my training. I’ve had to learn on the job, but I still feel like I don’t have the right strategies to help the learners” (Kunze & Budke, 2025; Teacher 6).

The role of language in learners’ understanding of map work

Both learners and teachers emphasized the role of language as a barrier to understanding map work. In the Rakwadu Circuit, most learners speak Sepedi as their first language, while the geography curriculum is taught in English. Several learners reported that they found it challenging to understand the English terminology used in map work, which affected their ability to grasp key concepts. One learner explained, “The words we use in map work are difficult. Sometimes I don’t know what they mean, and that makes it hard to understand the map” (Kunze & Budke, 2025; Learner 9).

Teachers echoed this concern, noting that the language barrier often compounded learners’ difficulties with abstract concepts like scale and contour lines. One teacher remarked, “The learners struggle with the English terms, especially when it comes to technical words like ‘contour interval’ or ‘gradient.’ I try to explain in Sepedi when I can, but the exams are in English, so the learners still need to

understand the English terms” (Havelková & Hanus, 2022; Teacher 8). This finding is supported by Mnguni (Kunze & Budke, 2025; 2018), who identified language as a significant factor contributing to learners’ difficulties in map interpretation.

DISCUSSION OF FINDINGS

The findings of this study highlight several key issues regarding Grade 11 learners’ misconceptions in the theoretical interpretation of map work in the Mopani District. These misconceptions are not unique to the Rakwadu Circuit, but they are exacerbated by the challenges of teaching and learning in a rural context. The discussion below focuses on the main findings and their implications for geography education.

The Prevalence of misconceptions in map work

The study found that misconceptions about map work are widespread among Grade 11 learners in the Rakwadu Circuit, particularly in the areas of scale, contour lines, and map symbols. These findings are consistent with previous research by Kimber and Pillay (Karaca & Yalcinkaya, 2021; 2017) and Pereira (Tunç, 2021; 2019), who identified similar misconceptions in other educational contexts. The high percentage of incorrect responses in the questionnaire indicates that many learners lack a fundamental understanding of these concepts, which hinders their ability to interpret maps accurately. One of the most significant findings is the difficulty learners have in understanding map scale and contour lines. These concepts require abstract thinking and spatial reasoning, skills that are often underdeveloped in learners who have limited exposure to geographic tools and technologies (Tunç, 2021; Liben & Downs, 2017). The results suggest that learners need more opportunities to engage with maps in a hands-on, practical manner to develop these skills.

The study’s findings indicate that learners’ misconceptions are rooted in their difficulties in relating Geographical theory to map work. Specifically, learners misinterpret how to relate theory in Geography to the questions asked on map work. Only 34% of learners could interpret the map scale correctly, revealing significant gaps in

their understanding of this fundamental geographic concept (Swienton et al., 2023; Thulare, 2021). These results suggest that learners struggle to grasp the abstract relationships between map representations and real-world dimensions, as highlighted by Liben and Downs (Tunç, 2021; 2017). Similarly, learners exhibited a weak understanding of contour lines, which represent elevation and topography on a map. The study found that only 29% of learners could accurately interpret how contour lines indicate the steepness of a slope or changes in elevation. The majority of learners were unable to visualize the three-dimensional terrain represented by contour lines, which is consistent with the findings of Kimber and Pillay (Kunze & Budke, 2025; 2017). This lack of spatial reasoning skills reflects a broader challenge in the South African curriculum, where learners are not given enough opportunities to engage in hands-on learning or to use geographic information systems (Swienton et al., 2023; GIS) that could help bridge the gap between theoretical knowledge and practical application (Swienton et al., 2023; Mnguni, 2018).

Map symbols, while more intuitively understood by learners, still presented challenges. Approximately 58% of learners struggled with natural features represented by symbols, such as vegetation, while man-made symbols like roads were better understood (Kunze & Budke, 2025; Pereira, 2019). This discrepancy suggests that learners may have more real-world exposure to human-made structures than to natural features, which limits their ability to apply geographic knowledge holistically.

Map-work challenges for learners in rural schools in South Africa

The study's findings have significant implications for learners' overall geographic literacy. Geography as a subject plays a vital role in developing spatial awareness, critical thinking, and an understanding of the world. However, when learners hold misconceptions about basic geographic concepts like map work, it can impair their ability to engage with more advanced topics in geography, such as environmental management, urban planning, and geographic analysis (Swienton et al., 2023; Nxumalo & Magano, 2016). The persistence of these

misconceptions limits learners' academic success and diminishes their future career opportunities in geography-related fields. The study also found that learners' misconceptions in map work are part of a larger issue of geographic literacy in South Africa. As noted by Mnguni (Swienton et al., 2023; 2018), the South African curriculum has undergone several reforms, but rural schools have not seen substantial improvements in terms of resources or teaching quality. This systemic inequality in education is reflected in the widespread misconceptions observed in the study, particularly in under-resourced rural areas like the Rakwadu Circuit.

Teachers' perspectives on map work instruction

The study revealed that many geography teachers in the Rakwadu Circuit lack the necessary training to effectively teach map work. Several teachers admitted that they had not received sufficient professional development in teaching map work, particularly in spatial reasoning and the use of modern tools like GIS (Ramsaroop & Kwayi, 2024; Teacher 4, Interview). This lack of professional development may contribute to teachers' reliance on outdated teaching methods, which do not adequately address learners' misconceptions. As noted by Pereira (Karaca & Yalcinkaya, 2021; 2019), professional development programs that emphasize the practical application of geography concepts are essential for improving teaching outcomes. The study also highlighted the role of resources and teacher training in shaping learners' understanding of map work. The lack of up-to-date maps, atlases, and technological tools in rural schools like those in the Rakwadu Circuit limits learners' exposure to practical map work activities. This finding supports the work of Nxumalo and Magano (Swienton et al., 2023; 2016), who argued that resource constraints in rural schools are a major barrier to effective geography education.

Language as a barrier to understanding

Another key factor contributing to learners' misconceptions is the language barrier. In the Mopani District, many learners speak Sepedi as their first language, while the geography curriculum is

taught in English. This language barrier complicates learners' ability to understand technical terms related to map work, such as "contour interval" and "gradient," resulting in confusion and poor performance (Karaca & Yalcinkaya, 2021; Mnguni, 2018). The study found that both learners and teachers struggled with this linguistic divide, with teachers often resorting to explaining concepts in Sepedi to help learners grasp the material. However, since exams are conducted in English, learners' reliance on their first language further hinders their ability to perform well in assessments. The role of language as a barrier to understanding map work was another key theme that emerged from the study. The use of English as the language of instruction in geography poses a challenge for learners who speak Sepedi as their first language. This language barrier affects learners' ability to grasp technical terms and concepts, which in turn affects their overall performance in map work. The findings suggest that bilingual or multilingual approaches to teaching geography could help learners overcome this barrier. By incorporating both English and Sepedi into map work instructions, teachers could provide learners with the linguistic tools they need to understand key concepts (Kunze & Budke, 2025; Mnguni, 2018). However, it is important to ensure that learners are still able to perform well in English-language exams, which remain a requirement in the South African education system.

IMPLICATIONS

The findings of this study have several important implications for geography education in rural South Africa. First, the widespread misconceptions identified in map work suggest that the current curriculum may not be adequately addressing learners' needs. To improve learners' understanding of map work, the curriculum should incorporate more hands-on, experiential learning activities that allow learners to engage with maps in a practical, meaningful way (Pereira, 2019). Second, there is a need for greater investment in teacher training programs that focus on map work and spatial reasoning. As the study has shown, many teachers in rural areas lack the necessary training to effectively teach these concepts, which

affects learners' ability to grasp them. Providing teachers with the tools and strategies they need to address learners' misconceptions could significantly improve outcomes in geography education (Kunze & Budke, 2025; Nxumalo & Magano, 2016). Finally, the role of language in learners' understanding of map work cannot be overlooked. Developing bilingual or multilingual approaches to teaching geography could help bridge the gap between learners' first language and the language of instruction, ultimately improving their ability to understand and interpret maps (Ramsaroop & Kwayi, 2024; Mnguni, 2018).

CONCLUSION

This study has presented the results of the study on Grade 11 learners' misconceptions in the theoretical interpretation of map work in the Mopani District. Using a mixed-methods approach, data were collected through surveys and interviews with learners and educators. The quantitative data from the questionnaire were analyzed using descriptive and inferential statistics, while qualitative data from semi-structured interviews were analyzed through thematic analysis. The findings reveal significant misconceptions in areas such as scale, contour lines, and map symbols, which are compounded by resource constraints, teacher training issues, and language barriers. The implications of these findings suggest that targeted interventions, including hands-on learning opportunities, improved teacher training, and bilingual approaches to instruction, are necessary to address these challenges and improve learners' understanding of map work.

RECOMMENDATIONS

The curriculum should incorporate more experiential learning opportunities that allow learners to engage with maps in practical, real-world contexts. Field trips, outdoor activities, and geographic exercises involving compasses, GPS devices, and physical maps can help learners develop a stronger conceptual understanding of map work. These activities can bridge the gap between theoretical knowledge and practical application, providing learners with a tangible context for the abstract concepts they encounter in the classroom.

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