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The implications of language when teaching geomorphological concepts and maps: Addressing learner-teacher articulation gap in secondary schools of South Africa

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ABSTRACT

Teaching and learning geography in many countries requires qualified teachers who are prepared to teach any geography curriculum prescribed for Secondary schools. However, most of the geography teachers who have undergone all the administrative, academic, and training to become experts in teaching geography are still finding it difficult to comprehend the language of teaching and learning when teaching geomorphology and map work. The purpose of this study was to explore the implications of language teaching and learn geomorphological maps. The study followed a qualitative approach with a case study design. An interpretive paradigm was used to look at the knowledge and practice of teachers on language towards the teaching of geomorphological maps. Purposive sampling was used to select 12 geography teachers who underperformed on geomorphology and map work during academic years 2022 and 2023. Focused group and document analysis were used to collect data. Social Constructivism theory was used to give theoretical grounding to this study. The results of this study revealed that most geography teachers lack language foundational competencies of teaching and learning language to provide a proper linkage of geomorphology and maps. The study concluded that support of language enrichment in teaching and learning geography and local maps to schools as instructional digital materials is needed to promote quality teaching of geography. The study further recommends that geography needs to be paired with English in the university as a specialized subject to enhance pre-service language proficiency and pedagogical skills.

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Introduction

This paper interrogates the challenges experienced by teachers in the language of teaching geomorphological concepts and maps to learners. As geography map work involves basics such as directions, scales, contours on topographic, orthophotography maps, and should be taught and integrated with geomorphology (DBE, 2011b). The basics to be used on each map work lesson regarding geomorphology should serve or enable learners to interpret theoretical questions on the map. These will allow learners to have a better understanding of the basics of the concepts of map in relation to Geomorphology. Teaching the basics by using the meaning of the world on daily presentations can reduce the problem of language used on the concepts of geomorphological maps (Makuvha, 2015). However, when learners have acquired the basics of language for teaching the map work, they will have confidence and engage in different discussions on geomorphological processes.

As the language of teaching is presented as a stumbling block, the teaching of mapwork remains a vital section for learners to know in the geography field. This mapping in geography refers to a collection of techniques in which a learner converts the spoken concepts from geomorphology into a spatial arrangement of words and links among individual learners (Still, 2023). In such cases, map drawings are found to be appropriate for teaching and learning of geography, containing several key spatial arrangements in relation to geomorphological concepts (Whalley, 2019). Drawings allow learners to be able to interpret the concepts and questions properly

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during the given activities (Gültepe, 2016). For example, blue colours used to represent the river enable learners to have a clear idea of how to tackle or interpret the given questions. Additionally, brown colours used on the map to represent the contour lines allow learners to determine the steepness and gentleness of the slope in that area. Okerefor (2011) asserts that presentation through drawing and illustration simplifies map work content, especially on cross-sections. Furthermore, drawings of different features can be well interpreted on both topographic and orthophotography maps.

This paper contributes to the body of knowledge in geography and social sciences teaching, geography language of teaching and learning, geomorphology, mapwork, and geographical information systems. The objective of the paper is to argue how language teaching and learning geography concepts contribute to the understanding of concepts and learner achievement. Two primary questions guide the paper. The first question is about the implications of teacher-learner attitudes towards language teaching and learning geomorphological maps. The second question: How do secondary geography teachers address the teaching and learning of geomorphology and map work skills? In the next section of this paper, we offer a background to the study, literature review, theoretical framework, methodology, findings, discussion, and recommendations.

Literature Review

Literature offered the conceptualisation of the mentioned sub-sections and educational implications.

Required geography language skills for teaching

There are several challenges, such as geography, language, deep concepts, processes, and pronunciation by teachers and learners in teaching and learning the subject. Such challenges are found to have inclusion of language as they are deep concepts used in the English language. Such require attention that do not compromise teaching and learning. Looking into countries such as Finland, geography teachers' training is equal to other subjects in different grades within the schools. Scholars like Hakala and Kujala (2021) are of the view that Finnish schools' curriculum does not prioritize subjects over others, unlike African countries, where mathematics and science are given priority over language and geography. Katukula (2018) further argues that the training of teachers focuses on equipping individual teachers in all subjects available in different schools to be responsible and accountable for geography and able to reciprocate the required knowledge and skills. OECD (2012) emphasizes that the training of geography teachers serves as an investment in Finland. Such training practices in secondary schools aim to equip teachers with effective skills in teaching to produce well-equipped geography learners. Parkinson (2012) agrees that the training of teachers is meant to enable teachers to understand policies within their field of study.

Cobern (2010) further concludes that the training is to make teachers specialists of the subject and to know the learners, use, and interpret content on the maps, which resemble the natural world. Such practices help most learners understand the concepts from geography content and interpret them on the given maps. Teachers in this country have a high level of scientific literacy and proficiency in schools. Scholars A like Virta and Yli-Panula (2016) assert that the training of Geography teachers in Finland includes content such as landscape, interaction of nature and human activity in different regions of the country. The part of the training on the interpretation of content on the map was not mentioned, even though it was mentioned that in Finland, all subjects are given attention irrespective of the nature of the content (Gholami& Husu,2010). Thus, teachers teach the economic development, nature, and its interrelation between people and their own environment in the country.

Concepts and pedagogies in geography teaching are to be drawn from the school subject planning and implementation of the periods (Lefty & Fraser,2020). Subsequently, when creating a collaborative classroom practice, where learners work with their teachers to interpret concepts and processes on maps, learners pay attention and focus. Juuti et al. (2016) argue that even though pedagogies are decided at schools, commentators have observed that Geography teachers still favour teacher-centred pedagogies. Furthermore, teachers are not required to employ any specific teaching pedagogies for different content in Geography (Andere, 2015). This means that teachers must select the appropriate teaching pedagogy to teach the interpretation of content on geomorphological maps in the classroom. However, the core curriculum only recommends that the approach to be used be a "Phenomenon-based learning approach" to engage all learners in the different schools and acquire knowledge and skills relevant to geography concepts and processes that are involved in the subject (Pollari, Autio& Elorinne,2024). Therefore, teachers need to take into consideration building geography, language, mapwork concepts, and pronunciation to make learners understand the geomorphological maps.

Difficulties in geography concepts and content

In the field of geography teaching, concepts and processes such as laminar, turbulence, meandering, slip, and cut off become very difficult for teachers to teach on map work and for learners to understand, as they require repetition. In relation to other researchers' work, Amosun (2016) revealed that most learners do not perform well in map work, and they lack basic skills of map reading and interpretation insinuated by teachers. On the other hand, Issa (2010) asserts that teachers also lack skills to teach map reading and interpretation. This shows how teachers frequently express some of their common sentiments that learners find it difficult to swallow, for they have less understanding and comprehension of concepts learned in geography. The attitudes towards a subject matter in geography as demonstrated by the teachers in a specific section, especially map work in Nigeria.

Jacob, Filgona, Sakiyo and Gwany (2020) contend that the difficulties are influenced by attitudes of learners towards a subject, which raises concern about the content knowledge and skills of a teacher that require observation. The attitude can be influenced by performance related to the section taught in the classroom, which makes it difficult for teachers to teach the subject. Fiona (2018) further argues that most learners develop negative attitudes towards the subject Geography in the section of physical geography and show signs of not being interested because of a lack of understanding and an inability to comprehend the language of teaching and learning. These learners have a higher achievement in the subject of geography when they demonstrate a positive attitude towards the interpretation of geomorphology on maps.

Obondo (2013) further states that, whatever the case may be, the attitude of a learner to a Geography subject matter could go a long way to determine the learner's academic achievement in the subject. Balogun and Yusuf (2019) believe that during such, the responsibility or accountability of a learner lies in his/her own educational development, as one learner is a product of his/her attitude. However, in the study field, it is disheartening to note that the attitudes of learners to Geography and their academic achievement in the subject have been plagued by the language of teaching and learning (Falode & Usman, 2016). Teachers who are found in the geography field have a knowledge gap in map reading and the interpretation of physical Geography on maps.

To close the difficulties in geography concepts and content, Ugodulunwa and Wakjissa (2015) believe that reading ability provides learners with the key to all forms of geography related to the content on geomorphology and maps. This makes some understand how to interpret the features displayed on the map with knowledge acquired from reading different types of maps. Ahmadi and Lukman (2015) continue to state that poor reading ability has a negative effect on understanding and sheds more light on the topic taught in the classroom. Oyewole (2017) found that poor reading ability is partially held responsible for the general attainment of learners in both internal and external examinations of geography. Mogbo (2023) concludes that reading activities given to learners should be engaged to influence their studying skills and subsequent academic attainment in the section of geomorphology and map work. Without such practices implemented in geography teaching and learning, most learners are likely not to master the content of geomorphology and be able to interpret maps.

Language construction in the teaching of geography

Geography is a subject built on the English language that allows learners, regardless of their cultural background and dialect, to understand concepts and processes to be interpreted on Maps. However, Sikerete (2023) asserts that the good achievement in the interpretation of Geomorphological maps emanates from proper learner-teacher instructional support materials. Therefore, failure to have access to topographic and orthophotography maps for individual learners creates a knowledge gap. Moreover, scholars like Chuene and Teane (2024) argue that the shortage of proper instructional learning materials for the subject in schools limits the chances of good scholastic results. Therefore, failure to use synoptic maps of the provincial compass and measure distance between two different places per week, instead of the content integrated with map work during classroom sessions, creates a huge gap for both teachers and learners.

Such concerns make learners neglect the teaching and learning of map work, which exhausts teachers in the classroom (Mukhari, 2016). The researcher's view is that most learners experience problems/difficulties in different sections of mapwork, which prevents individual learners from being able to interpret the question properly on the map. The view of the experience is supported by the NSC Diagnostic report for geography (DBE, 2021). Scholars like Hart and Laher (2015) further identified certain contributors to the negative influence on teaching and learning of mapwork willingness in learners. Unwillingness to participate in the classroom due to the language used in teaching and learning geography. These make learners think negatively about map work and have made individuals interpret concepts on maps poorly. Moreover, most learners find themselves not being responsible for their learning because of their unwillingness to develop within the learning map work. These negative views influence their academic achievement in map work, as they fail to accomplish or understand the interpretation of concepts on Geomorphological maps in subject geography (Department of Basic Education, 2011).

As observed in countries such as Finland and Nigeria, in South Africa, teachers are not familiar with the concepts offered in map work or geographical information systems due to a lack of subject training (Schoeman, 2018). Some geography teachers become incompetent with the subject knowledge, and as a result, they discourage/disempower learners, because they are unable to explain the subject matter to learners. They disempower learners by resorting to teaching Geography map work in their mother tongue/home language or code switching to facilitate learning within the grade. Mahlangu (2020) asserts that teachers who do not have a sense of knowledge on the interpretation of geography content and map work hinder smooth teaching. Additionally, poor attainment of geography content by learners emanates from such practices of teachers (Maduane, 2016).

Research and Methodology

Qualitative research focuses on the experience of present participants and their interaction with a phenomenon at a given point in time and context (Korstjens & Moser, 2017). This type of research approach serves to enable the researcher to qualitatively articulate the question of implications of teacher-learner attitudes towards the language of teaching and learning, Geomorphological maps? (Merriam & Grenier, 2019). A case study design was applied to secondary schools. However, in the present study, a case study was used by the researcher to provide in-depth insight into the selected secondary schools (Simons, 2014). Bailey and Monique (2020) further argue that the interpretivist paradigm served as a constructive approach to empirical research in a sense for twelve (12)

geography participants to construct meaning regarding the fundamental nature of the social world. Focus group and document analysis were used to gather perceptions about the implications of learner attitudes towards the language of teaching and learning geomorphological maps. Data was analysed through thematic analysis. This paper is generated from a PhD thesis; ethical issues were approved by Tshwane University of Technology, and permission to conduct the study was granted by the Limpopo Department of Education, together with the schools under the study. Participation was voluntary, and participants were informed of the right to withdraw.

Results

The findings of the study were applied arranged into a meaningful theme presented below. The three themes, such as map analysis and interpretation, geomorphological content, and Operational instructional materials, were discovered to answer the question of:

- i. What are the implications of teacher-learner attitudes towards language teaching and learning geomorphological maps?
- ii. How do secondary geography teachers address the teaching and learning of geomorphology and map work skills?

Map analysis and interpretation

The teaching of map work involves the application of content on geomorphological maps. However, for one to be able to interpret concepts and processes on maps, they need to understand what interpretation entails and how content should be interpreted. The teachers had different views about the understanding of map interpretation. This has been revealed by teachers not having a proper understanding of map interpretation. In an attempt to answer the question about understanding of map interpretation, the participants had this to say:

“Map interpretation is when a teacher makes learners aware of what is the map shows learners' map references.”

“Map interpretation is how a learner can answer a question without applying GIS content but with their own understanding”

“It's just to interpret a map knowing the intervals and contour lines with any questions being asked”.

“It's about understanding the rivers, contour lines, scale, and background of the area between the topographic and orthophotography map.”

With the above quotations, it clearly appears that most geography teachers do not understand what map interpretation entails. This is revealed by teachers as their response is revealed above. The failure of teachers not being able to have a clear understanding of map interpretation disadvantages the learners. The teachers who understand the meaning of map interpretation are teachers who are appointed as heads of department in the subject geography because of their teaching experience in the field of secondary teaching. Additionally, to the question of map understanding, the participants had this to say:

“Map interpretation is about how the learners can join the theory taught in class on the map and how to identify the features on the maps.”

From quotations, one may argue that teachers do not have a clear understanding of map interpretation using both geomorphological content and Maps. The different views about what map interpretation entails reflect the type of learners produced by teachers who are responsible for the subject Geography, which contribute towards the proper understanding of what learners need to know as interpretation.

Geomorphological content and map reading

With reference to the research title, geomorphological content revolves around the concepts and fluvial processes. This entails that where content becomes the centre of the subject, teaching and learning need to be involved. This requires a teacher to integrate the content and map work to be able to teach learners how to interpret geomorphology on maps. The question on views on how teachers in geography classrooms teach the interpretation of geomorphology on maps was responded to by participants in this way:

“Teachers think map work is very difficult, and they have an attitude towards teaching interpretation of fluvial processes, such as landforms on maps.”

“Most teachers are unable to bring the real-life situation into the field. In simple terms, they are unable to make the linkage between Geomorphology and map.”

“Teachers are having challenges in approaching the topic of geomorphology, leading to teachers not being able to interpret geomorphology on maps.”

The participants above show their views on the approach of geomorphology being difficult or challenging for individual teachers, since most of the teachers in the field are unable to teach the content and interpret concepts or processes on the map. Participants highlighted that most of the teachers developed attitudes towards geomorphology long before they could execute their duties as

professional teachers, which resulted in their inability to interpret the content of geomorphology on maps. Additionally, some participants had this to say:

“There is a little bit of a gap because some of the teachers are ignoring the linking of geomorphological features with map work, and some are saying that they did not do Map work at the higher institution, and this becomes a problem because they have to teach geography learners.”

“When I started teaching, I used to teach geomorphology first before map interpretation and that’s how most of the teachers approach the theory of geomorphology before map interpretation”

The above participants reveal that most teachers in the FET (further education and training) have problems regarding geomorphology and map interpretation. Furthermore, teachers who are responsible for geography in this grade have an ignorance towards the linkage of geomorphology and map work. This shows that to some schools in the circuit, teachers teach geomorphology and map work, while others are not well-trained to teach both content and map work. The failure of not having content towards the map interpretation makes learners not to understand what geomorphological concepts and processes entail on the maps.

The participants explained that teachers in the classroom fail to interpret the theoretical part of geomorphology on the map, which leads to the failure of a huge number of learners in the classroom. Failure to interpret geomorphology on maps shows that teachers are not ready to teach the subject and help learners progress. Additionally, participants had this to say:

“What I have realised is that teachers think map work is difficult, but I think a map is a memorandum, and this is just a question of attitude. If we can understand that everything, we are asked about these concepts, such as landforms, how they are built, and the arrangement of contour lines.”

The participants believed that most teachers develop an attitude towards the teaching and learning of the interpretation of geomorphological concepts and processes on maps. The attitudes make it difficult for teachers to deliver the desired lesson on geomorphology and maps. Additionally, some teachers have an attitude that destroys the morale of teachers and learners. The attitudes observed by the teachers reveal how much the absence of knowledge on concepts in this topic creates damage in the educational institution.

Operational instructional materials

The participants revealed that most teachers do not use both the topographic and orthophotography maps, since the maps are different, and they are not easily identified by learners on the topographic map. This is instigated by the teachers who are not using both the topographic and orthophotography maps to make it a point that learners understand the major lesson on the interpretation of geomorphology on maps. Other participants had this to say:

“The usage of videos to make learners see the geomorphological feature because learners learn from seeing.” “Laptop versus overhead project and deep maps that already have the information about the area to allow learners to have knowledge about the features.”

Participants show that interpretation of geomorphology requires videos and a local area map to engage learners throughout to understand the importance and how the features are identified on the map, but for most teachers, videos are not applicable. The videos of how to identify different types of fluvial landforms in an area are only available on mobile phones, and access is limited. The participants had the same views on the videos to be used that make the work of teachers easier. The participants emphasized that resources used on the interpretation of geomorphology and maps have been a problem for both teachers and the learners. The learners get used to a specific map of an area, rather than being familiar with different surroundings. Regarding these views, the participants had this to say:

“I think we need to give learners different maps every day. We treat the Ermelo map; therefore, we give them another map to refrain from sticking to one map to make learners familiarise themselves with the contour lines and features displayed on the map. In addition, we only have one overhead projector, and due to load shedding, most of the time it is used by other teachers. In the lower grades, we hardly use it because I am not teaching grade 12, and I don’t have access to it.” “We have maps, but we always keep losing and using one map to make learners understand the features displayed on the map.”

The reflection of the participants shows a sense of concern about the kind of resources that need to be used for teaching and learning interpretation on geomorphological maps. The response reveals that only one copy of a map is used in the classroom to make an application of theoretical knowledge to the given map. In addition, the teacher raised concerns about the resources used by a teacher responsible for grade 12, instead of the projectors used by teachers from lower grades.

Discussion

The discussion of these findings is based on the following themes: Map analysis and interpretation, geomorphological content, and operational instructional materials, confirmed by the existing literature and theoretical framework that guided the findings of this study.

Map analysis and interpretation

In a geography classroom, the interpretation of maps is about a teacher being independent about the spatial perception skills and conceptual understanding (Naxweka & Wilmot, 2019). The teacher who understands map interpretation to teach learners could recognize objects and features through cognition to interpret and make sense of the objects/features and have a proper understanding of how geomorphology and maps interrelate in geography (Naxweka & Wilmot, 2019). In this study, it was revealed that geography teachers do not understand map interpretation, which makes it difficult for learners to learn and have a proper understanding of the interpretation of geomorphological maps.

Wilmot (2019) is of the view that teachers need to understand the spatial information, concepts that they communicate, and conventions they use. However, as it was revealed that teachers do not even know how to teach the interpretation of geomorphological concepts on the map, learners in their respective classrooms fail to understand the concepts, processes, and reading the spatial information and interpreting knowledge on the map to make sense of the map interpretation. Vygotsky (1978) confirms the findings on the notion that the learner builds new knowledge from the foundation of the knowledge previously acquired. Therefore, teachers need to teach interpretation in relation to practice.

Geomorphological content and map reading

The study further revealed that most teachers have a knowledge gap, as shown by the geomorphological content, as teachers are unable to provide proper linkage of the geomorphology and maps. In addition, most learners cannot understand the concepts, processes, and formation of the landforms depicted on the Earth's surface. The National Senior Certificate (NSC) diagnostic report (DBE, 2021) supports that learners do not understand the basic concepts of drainage pattern and density, leading to these learners not being able to interpret how the folded underlying rocks created ridges (hard rocks) and valleys (soft rock). On the suggestion of the diagnostic report (DBE, 2021), teachers are encouraged to understand geomorphology content and use the diagrams when teaching geomorphology. The researcher's view is that teachers need to use the diagram to familiarize learners with the diagrams of geomorphology to be used on maps. Vygotsky (1978) confirms the findings by stating that every individual learner constructs his or her ideas opposed to receiving information from the teacher. Therefore, geomorphology and map work require a social constructivist teacher using the social constructivist style of teaching to teach both the content and reduce the attitudes identified from the learners.

Operational instructional materials

Teaching resources in geography refer to operational materials that simplify teaching and learning in the classroom (Catling & Willy, 2017). The resources in the map work play a role in the process of teaching and learning. Mapwork is a practical-oriented subject; hence, teachers need to use the maps concurrently with the content. Teachers are expected to teach in a favourable learning environment where they would be able to use instructional materials (Tshililo, 2016). However, learning resources in geography map work play a vital role in the process of interpreting geomorphological maps. This means that to teach map work, proper resources such as models, an overhead projector, maps, and a globe are to be in the classroom to make learners understand the Geomorphological maps (Mukondeleli, 2018). The researchers' view is that geography requires more than instructional materials to allow learners to understand the interpretation of geomorphological maps. Vygotsky's (1978) theory emphasizes that culture influences the teaching and learning of learners within the classroom. This entails that the teaching environment should properly meet the standards of the learners, and teachers should assess learners continuously to reduce any negative attitude towards the teaching and learning.

Conclusion

The study concluded that teachers do not understand the language used to teach geomorphology content and mapwork concepts and processes on both topographic and orthophotographic maps. On the other hand, learners have attitudes towards the language used for teaching the interpretation of geomorphological maps, leading to a high number of learners failing to understand the interpretation of geomorphological maps.

The study further entails that for teachers to be able to teach the interpretation of geomorphological maps in geography fields, proper instructional materials should be available in the classroom, such as an overhead projector to outline the slides of landforms, models, and enough topographic and orthophotographic maps.

The study concluded that support for language enrichment in teaching and learning geography and local maps to schools as instructional digital materials is needed to promote quality teaching of geography. The study recommends that geography teachers in various schools initiate a language programme to make learners conversant with the language through presentation and research. Moreover, for pre-service teachers to specialise in English geography and Mathematics to ease the teaching and learning.

Additionally, teachers should use different methods such as small group, whole classroom, and discussion (Cooperative and collaborative) to help learners get accustomed to the language of teaching and learning.

Future researchers can focus on the effect or impact of the language of teaching and learning on teaching geographical processes, such as meandering in the senior and FET phase, to determine whether it is a foundational problem. The researchers can use both senior and FET phase teachers to get in-depth information about the teaching and learning of the subject of geography.

To reduce the problem of learners not understanding the geography language, which prevents most learners from responding to questions in the classroom, formal and summative assessments are used. Teachers need to use the English language of teaching and learning often and code-switch where necessary. These recommendations aim to enhance both the scholarship of teaching and learning in secondary schools. To inform academic insights and prepare new preservice teachers in higher institutions.

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