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Utilising Tshivenḓa Scientific Language Register for Teaching Electric Circuits

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ABSTRACT

Teaching physical sciences in English as the Language of Learning and Teaching (LOLT) has presented numerous challenges, particularly for learners who are not proficient in the language. The South African government is increasingly considering the use of indigenous languages as the medium of instruction for subjects such as physical sciences, sparking debates regarding the effectiveness of indigenous languages in teaching and learning. This study aimed to explore stakeholders' perceptions regarding the use of Tshivenḓa scientific language for the concept of electricity. Utilizing qualitative interpretative case study methodology, the researcher conducted interviews with two grade 10 teachers, three parents, and two groups of grade 10 learners from selected schools to investigate their views on using Tshivenḓa scientific language register to teach physical sciences. The findings indicate that stakeholders view the adoption of scientific language registers in Tshivenḓa as a positive initiative. They believe it will provide learners who struggle to understand physical sciences when taught in English with an opportunity to learn effectively in a language they are familiar with. Therefore, the study recommends expanding the development of scientific registers in Tshivenḓa to cover other topics in physical sciences.

KEYWORDS

Perceptions; physical sciences; Tshivenḓa scientific language register; challenges; opportunities.

INTRODUCTION

In South Africa, the pursuit of equitable education has been an ongoing endeavour, characterized by attempts to address linguistic inequalities in classrooms. Despite the acknowledgment of twelve official languages (Tshivenḓa, IsiNdebele, Sepedi, Sesotho, Setswana, Isizulu, Xitsonga, IsiXhosa, Siswati, sign language) in the country's constitution, the dominance of English and Afrikaans as mediums of instruction in crucial subjects like physical sciences has raised concerns regarding inclusivity and accessibility, especially for speakers of indigenous languages (Shayne, 2020). On March 9, 2022, Minister Angie Motshekga of the Department of Basic Education (DBE) announced a shift towards using indigenous languages to teach STEM after the foundational phase (Manuel, 2022). Additionally, UNESCO has designated 2022-2032 as the Decade of Indigenous Languages. This initiative aims to ensure the availability of mother tongues in education and public life, aligning with Section 29(2) of the South African Constitution, which guarantees the right to learn in any official language or preferred language. The utilization of European languages such as English and French to teach physical sciences is seen by Madiba (2012) as a contributing factor to high failure rates and dropouts during learners' school years. The development of scientific language registers in indigenous languages for physical sciences is crucial to realizing the vision of enabling every child to learn science in their instructional language (Chikiwa & Schafer, 2019). Madriñan (2014) further argues that learners taught physical science concepts using registers in indigenous languages do not necessitate English instruction, as the underlying processes remain the same.

Amid ongoing discussions surrounding academic underachievement, some scholars argue that the prevalence of English as the Language of Learning and Teaching (LOLT) has a detrimental effect on learners' performance in physical science subjects (Dlodlo, 1999; Mthiyane, 2016). This discrepancy stems from the fact that English is not the primary language for most learners in South Africa, especially those from rural areas (Probyn, 2009). Consequently, parents who are not proficient in English have limited contributions to make to their children's education (Netshivhumbe & Mudau, 2023). The Curriculum and Assessment Policy Statement (CAPS) emphasizes the importance of fostering scientific inquiry and problem-solving skills. However, language barriers impede the transmission of scientific knowledge, particularly for learners in rural areas and townships with minimal exposure to English outside the classroom (Probyn, 2006). The language issue has become a matter of human rights urgency because if learners cannot utilize their local African indigenous languages in classrooms, education will continue to perpetuate inequality and social injustice for mother tongue speakers (Msila, 2021). Although the government advocates for instruction in the home language, Robertson and Graven (2020) suggest that learners may still face challenges without sufficient support, highlighting the importance of adequate instructional assistance such as the development of a scientific language register in Tshivenḓa. This study represents a significant stride towards the utilization of the Tshivenḓa scientific language register with the goal of creating a more inclusive and equitable education system. Therefore, the researcher employed

a qualitative approach to address the research question "What are the perceptions of stakeholders toward the use of the Tshivenda scientific language register for electricity concepts?" It was deemed crucial to understand stakeholders' perceptions regarding the use of the Tshivenda scientific language register for electricity.

LITERATURE REVIEW

Africa is believed to be home to more than 2000 languages (Sands & Gunnink, 2019). Nonetheless, indigenous African languages are rarely employed as instructional mediums in schools beyond the Foundation Phase (Prah & Brock-Utne, 2009). Following the advent of the democratic government post-1994, there was a push for mother tongue instruction; however, the implementation to facilitate such instruction across all subjects was lacking. The lack of explicit policies supporting learners from diverse linguistic backgrounds often results in confusion among teachers and schools (Garcia & Lin, 2017).

Importance of indigenous languages as LOLT in South Africa

Language plays a crucial role in facilitating communication and serves as a channel for transmitting individuals' knowledge, practices, and cultural values. Moreover, it significantly shapes and delineates various aspects of indigeneity (Manyike & Shava, 2018). Students attending schools in townships and rural areas often encounter challenges in meeting the requirements of English as the Language of Learning and Teaching (LOLT), which adversely affects their academic performance (Naketsana, 2019). According to the 2021 International Reading Literacy Study (PIRLS), 81% of Grade 4 pupils in South Africa struggle with reading comprehension (Chabalala, 2023). Furthermore, the South African education system continues to confront difficulties related to teaching materials, particularly in rural areas, as well as a shortage of both teachers' and learners' content knowledge and language proficiency (Ntuli, 2019). Negative attitudes towards indigenous African languages among education inspectors, as highlighted by Sibanda (2019), impede the effective implementation of mother tongue-based education policies, exacerbating learners' feelings of inferiority and detachment from their cultural identities. Research suggests that employing learners' home language improves literacy skills (Giambo & Szecsi, 2015), laying the groundwork for multilingual education that fosters deeper comprehension of concepts and critical thinking (Ojoo & Moyi, 2022). The development of scientific language registers in indigenous languages, such as Tshivenḓa, has the potential to address poor academic performance and promote cognitive development, critical thinking, and overall learning outcomes (Ezeokoli & Ugwu, 2019).

Parents' perceptions of using indigenous language as LOLT

The linguistic input children receive from their caregivers and educators during early childhood education programs significantly influences their language development (Motseke, 2020). UNESCO (1953) emphasizes the importance of the mother tongue as a means of self-expression and learning. Many studies indicate that parents prefer their children to use English as the Language of Learning and Teaching (LoLT), believing that proficiency in English improves job

opportunities (Maluleke, 2019). Especially in disadvantaged situations, parents often perceive English as essential for their children's success, relegating their mother tongue to social contexts only (Madiba, 2012). The South African National Policy Framework (2002) mandates mother tongue instruction in the Foundation Phase, transitioning to English from Grade 4 onwards through tertiary education. Despite this policy, many parents prefer early English instruction. Ezeokoli and Ugwu (2019) emphasize the need to change perceptions among teachers, parents, and communities regarding mother tongue education, advocating for its recognition as an effective learning tool rather than a barrier. Utilizing the learner's home language in classroom interactions facilitates effective communication, empowering learners to take charge of their learning.

Code-switching

Code-switching is commonly utilized as a teaching and learning method, particularly in situations where the Language of Learning and Teaching (LOLT) presents difficulties, especially when delivering subjects to learners in a foreign language. Chikiwa and Schafer (2019) have demonstrated the advantages of code-switching for learners whose language proficiency is not yet advanced enough to serve as the LOLT. In South African schools, code-switching involves the use of indigenous languages alongside English, even after the transition to English as the LOLT from Grade 4 onwards, often continuing until Grade 12. It is argued that code-switching can effectively bridge language barriers and enhance teaching and learning (Chikiwa & Schafer, 2016). Research conducted by Van der Berg et al. (2016) highlights that a significant proportion of South African learners in rural schools complete their education without acquiring sufficient academic skills. To tackle linguistic challenges in teaching and learning, code-switching has emerged as a communication strategy employed by both teachers and learners to effectively convey thoughts and ideas, thereby overcoming the ethnic divisions institutionalized by apartheid (Finlayson & Slabbert, 1997).

METHODS

A qualitative approach was employed, primarily focusing on capturing participants' experiences, perceptions, and behaviours (Tenny et al., 2017). This methodology allows the researcher to gain insights into the views of stakeholders (teachers, learners, and parents) regarding the use of Tshivenḓa as a language for teaching and learning physical sciences. The study adopted a case study method, as described by Selemela (2020), involving a systematic investigation aimed at examining a chosen phenomenon in an organized manner to generate insights contributing to public knowledge. Two cases were utilized, with each school serving as a case, facilitating varied perspectives from diverse backgrounds. Moreover, purposive sampling was employed, deliberately selecting individuals based on specific attributes such as expertise and experience (Etikan et al., 2016). In order for the research to be reliable, two teachers from selected schools were sampled based on their possession of a bachelor's or diploma in physical sciences, a minimum of three years' teaching experience in physical sciences, and proficiency in Tshivenḓa.

Additionally, two groups of learners per school were selected based on their enrolment in grade 10 physical sciences and their use of Tshivenḓa as their home language. Three parents from each school were also selected as stakeholders within the school community who communicate in Tshivenḓa.

Data collection method

Semi-structured interviews were conducted to gather data and obtain comprehensive insights from the teachers and parents. Maree (2016) describes semi-structured interviews as a method involving pre-planned questions to collect data, where participants are presented with a series of open-ended questions and their responses are further explored. A focus group interview was conducted with one class of learners from each school. Focus groups allow homogeneous groups to reflect on "high quality data," providing insights into the perceptions, thoughts, feelings, and impressions of participants (Dilshad & Latif, 2013). These interviews were conducted face-to-face, with an audio recorder used to collect data, which was later transcribed and analysed. In order to assure the validity of the findings, the data obtained from the interviews was systematically classified and analysed to identify recurring themes and patterns using a coding procedure. Since study involved learners as participants, the researcher sought parental consent by having parents sign a consent form on behalf of their children, indicating their approval for participation.

Data analysis

In qualitative research, data analysis involves transforming raw collected data into coherent facts and ideas (Alem, 2020). The data gathered from two cases through participant interviews were consolidated and subjected to content analysis. This method helped the researcher examine the recorded data from semi-structured interviews, which were transcribed into written form after multiple listens to the audio recordings. Since the participants were non-English speakers, instances of code-switching and grammatical errors were recorded verbatim.

RESULTS AND DISCUSSION

The results of this study were derived from participants (teachers, learners, and parents) from two cases. The data focused on stakeholders' perceptions regarding the use of the Tshivenḓa scientific language register for teaching physical science. Additionally, the results for each case were presented separately, treating each as a single case. This approach aimed to gain an in-depth understanding of each case within its own context, rather than conducting a comparative study.

Case 1 Tshifhiwa

Stakeholders hold diverse opinions regarding the preferred language for instructional purposes. The researcher aimed to understand stakeholders' perceptions of using the Tshivenḓa scientific language register to teach the concept of electricity in physical sciences. Tshifhiwa, a teacher at Muri Secondary School, shared the following sentiments:

"When I look at it, it becomes simple for learners to understand when they learn in their home language. In most cases learners have answers, but they do not understand the questions. When we do corrections in class, translating questions from English to Tshivenḓa, they tend to answer the question they were failing to answer in English. This tells us that if the questions were set in their home language, they would answer the questions without any difficulties". (Translated to English)

The statement above reflects Tshifhiwa's support for using the Tshivenḓa scientific language register in physical sciences. Teaching in a rural area where learners are instructed in English, Tshifhiwa has observed that students struggle to comprehend physical science in English, negatively affecting their academic performance. Similar findings were reported by Ntuli (2024) in a study on using the isiNdebele scientific register, which suggested that learning in one's mother tongue helps learners understand the subject more effectively and increases their interest in learning. Additionally, it was important for the researcher to understand how learners perceive the use of the Tshivenḓa scientific register. The learners responded as follows:

"*In Tshivenḓa, we are able to understand better. Even when we write, we are able to explain better than in English". Group 2 (translated to English)*

"IN Tshivenda we are able to explain our answers without language barrier)". Group 1(Translated to English)

According to Mavuru and Wilson (n.d.), learners find English to be a challenging language, which leads to underperformance in science subjects. This suggests that the lack of engagement in science classrooms is not due to a misunderstanding of the concepts but rather the language used for instruction. Mavuru and Wilson (n.d.) found that using learners' home languages would create a more equitable environment, providing them with opportunities like those of peers who receive instruction in their native language. While some learners believe that using their mother tongue would improve their performance in physical sciences, there are divergent opinions. Although they acknowledge that learning physical science in Tshivenḓa would enhance their understanding compared to English, they still prefer to continue with English instruction. Their perspective is detailed below:

"We are used to learn physical sciences in English, in Tshivenḓa it will be a challenge". Group 2 (Translated to English)

While studies like Molteno (2017) suggest that parents view early English learning as beneficial for their children's future opportunities, Ezeokoli and Ugwu (2019) find that parents support mother tongue instruction to enhance learners' educational experiences, classroom engagement, self-confidence, and overall academic performance. This preference is partly because parents who are not proficient in English have limited ability to contribute to their children's education (Netshivhumbe & Mudau, 2023). These findings align with parental perceptions regarding the use of Tshivenḓa as the language of instruction in science education. Their responses are detailed below:

"It is a good thing to use Tshivenda, because learners can be taught in English and fail to answer the questions, but in Tshivenḓa they can be able to answer" parent 1(Translated to English)

"I stand with this idea of teaching science using Tshivenḓa. Learners are not failing because they do not understand. When they learn in English one can assume they understand, only for them to forget everything when they go for writing" parent 2 (Translated to English)

The parents' statements support the use of Tshivenḓa for teaching physical sciences. They believe that using Tshivenḓa is particularly beneficial for learners who struggle with English as the medium of instruction. This view is supported by research conducted by Naom and Sarah (2014), which found that parents believe adopting the mother tongue would reduce learners' absenteeism and dropout rates, enhance classroom interaction and discourse, and lead to more meaningful learning and improved performance (Ntuli, 2024).

Case 2 Abigail

Although Abigail believes that changes can be challenging, she sees the use of the Tshivenḓa scientific language register for teaching physical sciences as a positive initiative. Her response is detailed below:

"I think it is ok. It will be easier to use our own language, though I find that some terms they will still give learners difficulty because most of learning areas are in English. So, for beginners, they might find a challenge to use Tshivenḓa. In the physical science area and also, it's a new thing that is going to be introduced to them. So, learning new things remains difficult, but I think as we go on it will be an advantage because they will have to understand a lot of things and most of the things they do. Speak about them thinking of physical sciences in everyday life, they do know most of the things in their daily lives, but when it comes to a physical science in class, it becomes as if it's something different since they are learning in a foreign language. But when they're using their own language, I think it will be very helpful and useful".

Abigail recognizes that learners have a wealth of scientific knowledge but struggle to connect their prior knowledge to new scientific concepts due to language barriers. She emphasizes that the inadequate English language skills among most learners in rural schools hinder their chances of effective learning (Probyn, 2006). Effective learning requires linking prior knowledge with new information (Gurlen, 2012); thus, Abigail highlights the use of code-switching as a strategy to help learners who have difficulty comprehending physical sciences taught in English.

"It is very important that I do so because at some point you will find that you continuing with English and then the learners do left behind, not understand anything. So, you have to code switch that you bring also the attention of the other learners"

In the absence of alternatives, teachers resort to code-switching due to the widespread use of English as the medium of instruction in schools. As highlighted by Netshivhumbe and

Mudau (2023), teachers switch from English to Tshivenḓa to accommodate learners who struggle to grasp scientific concepts in English. This presents a dual challenge of understanding both the English language and scientific concepts when taught in English (Prophet & Badede, 2009), resulting in poor performance in exams for learners (Naom & Sarah, 2014). In this study, both the teachers and the learners themselves acknowledge the impact of language on learners' performance, as evidenced by their expressed viewpoints aligning with the teacher's observations.

"*I think language has an impact on our performance, not all of us understand English better".* Group 1 (*Translated to English*)

Therefore, Abigail suggests that given the option, learners would prefer instruction in Tshivenḓa rather than English. This aligns with a statement by Minister of Basic Education Angie Motshekga during a parliamentary question and answer session, suggesting that learners' poor performance is often attributed to being taught in English, which assesses language abilities rather than cognitive development or understanding (Writer, 2022). However, some learners advocate for continuing with English as the medium of instruction for physical science, as they have been accustomed to it since primary school. Here is their response:

"We are used to learn in English, scientific words in Tshivenḓa are new to us". Group 2 (Translated to English)

This perspective is rooted in a specific belief held by parents, particularly those in disadvantaged circumstances, that English is indispensable for their children's success, relegating their mother tongue to purely social functions (Madiba, 2012). Additionally, our educational system allows for an early transition from the home language to English starting from the fourth grade, after which learners use English as the Language of Learning and Teaching (LOLT) up to tertiary level. English has emerged as the predominant global language for scientific endeavors, providing access to a vast array of scientific literature and facilitating international scientific communication (Ramulumo, 2023). This leads learners to perceive English as a superior language.

"*I would like to learn in English, because in the university we have different languages, so English will be used as a medium of instruction as we are from different cultures". Group 2 (Translated to English)*

Furthermore, the researcher was also interested in investigating parental views regarding the use of the Tshivenḓa scientific language register for teaching physical sciences, given that parents play a significant role in deciding the language of instruction in schools. Here is their perspective:

"I think it is a great idea, we used to have subject such as nguda mutakalo (life sciences) in Tshivenḓa)". P1(Translated to English)

The idea of educating children through mother tongue instruction is not new; it has been present before. Hence, parents view it as a beneficial concept that will greatly influence

learners' academic performance. The researcher observes that there is little they can do at home to assist their children since they also lack proficiency in English.

CONCLUSION

Case 1

Tshifhiwa regards the utilization of Tshivenḓa in teaching physical science as advantageous, observing that learners find it challenging to understand assessments in English but comprehend questions when translated into Tshivenḓa. Tshifhiwa emphasizes the importance of language in learners' performance, proposing that while teaching physical sciences in Tshivenḓa is preferable, direct translation of scientific terms from English to Tshivenḓa is necessary due to the lengthiness of Tshivenḓa terminologies. However, learners have varied perspectives on this issue. Some believe that studying physical sciences in Tshivenḓa would enhance their academic performance as they would be using their native language, facilitating better comprehension and explanations. Conversely, others express concerns about understanding physical science in Tshivenḓa due to the complexity of terminologies, as they are accustomed to learning in English. Similarly, parents share the view that adopting Tshivenḓa for teaching physical science is advantageous, attributing learners' struggles not to lack of knowledge but to the English medium of instruction, suggesting that using Tshivenḓa would improve understanding of difficult terms.

Case 2

The study suggests that Abigail holds a positive view regarding the use of Tshivenḓa for teaching physical sciences. While initially acknowledging potential challenges for learners, she anticipates long-term benefits, especially since learners currently struggle to grasp physical science concepts when taught in English. The choice of language for teaching physical sciences significantly influences learners’ comprehension of scientific concepts. Abigail mentions employing code-switching as a strategy to alleviate confusion arising from the English medium of instruction. On the other hand, learners express varied opinions on the use of Tshivenḓa as the language of instruction. Some believe it will positively impact their academic performance, citing difficulties with English terms during learning and assessments. However, others advocate for continuing education in English, emphasizing the need to prepare for university education where English is predominant. Contrary to learners' perspectives, parents recall past experiences of learning content subjects in their native language and view the proposal favourably. They note the current underperformance of students in physical sciences and commend teachers for implementing a bilingual approach, utilizing both Tshivenḓa and English to accommodate all learners.

The study's findings carry implications for educational policies and curriculum development initiatives geared towards fostering multilingualism and preserving indigenous languages in education. They underscore the necessity for policy frameworks supporting the integration of indigenous languages into science education and allocating resources for

developing language registers and instructional materials. Stakeholders, encompassing teachers, learners, and parents, expressed favourable attitudes towards employing Tshivenḓa as a medium of instruction for teaching physical sciences. They highlighted the significance of using a language that learners find comfortable to enhance comprehension and engagement with the subject matter. Given these findings, it is advisable to conduct further research and foster collaboration to establish a comprehensive Tshivenḓa scientific language register with standardized terminology. This endeavour would necessitate input from linguists, educators, and other pertinent stakeholders to ensure accuracy and consistency.

Limitations of the study

The study focused on two schools in the Vhembe West district, selecting one teacher, parents, and a single class of learners from each school. While this narrowed focus limits the generalizability of the findings, the chosen participants were deemed to offer valuable insights and met the criteria outlined in the study design. Therefore, while the findings may not be universally applicable, there is potential for their relevance to extend to other educational settings.

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