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The influence of natural science scientific register in isiNdebele on classroom practices

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Abstract

This study is an interpretive qualitative case study. Its goal was to look at the influence of natural science scientific register in isiNdebele on classroom practices. The study was conducted in some schools of the Siyabuswa 2 circuit in the Mpumalanga Province. The stakeholders' (teachers, learners, and parents) information was gathered through interviews and observations. Data gathered from interviews and observations were analyzed using content analysis. Interviews and observations that were recorded on audio were examined by playing them back numerous times after being transcribed into a word document. The findings demonstrated that the usage of indigenous languages favorably influences learner interactions and discourses in the classroom. This is because there was the most interaction in the classroom when learners were taught natural sciences using isiNdebele register. As opposed to when they taught using the English register, where they were mostly passive. This emphasizes the requirement for the creation of scientific registers in native languages. Consequently, it is advised that indigenous languages' scientific language registers be incorporated into education and learning as they positively influence interactions and discourses, which yield to meaningful learning and better performance.

Keywords: isiNdebele, scientific language register, natural sciences, classroom interactions and discourses, classroom practices

INTRODUCTION

In terms of its laws and linguistic usage, South Africa is a multilingual nation. This is clear from the fact that nine of the eleven official languages recognized by the South African Constitution (Republic of South Africa [RSA], 1996) are indigenous languages (Oyoo & Nkopodi, 2020). In this study, indigenous languages are local languages, such as isiNdebele and Sepedi being local languages in KwaNdebele in the Mpumalanga Province. Different people often connect with one another using these languages. The majority of South Africans are multilingual, frequently three or more. However, the majority of the nation's official activity is conducted in English, with certain smaller towns and provinces also using Afrikaans (Oyoo & Nkopodi, 2020).

Despite the fact that South Africans naturally speak a variety of languages, the global dominance of English has made its way into the country's early education system (Choi, 2021). According to Roy-Campbell (2019), English is seen as a key factor in facilitating global mobility as well as a potent instrument for linguistic dominance and financial gains. Concerns concerning the detrimental effects of English's dominance as an international language on the South African educational system have been expressed (McKinney & Tyler, 2019). This has also drawn criticism for restricting the use of indigenous African languages in school and creating a threat to their survival (Liddicoat & Kirkpatrick, 2020).

Due to the dominance of English in South African schools, African learners are forced to adhere to the usage of English, which restricts their freedom of language choice and the variety of this nation (Oihana et al., 2020). Researchers like McKinney and Tyler (2019) and Mweli (2018) have long questioned the effects of employing English as the instruction language in South African schools. These results suggest that a further barrier to meaningful learning is language proficiency. According to Oihana et al. (2020), there are few to no interactions in African classrooms, where English is used

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Contribution to the literature

- This study explored the influence of natural science scientific register in isiNdebele on classroom practices.
- The study proves that there is a positive correlation between the use of isiNdebele scientific language register and classroom room practices.
- The use of isiNdebele scientific language register can enhance learners critical thinking skills.

as a medium of instruction because learners will find it difficult to participate in the lesson and move on to the next one if they cannot understand what is being taught in the language of instruction. They further noted that learners who receive information in their mother tongue benefit more than learners who do not.

The basic education minister, Angie Motshekga, stated during a parliamentary question-and-answer session on March 9, 2022, that one of the main reasons South African children have such poor reading comprehension skills is that they are essentially learning in a foreign language by being taught in English (Writer, 2022). This further supports the claims made by McKinney and Tyler (2019) and Mweli (2018).

African learners face difficulties when English is employed as the teaching language, according to recent study (Oihana et al., 2020; Omidire, 2019). Using African indigenous languages in education has been found to be important. The importance of African indigenous languages in education has paved the way for strategies like code-switching, translanguaging, bilingualism, and multilingualism. These practices are prevalent in South African schools, where neither the teachers nor the learners understand the teaching language (Ticheloven et al., 2019). By incorporating native languages into teaching and learning, these strategies aim to overcome the barrier created by the medium of instruction. The improvement in learner interactions and discourses, which leads to meaningful learning and higher performance, has demonstrated the advantages of utilizing these practices (Ticheloven et al., 2019). In order for learning to occur, Omidire (2019, p. 5) claims that "interaction between learners in the classroom is necessary, and this could be facilitated by encouraging the use of home languages to engage and make connections that lead to high-level comprehension."

Classroom discourse, according to Smart and Marshall (2012), is the conversation that takes place in a classroom between a teacher and a learner. He also emphasized that this type of engagement could manifest as spoken dialogues and disagreements. According to Mortimer and Scott (2003), these interactions between teachers and learners are crucial because they help learners get a complete knowledge of the material being covered. Gee (2004) describes discourses as connected linguistic units that, when put together, convey meaning to a group of people. The teacher and learners in a natural sciences classroom are the people in this paper's referenced group. To help learners feel at ease communicating with teachers, many tactics are used in the classroom. This study uses two definitions for interactions and discourse in the classroom: first, as interaction, which refers to the teacher's contact with the learners, and second, as discourse. Classroom interaction, according to Mudau (2013), comprises teachers and learners working closely together to uncover or resolve particular scientific ideas and concepts.

Other facets of discourse and engagement in the classroom were recognized by Smart and Marshall (2012). Smart and Marshall (2012) define these discourses as various communicational interactions between teachers and learners. These discourse forms are referred to as authoritative discourse, dialogic discourse, and reflective discourse by Mudau (2013). Authoritative speech, according to him, is the kind of discourse in which teachers elicit responses from their learners through questions and truthful comments. In order to determine and further enhance learners' comprehension, dialogic discourse stimulates and motivates debate between teachers and learners. Last but not least, teachers who use reflective discourse interact with learners in an effort to elicit new perspectives, solutions, and methods of comprehending issues. This is a method of figuring out or ascertaining the degree to which learners comprehend concepts and ideas.

The communicative method is also emphasized in the discourse and interactions in the classroom (Mudau, 2013). According to Mortimer and Scott (2003), there are four types of communicative approaches: interactive/authoritative, interactive/dialogic, non-interactive/dialogic, and non-interactive/authoritative. There are definitions and descriptions of these approaches, according to Mudau (2013). The interactive-authoritative approach explains how teachers encourage learner responses but discredit them if they are inaccurate because the emphasis is solely on accurate responses. There are no wrong responses in an open discussion if an interactive-dialogic method is used, and learners' opinions are considered even if they differ from those deemed to have accepted scientific meaning. The opposite of an interactive authoritative discourse is a non-interactive authoritative approach. Here, learners are expected or forced to understand the knowledge without asking any questions or offering any recommendations, and information transmission is one-sided. According to Mudau (2013), a non-interactive-dialogic approach allows teachers to add their own

materials on top of the official manual. Although this is done to help learners comprehend concepts or ideas, they are still not asked to or permitted to provide any input.

A vital component of meaningful learning that results in improved performance for learners is the utilization of indigenous African languages, relationships, and discourses (Omidire, 2019). This paper focuses on the influence of natural science scientific register in isiNdebele on classroom practices.

METHODS

Study Group

The study was conducted in some schools of the Siyabuswa 2 circuit in the Mpumalanga Province. The research methodology employed in this study is qualitative, which is regarded as an inquiry method that makes sense of key phenomena while observing participants in their surroundings. A qualitative research design, according to Creswell (2017), enables the analysis of the phenomenon within its actual environment. No assumptions are made during phenomenological research; instead, an attempt is made to comprehend the participants' experiences. Because the researchers were more interested in learning in-depth information about the topic being examined, a multiple case-study method was adopted in this study (Nkanyani & Mudau, 2019). Because participants' backgrounds and teaching experiences varied, the researchers were able to approach each situation differently thanks to this methodology.

For this study, two teachers of natural sciences, two learner groups, and two parents were chosen through the technique of purposeful sampling. Sampling was carried out based on the following criteria as it was referred to by Maree (2017) as the optimal selection of information-rich instances for an in-depth study employing participants who are educated about the issue under investigation: Parents and learners from the chosen school, as well as teachers who teach natural sciences in senior phase schools, particularly in the Siyabuswa 2 circuit were selected. Finally, we only considered participants who were willing to take part in the research. As we sought ethical clearance and visited the targeted school and explained what the research was about, then the participants who were willing to take part in the study they indicated their interest.

Data Collection Tools

Two methods were used in this study to acquire qualitative data. One-on-one semi-structured interviews with a predetermined list of questions made up the first strategy (Creswell, 2017; Maree, 2017). The question of "whether the developed isiNdebele natural sciences scientific language register shape learner's classroom interactions and discourses" was discussed in interviews with two natural science teachers, two groups of learners, and two parents from chosen schools. When conducting these interviews, follow-up queries like "if, yes." To obtain additional information and gather more data, the question "how please elaborate" was posed.

Although Sahin-Topalcengiz and Yildirim (2020) believe that interviews are time-consuming and expensive, this method has been found to be the most relevant for gathering data due to the small number of participants who took part in the study and the individualized nature of interview data. The interviews were the primary method used to obtain enough and pertinent data (Nkanyani & Mudau, 2019). Additionally, interviews offered a more comprehensive source of descriptive data than could have been obtained using tools like questionnaires (Madueño Serrano et al., 2020). In order to investigate the influence of the natural science scientific register in isiNdebele on classroom practices, participants were interviewed after school and during their spare time. To make sure the researcher had accurately recorded the participants' comments, the interview responses were audio recorded.

The second technique, classroom observation, was helpful in gathering data for this study since it allowed researchers to see teachers teaching natural sciences in both English and isiNdebele. To confirm the validity of the data gathered, observations were made constantly over the course of three weeks. Each teacher was observed a minimum three times over number of days. For the first 45 minutes, unit 1, which dealt with separating mixtures was taught using the isiNdebele scientific register for the natural sciences, and for the final 15 minutes, the English scientific register. A variety of times were set aside to examine how interactions and discourses in the classroom change when different registers are employed. The best kind of observation most suited for this study is thus the observer as a non-participant because the researchers remain uninvolved and do not influence the dynamics of the setting.

Observations and interviews helped to triangulate the data. In order to come to the conclusions of this study, the researcher verified participant replies from the interviews along with observations made in the classroom.

Data Analysis

For this study, information gathered from interviews and observations were analyzed using content analysis. Interviews and observations that were recorded on audio were examined by playing them back numerous times after being transcribed into a word document. The researcher listened to the audio once more after transcribing the information from the video and interview data. This was done to guarantee that the transcribed data matched the responses of the

participants. The researcher analyzed the transcribed data from the interviews and observations and underlined key passages that helped comprehend the participants in order to develop themes and categories utilizing the research questions (Creswell, 2017). Themes of interactions and discourses were employed to analyze the study's data.

DATA PRESENTATION & DISCUSSION

Smart and Marshall (2012) define classroom discourses as a variety of interactions between a teacher and a learner that are best carried out verbally through discussions and debates. Meaningful learning is a dialogic process in which many ideas are brought together and considered, whereas Mudau (2013) defines classroom interactions as the involvement of teachers and learners closely working together to achieve that goal. Mortimer and Scott (2003) emphasize the significance of interactions and discourses as a basic to meaningful learning, which favorably effects a learner's performance. They also hinted that there are three stages to meaningful learning: the social plane, where new information is provided to learners, the internalization process, where learners are helped to understand and make sense of it, and the application of the newly learned information. Language serves as a tool for interactions and discourses, facilitating these phases (Reis & Ng-A-Fook, 2010).

In applying the register, I also intended to comprehend stakeholders' perspectives on how classroom interactions and discourses are influenced by the scientific language register for natural sciences in isiNdebele?

> "Yes, I think it does positively influence, because the register is written in their home-language making it easier for learners to interact when they understand the language rather than when using English register, where their participation is minimal" Themba (pseudonym) from Soneni school.

> "Yes, it will–in a good way, because often people who are unable to communicate properly do not truly ask the questions that need to be asked. Sometimes they do not speak because they do not want to participate in the language of instruction. However, since they will be conversing in their native language when using the isiNdebele register, their interactions will be improved" Sipho (pseudonym) from Mkhayo school.

From the posed question "How classroom interactions and discourses are influenced by the scientific language register for natural sciences in isiNdebele"? Stakeholders based their answer on the idea that learners will learn in their home tongue, which will help them comprehend things more clearly and interact more naturally than if they were taught in English. Their claims are supported further by Adesemowo (2017), who observed that one advantage of utilizing an indigenous language while instructing African learners is that learners are better able to comprehend and relate to ideas from their own language and culture. The same question was put to the other learners, and learner from Mkhanyo School gave the following response:

> "The register will have a good influence because when we learn using this register, we can participate and interact without fear because we learn using the language, we are familiar with, and we can think quickly because we understand better."

The identical query was posed to the parents. Parent from Soneni School gave the following response:

> "Yes, it can have a great impact because, in my opinion, if they can teach natural science in IsiNdebele, all learners will grasp it very well. And I believe that everyone in the class will grasp everything, participate, and engage, and they will all receive full marks. simply because they were able to learn in their mother tongues."

Based on the replies above, stakeholders concurred that interactions and discourses in the classroom may be influenced by the scientific language register that has been developed for the natural sciences in isiNdebele. Their comments focused heavily on the advantages and benefits of speaking one's mother tongue, which, as Adesemowo (2017) suggests, leads to more meaningful learning and ultimately improves performance. According to political analysts like Dr. Somadoda Fikeni, traditionalists like Zolani Mkiva, and historians and cultural analysts like Professor Pitika Ntuli, learning in the learner's mother tongue enhances interactions and discourses, which results in more meaningful learning and improved performance. Reis and Ng-A-Fook (2010), who also noted how the use of indigenous language might increase meaningful learning and better results, provide additional support for these stakeholders' replies.

The researcher then went to a classroom to observe the teachers and learners. This was carried out in order to confirm and combine information gathered from interviews with what was seen in the classroom (Nancy Carter et al., 2014). As approaches other than the observation technique would not have been able to record classroom interactions and dialogue.

In the interviews, Themba stated that interactions and discourses in the classroom are influenced by the scientific language register that has been constructed for the study of the natural sciences in isiNdebele. He was

thus observed teaching using isiNdebele scientific language register. As suggested by Keeley (2012), he began his class by assessing the learner's prior understanding of the subject, which is crucial for meaningful learning. He made the statement:

> "What comes to your thoughts when you hear the word 'matter' Any view is acceptable?"

He employed dialogic discourse in his lesson, as Mudau (2013) has hinted at, allowing learners to interact with and discuss the material being taught to them. This is reinforced by the excerpt from their explanation of what they consider to be "matter" below:

> "I think matter is used to do something" Ntando (pseudonym).
>
> "Matter is something that can take up space" Simiso (pseudonym).

He explained to his learners that any point of view is welcome after he inquired as to the issue. Because of this, his approach was interactive and dialogic, as stated by Chin (2006) and Mudau (2013). Learners were encouraged to share any comments they had because the emphasis was on their involvement and interaction rather than on getting the right answers, with the goal of meaningful learning as the end goal.

As mentioned by Chin (2006) and Mudau (2013), he was also seen incorporating dialogic discourse into his class as learners engaged in a discussion on whether it was feasible to extract salt from seawater and, if so, what the name of the procedure was in isiNdebele. The following learners' comments bolster the aforementioned claim.

> "Yes, through boiling" Thandi (pseudonym).
>
> "Through filtering" Buhle (pseudonym).

According to the aforementioned claims, Themba employed both dialogic speech and an interactive dialogic methodology. Even though several of his learners' suggestions for how to separate the salt and water mixture were incorrect, he did not disregard them; instead, he noted their suggestions and provided the correct answer.

He asked questions that prompted conversations or raised learners' levels of thinking throughout the course of his lesson. In other words, he asked questions to sharpen his thinking. He invited them to name and describe mixtures and pure substances, and this was seen as he did so. The excerpt below demonstrates this:

> "Raisons are pure-substances" Busi (pseudonym).
>
> "Rama is a pure substance" Sifiso (pseudonym).
>
> "I do not know any other name that best describes Rama in isiNdebele" Themba.
>
> "Yibhodoro" Hlokokulu (pseudonym).

Margarine is debated as being in the English language by the teacher and learners, who ultimately decided that 'yibhodoro' is the correct answer.

According to the aforementioned claims, Themba did not elicit answers to buy time. But he asked inquiries that forced learners to grow as thinkers. This was noticed as learners discussed the meaning of "rama" in isiNdebele, which Themba stated he was unaware of. However, his learners named it "yibhodoro," which is better in isiNdebele. In order to examine open-ended and learner-centered inquiries, Themba was observed using an initiation, response, feedback, response, and feedback (IRFRF) pattern of speech (Graesser et al., 2003).

Sipho noted during the interviews that the isiNdebele scientific language register for the natural sciences has a favorable impact on conversations in the classroom. Additionally, he pointed out that while teaching natural sciences in isiNdebele rather than English, learners are more likely to interact with one another. I made the decision to observe him teach the same content using the English scientific register for natural sciences based on his hints regarding the differences between the English and isiNdebele registers for natural sciences.

Chin (2006) and Mudau (2013) claim that Sipho deployed authoritative discourses right away. This is true because learners were not given the opportunity to discuss or argue the ideas. All he did was convey knowledge to learners using the question-and-answer technique of instruction, which is strongly criticized by academics who think it develops learners' passive and superficial thinking. See the excerpt below:

> "Why do you claim that tap water is a combination? since they employ a chemical, correct?" Sipho.
>
> "Yes" L's.
>
> "So, it appears that everyone agrees that tap water is a combination" Sipho.
>
> "Yes" L's.

Learners were not given the option to participate in the class or have a discussion, not even to ask questions or offer their opinions on the material being covered. His speech was authoritative since he just provided the knowledge, and learners served as passive recipients of it (Chin, 2006).

Sipho used the initiation response feedback (IRF) pattern of speech in his class (Graesser et al., 2003). He was seen asking inquiries regarding mixtures and pure

substances, then responding with his thoughts. The excerpt below demonstrates this:

> "Milk is a what? Is a pure substance right?" Sipho.
>
> "Yes" L's.

Sipho never posed questions that would lead to discussions or encourage learners' levels of thought; instead, he always asked simple questions with clear answers, and in some cases, he even provided learners' responses.

When teaching, Sipho adopted interactive-authoritative approach. This is the case because, despite interaction between the teacher and the learners, there was little interaction among the learners themselves. Sipho's dominating style of teaching with lectures and question-and-answer sessions is evident throughout the lesson, and learners were not given the chance to challenge or examine the material that was being taught to them. Although he encouraged responses from the learners, he provided answers to queries that they were unable to answer. The observation noted below lends credence to the previous assertion:

> "Let us go to picture B. Picture B, what do you think of picture B"? Sipho.
>
> "Mumbling" L's.
>
> "What you see there it is a mixture" Sipho.

The excerpts from the above passages demonstrate how authoritative his communication style is. Instead of providing them with answers, he could have given the learners the chance to interact with one another and the material they were learning, giving them the chance to practice different skills like asking questions and communicating, as curriculum and assessment policy statement for natural science (CAPS NS) document for grade 7-grade 9 specifies (Department of Basic Education, 2012). As a result, because English was the register utilized for natural science, learners were not engaging with the teacher in meaningful ways.

FINDINGS

The results of this study show that Themba employed dialogic discourse when utilizing the isiNdebele scientific language register for natural sciences. He was seen giving his learners several opportunities to interact with and discuss the ideas being introduced to them. Furthermore, despite the fact that their solutions to questions were incorrect, he managed to establish an environment, where his learners felt more comfortable interacting with him and with one another. His strategy became interactive-dialogic as a result. Themba used the question-and-answer method to give his lesson, posing inquiries to foster critical thinking. He continued to use IRFRF pattern of discourse as he was seen providing comments that stimulated his learners' critical thinking, leading to further discussion and improved input from them.

The researcher detected no attempts at conversation between Sipho and the learners or even among the learners themselves, in contrast to when Sipho was using the English scientific register for natural sciences. Sipho was seen to be an information transmitter, while his learners were seen to be information receivers. His speech became authoritative as a result. Additionally, IRF discourse patterns he used denied learners the chance to use certain abilities, like question-posing and scientific process skills, as outlined in CAPS NS policy statement. Sipho did not ask questions during his class to help learners improve their ability to think critically or to purchase more time before moving on to the next question, but rather merely to evaluate. The researcher observed that after the session, learners were not given the opportunity to discuss, consider, or clarify what they had learned, which he described as making his communicative method "interactive and authoritative."

Based on the two observations, it can be concluded that the isiNdebele scientific language register for natural sciences does, as suggested by (Mortimer & Scott, 2003), positively influence classroom practices, which can result in more meaningful learning of natural sciences and ultimately better performance in the subject.

CONCLUSIONS & RECOMMENDATIONS

Does the developed scientific language register for natural sciences in isiNdebele influence learner interactions and discourses, according to the stakeholder responses? The stakeholders agreed that the register should influence classroom interactions and discourses in a good way. They founded their claims on the fact that learners will study natural sciences in their mother tongues in which they are fluent and further grasp it better, which is a powerful argument in their favor. The language barrier will be less of an issue as a result, and their engagement and performance in the subject will both increase. Since they will not learn the language, they will only learn concepts of natural science Motloung et al. (2021), political commentators like Dr. Somadoda Fikeni, traditionalists like Zolani Mkiva, and historian and cultural analyst Professor Pitika Ntuli, who affirms that learning in the mother tongue should improve learner performance, all support the claims made by these individuals.

According to observations, learners were interacting to the fullest and asking questions with ease while teachers were using isiNdebele register. When they spoke in English, there were less interactions because they were seen to be silent or nod in agreement with the teacher's points without challenging the lesson. from

comparing the many discourses and interactions in the classroom that were recorded when teachers used various registers. The developed scientific language register for the natural sciences in isiNdebele can be inferred to have a favorable influence on discussions and interactions in the classroom. According to the study's findings, using indigenous languages in the classroom significantly influences learner relationships and discourse, which results in deeper learning and improved performance. As a result, it is advised that South African schools establish and incorporate scientific language registers in indigenous languages into their curricula.

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