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Translanguaging in action: Foundation phase learners' use of different communicative linguistic resources for meaning-making during science education

Abstract

This study explores how primary school learners in a multilingual South African foundation phase classroom use linguistic resources during communicative exchanges in science experiments. Focusing on the topic living and non-living things, it examines how plurilingual learners creatively draw on linguistic and cultural resources to engage in science explorations. Employing an ethnographic research design, the study involved 20 participants (one Grade 3 teacher and 19 learners aged 8–10 years). Ethnographically informed, the study collected data through video recordings and classroom interactions in a third-grade class (8–10-year-olds) to analyse their participation in both whole-class discussions and small-group interactions. Data were analysed using conversation analysis, informed by a critical ethnographic lens. This analysis considers how learners construct and communicate meaning as they interact in diverse groups. The findings reveal the importance of dialogical, open-ended classroom spaces that allow linguistically and culturally diverse learners to draw on their unique resources, enabling them to participate more fully in science discussions. Framing natural science learning as a culturally integrated practice, this study offers new insights into the complex translanguaging processes at play in foundation phase education. The findings advocate for a transformative shift in educational practices to recognise and harness the rich linguistic and cultural resources that plurilingual learners bring. Despite various linguistic discourses, the success of using different communicative resources in South African classrooms hinges on receptive, supportive contexts.

Keywords: *Foundation phase; multiculturalism; plurilingual learners; science education; translanguaging*

1. Introduction

Four learners – two boys and two girls – stand around a desk staring at a clear rectangular plastic container with an insect inside. Tshepiso¹ leans over and, using a plastic drinking straw, turns the insect face up.

Then Mongezi points at the insect and exclaims in isiZulu, “Look, it has many legs!”

Mbali points at each leg while counting, raises six fingers, and shouts in Sesotho, “It has six hairy legs!”

Siphiwe, who has been examining the insect quietly, raises his head, turns to Mongezi, and calls out excitedly in isiZulu, “The body is divided into three parts,” as he raises three fingers. He then faces Mbali and repeats the same thing in Sesotho.

“Wow, look! It has two things like a cow’s horns!” Tshepiso exclaims in isiZulu.

Siphiwe looks at their teacher, Ms Shaman, and asks in English while pointing at the insect, “Are those two items on its head horns?”

Immediately, Mongezi, raising six fingers, also asks Ms Shaman in isiZulu, “Why does an insect have six legs when it also has wings?”

Mbali turns to face Mongezi and explains in isiZulu, “Because legs are for walking, and wings are for flying.”

Tshepiso looks at both Mongezi and Mbali, smiles, nods, and gives a thumbs-up.

“Look! The eyes are on the sides of the head. Wow, why?” Siphiwe exclaims excitedly in Sesotho.

Tshepiso looks at him and simply shrugs.

The speakers in the excerpt above are third-grade learners in a primary school in Sasolburg, in the Free State province of South Africa. They are participating in a lesson on insects, in which they examine the insect before drawing it. The class is multilingual, with learners having either isiZulu or Sesotho as their home language. As they examine the insect, the linguistic diversity of the class comes to the fore – a common feature of most classrooms in South Africa today (Siry *et al.*, 2022). More than 35 languages are spoken in the country 12 of which (including South African Sign Language) are official languages. Of the 12 official languages, only two (English and Afrikaans) are used as languages of instruction in schools making translanguaging topical.

In their discussions, it is interesting to note how Siphiwe moves seamlessly between isiZulu when speaking to Mongezi, English when speaking to Ms Shaman, and Sesotho when interacting with Mbali and Tshepiso. None of the learners in the class is a native speaker of English (the school’s medium of instruction), so they have varying levels of proficiency in the language.

1 A pseudonym is used to refer to each study participant.

While translanguaging has been widely theorised in multilingual education research, fewer studies have closely examined how it unfolds during classroom interaction in foundation phase natural science classrooms in South Africa. In the South African foundation phase, science education is not taught as a discrete subject. However, it is integrated within the life skills subject, specifically under the Department of Basic Education's beginning knowledge strand (DBE, 2011a). Concepts from natural science are introduced and taught and as in this particular classroom context, learners draw on numerous communicative resources. For example, Tshepiso just looks at Siphwe, shrugs her shoulders and, non-verbally indicates that she does not know the answer to his question. Tshepiso and Mbali, who are not proficient in isiZulu or English, resort to Sesotho during interactions with their peers.

Clearly, these learners communicate their observations with one another and with the teacher across multiple modalities, drawing on gestures, expressions, and vocal intonations as they move in and out of the named languages (Siry *et al.*, 2022). Guided by Vygotsky's (1978) sociocultural theoretical framework, the study used video-based critical ethnography (Mukherji & Albon, 2023) to explore and elucidate third-graders' multimodal intercommunications during their science lessons. This approach allows for close examination of translanguaging "*in action*" as learners engage in science learning activities. Based on a detailed analysis of numerous occurrences drawn from this video-based critical ethnography, the study explores underlying claims about learners' translanguaging as they participate in group and class discussions during natural science lessons. This theoretical framing supports the analysis of translanguaging as a socially situated process of meaning-making.

The moment when thought and language amalgamate, the social language—extending beyond the mother tongue to include any language or system of communication encountered in the child's social environment—becomes integral, is incorporated, and supports the child's reasoning. Consequently, the social environment is embedded within the child's learning. Sociocultural theory suggests that human learning is largely a social process and that our mental functions are established and grounded in our interactions with others (Vygotsky, 1978).

Back to Ms Shaman's classroom as an exemplar of how children's perceptions can be exhibited and normalised in dialogical interactions, other learners engage in the lesson.

"The legs are hairy," Reneiloe says in Sesotho.

Mongezi looks at the insect's legs, points to one of them, and shouts in isiZulu, "Look! The legs are different!"

As Ms Shaman joins them, she asks in both isiZulu and Sesotho, "Why are the hind legs bigger than the other four?"

Thato hops up and down, then says in Setswana, "They help the insect jump up before flying."

Mbali moves closer, looks at the insect again briefly, and then, pointing with a pencil at the container and shaking his head, counters Thato in Sesotho, "No! If we remove those big legs"—pointing—"it can still fly."

It is interesting how Sipiwe and his peers make use of their entire linguistic repertoire to express and develop their conceptions and scientific knowledge. Another noteworthy point is how these learners exercise agency in classroom interactions, and the manner in which structures such as teaching methods, curriculum design, and classroom management shape their potential for action and engagement (Siry *et al.*, 2022). This study, therefore, asks:

How do foundation phase learners draw on their linguistic and multimodal resources during natural science classroom interactions?

2. Literature review

2.1 Translanguaging and transmodality as communicative practices in education

Often, we think of distinct languages as being absolutely separate and bounded systems. For example, when learning a language, one tends to focus solely on mastering its grammar and vocabulary. Indeed, mixing in one's old or home language with the one being learnt might even be seen as a failure, as one is required to speak the new language fluently. However, this inclination is not compatible with the real world; in daily communication among multilinguals, there is often a combination of two or more languages. This reality is called translanguaging (Garcia, 2023).

In this study, “plurilingual” emphasises learners’ integrated linguistic repertoires, while “translanguaging” refers to the dynamic processes through which these resources are mobilised for meaning-making. The term “translanguaging” is difficult to define, as it is used in diverse ways by various people. The term was coined by a Welsh educationist, Cennydd Williams, who wrote about *trawsieithu* – the Welsh word for “translanguaging” – in the 1980s. In its original usage, Williams (1994) used the term in a restricted sense, referring to the use of both English and Welsh within the same academic lesson.

With the passage of time, several scholars, such as Creese and Blackledge (2010) and Wei and Garcia (2022), have accepted the term to depict the simultaneous deployment of multiple linguistic resources in a single communicative situation. Translanguaging in the classroom involves allowing multilingual learners to draw on their linguistic repertoires for meaning-making. Translanguaging can be viewed as a communicative process through which multilinguals draw on resources from multiple languages (Wei & Garcia, 2022). In classroom practice, translanguaging is often used to explain scientific concepts, negotiate meaning during group work, and scaffold understanding of abstract terminology through learners’ home languages. Translanguaging is both a communicative experience and an instructional approach that can augment communicative potential and negotiate learners’ agentic possibilities (also in science), as it affords them access to expansive resources (Zano & Mbirimi-Hungwe, 2023).

In their study, Siry *et al.* (2022) explored how plurilingual kindergarten learners in Luxembourg engage with science and communicate their comprehension of scientific concepts by foregrounding the myriad modes and modalities visible in interactions. In education, modalities are the sensory pathways through which learners give, receive, and store information. By combining these modes, such as speech, gesture, drawing, and writing,

learners experience learning and express themselves in a variety of ways to create a diverse learning style (Johnson & García, 2022), and in some cases, they “cross over”, thus making use of more than one mode or modality (transmodal).

In particular, learners draw on translanguaging practices (Wei & García, 2022), combining linguistic and semiotic resources for meaning-making in classroom interaction, reflecting the heteroglossic nature of language and semiosis in established communal settings. The current study advances the argument that English-dominant educational settings often reflect a monolingual and monomodal bias in official policies, instructional materials, textbooks, and assessment practices, which can create a stifling environment that fails to draw on learners’ linguistic resourcefulness. These perspectives on translanguaging and multimodality provide a useful lens for examining how meaning-making unfolds in subject-specific contexts such as science education.

2.2 Translanguaging research in science education

Lately, there has been an increase in studies focusing on translanguaging in science education. In science, technology, engineering and math (STEM) classrooms specifically, research shows that translanguaging can promote language development, high-order thinking, and conceptual understanding (see, for example, Hattingh *et al.*, 2022; Pierson *et al.*, 2021; Radke *et al.*, 2020). In their studies, Hattingh *et al.* (2022) explore some alternative translanguaging practices of teachers and learners in multilingual classrooms and how these support opportunities to learn science in South African primary schools. The scholars show how transitioning from isiXhosa (learners’ home language) to English limits learners’ participation and meaning-making; how learners’ languaging practices evolve in collaborative group work and how they make use of their language resources for effective discussions of scientific concepts; how translanguaging practices in teacher-led whole-class discussions support learning; and how translation activities facilitate conceptual understanding. In the United States of America, most learners attend English-dominant schools. Although translanguaging practices have been studied in classroom contexts by a growing body of literature, there remains a need for further research on how they can be systematically integrated in English-dominant classrooms (Pierson *et al.*, 2021). In their study in the USA, Pierson *et al.* (2021) explored how scientific modelling could accommodate translanguaging in a sixth-grade STEM classroom and how it could also allow for a situation in which modelling and translanguaging could be experienced as homologous meaning-making practices. Their study suggests that translanguaging can scaffold learning in English-dominant STEM classrooms. Similar studies suggest that translanguaging (1) promotes higher-order thinking (Karlsson *et al.*, 2020); (2) contributes to more equitable learning spaces for multilingual learners (Williams, 2020); (3) facilitates conceptual understanding (Oliveira *et al.*, 2019) and (4) drives language development (Poza, 2018).

In their study, Licona and Kelly (2019) demonstrate that exploiting learners’ entire linguistic repertoire can facilitate comprehension of the epistemic dimensions of argumentation. The two scholars argue that linking translanguaging and language-intensive practices, such as argumentation, can help include English learners (ELs) in science classrooms, as translanguaging enhances learners’ access to linguistic resources for meaning-making (Licona & Kelly, 2019).

Translanguaging practices include the use of multimodal semiotic repertoires (Hua *et al.*, 2019; Sherris & Adami, 2018; Wei, 2018). For example, in one of their studies drawing on translanguaging theory, Radke *et al.* (2020) show how learners used a multilingual and multimodal programming environment to understand the effects of Hurricane María on Puerto Rico. The learners in that study capitalised on their full semiotic, cultural, and experiential repertoires to explore statistical modelling and human accounts of migration. The Radke *et al.* (2020) study highlights the paramourcy of multimodality and translanguaging in science education.

3. Theoretical framework

Lev Vygotsky (1978) argued that parents, caregivers, peers, and the broader cultural community are responsible for a child's cognitive development. According to the sociocultural viewpoint, our intellectual growth is assisted (to a large extent) by people in our lives, such as teachers, peers, and parents. A crucial concept in sociocultural theory is the zone of proximal development, which is the distance between the actual developmental level (of the learner) and his or her level of potential development, as determined through collaborative interaction and scaffolding provided by more competent peers.

Vygotsky's (1978) theory highlights the primary role of social interaction in cognitive development, positing that communities play a pivotal role in meaning-making. It thus follows that, as children interact with one another, these interchanges remarkably enhance not only the amount of information gleaned and the number of skills a child develops but also influence the advancement of higher-order intellectual functions such as formal reasoning. A point to note is that social interactions take place through language or modalities.

Vygotsky (1978) suggests that language has two roles: (1) inner speech, which is used for cognitive reasoning, and (2) external speech, which is used to communicate with others in one's social circles. In this study, sociocultural theory is used as an analytical lens because it explains how learning is mediated through social interaction, where language functions as a key tool for meaning-making. This theory is particularly relevant for understanding translanguaging, as learners draw on multiple linguistic and semiotic resources when engaging in collaborative science activities, thereby co-constructing understanding within their zone of proximal development.

4. Materials and methods

4.1 Research approach and design

Since the aim of the study was to gain in-depth insight into how foundation phase learners' language develops during science activities, it was qualitative and followed an ethnographic design. Ethnography is the study of people in their natural environment and uses data-collection methods such as observation and face-to-face or focus-group interviews (Caulfield, 2020). This study follows these principles by immersing in the participants' natural settings, utilising participant observation to explore their social practices and cultural dynamics. During the study, we observed lessons in which third-graders engaged in scientific activities and science learning. Our role was that of participant observers. We detailed all our observations, especially when the learners and/or teacher were "languaging". We video-recorded the lessons, with the participants' consent. The use of video recording was negotiated with the school and participants before data collection, and informed consent was obtained from the teacher, learners, and parents.

4.2 Contextual framing of the study

The study was carried out in Johannesburg, also known by its isiZulu name, *eGoli*, meaning “city of gold.” Johannesburg, South Africa’s most populous city and the capital of Gauteng province, was founded in 1886 following the discovery of gold deposits in the hills of the Witwatersrand. Johannesburg city has an estimated population of about six million (UN, 2024), with 29 percent of residents living in informal dwellings (CoGTA, 2021).

The City of Johannesburg metropole website (2018) notes that the most populous racial groups in Johannesburg are Black Africans (76.4%), Coloureds (5.6%), Whites (12.3%) and Indians/Asians (4.9%). Of these, about one-third speak a Nguni language, 25 percent speak Sesotho, 18 percent English, seven percent Afrikaans, and six percent Tshivenda, with the remainder speaking a language from outside of South Africa. The Nguni languages spoken in Johannesburg include isiXhosa, Hlubi, isiZulu, isiNdebele, and Seswati.

The city is home to over 260 schools catering to learners as young as a few months old, to young adults pursuing secondary education. Despite the city’s linguistic and cultural diversity, almost all schools use English as the language of instruction, which is the home language of about 18% of the city’s population (CoGTA, 2021).

Thus, the linguistic complexity in foundation phase classrooms (such as the classroom which was the focus of this study) cannot be overemphasised. Foundation phase classes in South Africa include Grade R (also called the reception year, a year of schooling before Grade 1) to Grade 3. Grade 3 learners will thus have received formal education for three years, inclusive of Grade R. In South African schools, the language of learning and teaching (LoLT) is largely determined by the choices that learners or their parents make when selecting the medium of instruction (DBE, 2010). At this school, as in most schools across the country, learners are taught in their home language alongside English from Grade R to the end of Grade 2. From Grade 3 upwards, the LoLT or medium of instruction follows a more monolingual trajectory, with only English used for instructional purposes (DBE, 2010). In this article, we draw on a study in which learners were taught about *living and non-living things* by their teacher in the presence of one of the researchers.

4.3 Participants

A total of 20 participants took part in the study. They comprised one Grade 3 teacher and 19 Grade 3 learners (see Table 1). The participants’ biographical information was obtained from school records, while their linguistic backgrounds were identified through teacher reports and classroom interactional observations during lesson activities.

Table 1: Biographical information on the 20 participants

Participant	Pseudonym	Gender	Age	Designation	Linguistic background (as reported/observed)
1.	Ms Shaman	Female	36	Teacher	English, isiZulu, Sesotho
2.	Tshepiso	Female	9	Learner	isiZulu
3.	Mongezi	Male	9	Learner	isiZulu
4.	Mbali	Female	10	Learner	Sesotho
5.	Siphiwe	Male	9	Learner	isiZulu, Sesotho, English
6.	Reneiloe	Female	10	Learner	Sesotho
7.	Thato	Female	10	Learner	Setswana

Participant	Pseudonym	Gender	Age	Designation	Linguistic background (as reported/observed)
8.	Chuma	Male	10	Learner	isiZulu
9.	Dineo	Female	10	Learner	Sesotho
10.	Nkhululeko	Female	10	Learner	isiZulu, English
11.	Gugu	Female	8	Learner	English, isiZulu
12.	Lindiwe	Female	8	Learner	English, Sesotho
13.	Xolelwa	Female	9	Learner	English, isiZulu
14.	Marvelous	Female	9	Learner	Sesotho
15.	Gloria	Female	8	Learner	Sesotho
16.	Vimbai	Female	9	Learner	isiZulu
17.	Alice	Female	9	Learner	isiZulu
18.	Hellen	Female	9	Learner	isiZulu
19.	Khensani	Female	9	Learner	isiZulu
20.	Hloni	Female	9	Learner	English, Sesotho

4.4 Data-collection instrument

Ethnography is a qualitative research method commonly applied in the social and behavioural sciences, in which participant observation is a key method for data generation (Caulfield, 2020). It was used to collect data. The study examined third-grade learners' interactions during science education, using video recordings to observe how they made and expressed meaning in whole-class dialogues and small-group interactions. The researchers observed multiple natural science lessons over a defined period (October 2023 to April 2024), including whole-class and small-group interactions before, during, and after science activities, in order to capture the flow of classroom meaning-making. This approach aimed to conclude how a group of third-grade learners interacted with one another and with their teacher during classroom learning. As Caulfield (2020) points out, ethnography provides the researcher with direct access to and first-hand insight into participants' behaviours and interactions (in this instance, foundation phase learners in a third-grade classroom setting).

4.5 Data analysis

The guiding frameworks introduced earlier in this article and the understandings gained from the literature reviewed are brought together through a critical ethnography lens to guide data analysis.

4.6 Critical ethnography

Critical ethnography employs a critical theory-based approach, focusing on the absolute values expressed in ethnographic research. The approach capitalises on studies and theory to appraise hegemony, oppression, skewed power relations, and the standardisation of these structures in society, in a bid to stimulate social change in direct or indirect ways. In this study, this critical orientation is reflected in the examination of dominant monolingual norms in classroom practice and in foregrounding how learners draw on their full linguistic repertoires to negotiate meaning and participation.

Through the critical theory lens, critical ethnography aims to establish symbolic mechanisms, distil ideology from action, and comprehend the cognition and behaviour of research participants within historical, cultural, and social frameworks.

4.7 Data analysis through conversation analysis

The video-recorded data were first transcribed verbatim, including verbal utterances, code-switching, and relevant non-verbal actions such as gestures, pointing, and movement. The transcripts were then carefully reviewed and initially coded to identify instances of translanguaging and multimodal interaction. From these codes, broader analytical patterns were developed, focusing on recurring ways in which learners used linguistic and semiotic resources to construct meaning in science classroom interaction.

The data were analysed using conversation analysis (CA) (Seedhouse, 2005), which interrogates social interactions by focusing on both verbal and non-verbal conduct and communication. This analytical approach focuses on the study of talk-in-interaction to discover how participants understand and respond to one another as they take turns speaking. The current study primarily focused on the actions participants took as they engaged in *linguaging* during the lesson discussions.

According to this analytical technique, actions are chiefly performed through talk and nonverbal means, which explains why it is sometimes called the study of “*talk-in-interaction*”, simply acknowledging that interaction is not merely “talk”. During the analysis, we identified and described the social purposes achieved through all aspects of *linguaging* among the participants and their teacher, providing us with invaluable details of how the third-graders interacted with one another, thus positioning the technique as an ideal lens for analysing instances of translanguaging during natural science lessons. Transcripts of the conversations were reviewed, and the findings are presented hereunder (see Results).

4.8 Trustworthiness

Stahl and King (2020) note that, for research to be trustworthy, it must be credible and accurate. The trustworthiness of this study is reflected in the analysis of the video recordings, which captured the interactions of third-grade learners during science education in the classroom context. The video recordings allowed the researchers to rewatch the content and verify the information and conclusions drawn with other researchers involved in the study. Thorough examination and cross-referencing of the data strengthened the study's reliability, ensuring that insights into third-grade learners' interactions were accurate and would contribute to the overall trustworthiness of the research findings.

4.9 Ethical considerations

Ethical considerations in qualitative research must adhere to specific protocols. Mirza, Bellalem and Mirza (2023) emphasise several essential ethical requirements for maintaining sound research practices. This study adhered to the following guidelines during data collection and analysis: adhering to an ethics of respect and avoiding conflicts of interest, fostering relations with participants, obtaining informed consent, guaranteeing confidentiality and anonymity, and reporting back to participants, as well as ensuring the trustworthiness of research and addressing issues of translation (Mirza *et al.*, 2023). Signed consent forms were obtained from the participants (including assent from the learners and consent from their parents) to permit the researcher's presence in, and observation and video recording of, the science lesson in the third-grade classroom. Participants were informed that their participation was voluntary and confidential, and that they could withdraw at any time without consequences. The study respected the participants' autonomy and used pseudonyms to protect the identities of the school, the teacher, and the learners involved. Feedback to participants did not involve

reporting the analysed research findings; rather, it provided general feedback on the research process and confirmed participants' willingness to continue participation. In addition, the school was provided with a summary of the study's purpose and the classroom engagement patterns observed, in line with ethical transparency and respect for participants.

4.10 Contextual scope and implications

A small context-specific sample size was used in this study; therefore, the findings are context-bound and are not intended to be generalised to Grade 3 learners in other regions of South Africa. The research period captured classroom interactions over a defined timeframe, and further longitudinal studies may be useful to explore the longer-term implications of translanguaging for teaching and learning.

5. Results

5.1 Language for academic purposes

The study highlighted how crucial it is to embrace multilingualism and multimodality when negotiating the ever-changing social environment of multilingual and multicultural classrooms, unearthing the crucial role language plays in education, and how it and its varieties act as vehicles for natural science learning through interaction with the *more knowledgeable other* (MKO). A lack of (or limited) proficiency most likely results in reduced participation in meaning-making processes. In cases of insufficient proficiency in the language of instruction, we observed participants using their linguistic repertoire to ask, discuss, and answer questions, in line with Wei's (2022) findings. When learners enter the classroom, they are not blank slates; they bring rich resources that can enhance teaching and learning. It is imperative to note that language is one of the resources learners bring to class. Teachers should thus not view linguistic diversity as an impediment to learning, but rather as an invaluable resource for teaching and learning. For example, in one of the groups, the following conversation could be heard:

Chuma (using isiZulu, gestures and embodied actions, and English): *Kanjalo nale nto* [pointing to the insect] *isebenzisa kokubili* the legs *namaphiko* [mimicking flying] when moving? (Translation: So, does this thing use both legs and wings when moving?)

Dineo (using Sesotho and English): *Ba li sebelisa ka nako efe kapa efe*. (Translation: They use them all the time.)

Nkhululeko (using English and isiZulu): No! I think *isebenzisa imilenze uma ihamba* on the ground *namaphiko* when flying. (Translation: No! I think it uses legs when moving on the ground and wings when flying.)

Gugu (using English, gestures and embodied actions, and isiZulu): *But why all those* [raising six fingers] *legs uma inamaphiko?* (Translation: But why all those legs when it has wings?)

Lindiwe (using English and Sesotho): Maybe it's because *maoto ha a na matla a lekaneng*. (Translation: Maybe it's because the legs are not strong enough.)

Xolelwa (using isiZulu and English) [pointing at the legs]: *Leyo milenze ayiqinile kakhulu. Bheka ngisho namaphiko*. This insect is weak. (Translation: Those legs are not very strong. Look, even the wings. This insect is weak.)

In another instance, multilingual learners switched between languages in the same conversation. As reflected in the introductory excerpt and in elaboration of Mbali's response on the use of hind legs, Reneiloe says, "*I don't know* (in English) *kodwa* (isiZulu) *the wings* (English) *ngezokundiza* (isiZulu) *lehodimong* (Sesotho)," demonstrating how learners move seamlessly between languages to explain that wings are used for flying. This translanguaging episode in Reneiloe's utterance showcases the manner in which scientific concepts "are drawn out, written out, acted out, talked about" (Bezemer & Kress, 2008).

The excerpts above clearly show how learners navigated the linguistic spaces in fruitful academic discussions. Chuma, for instance, was able to pose a valid question [So, does this thing use both legs and wings when moving?], while pointing out that an insect has legs and wings. Similarly, Nkhululeko used two languages, correctly highlighting the uses of an insect's legs and wings – its wings for flying and its legs for moving on the ground or other surfaces. Gugu questioned the rationale for having legs when it already has wings to fly. To this, Xolelwa questioned the insect's wings and legs, calling it weak. The learners' engagement and reasoning, albeit not entirely in the language of instruction (English), clearly show a smooth flow of argument. The use of translanguaging does not take away the relevance of the questions asked or the responses given (Fang *et al.*, 2022). It also does not change the scientific correctness of the responses. For instance, Nkhululeko correctly points out that an insect uses its legs to move on the ground and its wings to fly. I think *isebenzisa imilenze uma ihamba* on the ground *namaphiko* when flying. In addition, learners used non-verbal modalities to support meaning-making. For example, by nodding, Tshepiso communicated agreement with Mongezi's explanations of the use of legs and wings, demonstrating the multimodal nature of classroom interaction (see *also* Bakhtin, 1981).

An important consideration emerging from the data is the participation of learners who do not share the dominant classroom languages (isiZulu and Sesotho), such as the Setswana-speaking learner, Thato. While isiZulu and Sesotho were more frequently used during peer interactions, the findings suggest that translanguaging created space for inclusion rather than exclusion, as meaning-making was supported through multiple semiotic resources, including English, gestures, and peer scaffolding. In this sense, even learners from less frequently represented linguistic backgrounds were able to participate in knowledge construction. However, their engagement was often mediated through the dominant linguistic resources available in the group, indicating that translanguaging, while highly inclusive, is also shaped by the linguistic distribution within peer groups. These interactional patterns further suggest that meaning-making in classroom interaction extends beyond linguistic exchange to include broader cognitive and semiotic processes.

By examining learners' different communicative practices, we can learn important lessons about how to design inclusive, linguistically diverse learning environments. Teachers can leverage this cultural and linguistic diversity to create engaging and meaningful academic experiences that draw on learners' linguistic and cultural backgrounds (Anderson, 2024). For a foundation phase teacher to facilitate understanding and the creation of scientific knowledge, they must weave a tapestry of translanguaging strategies. In a way, literacy appears to involve a range of cognitive, perceptual, and contextual processes beyond mere knowledge of language. Not only does translanguaging value learners' cultural backgrounds, but it also provides scaffolding for language and literacy development. Literacy thus appears to hinge on a wide range of cognitive faculties, beyond mere knowledge of language. These faculties include background knowledge, institutions of reasoning, psychomotor control, optical processing, shape recognition, and context.

Translanguaging emphasises the importance of adopting a more comprehensive pedagogical approach that celebrates linguistic diversity and gives learners the freedom to use their multilingualism as a learning resource, rather than focusing solely on additional language acquisition. The excerpts cited here hold numerous paramount lessons for educationists. Translanguaging takes into account the unitary linguistic system, which allows learners to use their full linguistic repertoire, and not only the particular named languages (Charamba, 2022).

Primary school education in South Africa has generated significant discussion during the past three decades, with learners' performance in national and international assessments being central to the debate. South Africa participates in three significant international assessments: the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS), and the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ).

In all three assessments, South Africa has repeatedly achieved the lowest overall average score among the participating low-income countries, or performed worse than less developed countries such as Kenya, Swaziland, and Tanzania (Robertson & Graven, 2020). In analysing the possible causes of learners' sub-par academic performance in these assessments, analysts have singled out the language of instruction as the major contributing factor (Robertson & Graven, 2020), especially when it differs from learners' home language.

To cater to the unique academic demands and linguistic profiles of learners, teachers must adapt their instructional approaches and become lifelong learners of new and effective ways to meet diverse learners' needs. In the event teachers are not conversant with learners' languages, all they need to do is "open the languaging door" so that learners can converse among themselves, thereby paving the way for progressive, fruitful academic engagement.

The current study, as with previous research on translanguaging in multilingual classrooms, identified the advantages of translanguaging in the foundation phase classroom as including the following: the capability of the participants to engage their classmates through translanguaging and heteroglossia; acceptance of synchronic literacies and languages (isiZulu, Sesotho, gestures and embodied actions, and English) to keep the academic project on track; and enhanced concept comprehension (Anderson, 2024).

Translanguaging, as evidenced in the present study, enables multilingual learners to employ the means at their disposal to engage, learn, and demonstrate concept comprehension and skills, and to open up spaces for further development of questioning and answering skills. Rather than having to engage solely in one language, translanguaging enables learners to demonstrate concept comprehension through multiple languages (Fang *et al.*, 2022) – in this instance, as they moved between English, Sesotho, gestures and embodied actions, and isiZulu during collaborative group discussions.

6. Discussion

Zano and Mbirimi-Hungwe (2023) argue that the global arena has become multilingual. However, in the South African context, monolingual practices still prevail, particularly given that English dominates in many South African schools. Bridging the gap between the LoLT in schools and learners' home languages remains a major challenge in the South African education landscape.

Manyike and Lemmer (2014) argue that, despite South Africa's linguistic diversity, its language policies and educational practices have often been influenced by ideological and political agendas, rather than pedagogical principles. The scholars further contend that a significant challenge to achieving equitable education nationally is the schooling system's failure to adequately support the needs of Black learners who use English as an additional language, and the LoLT for all subjects (Manyike & Lemmer, 2014).

When learners' home language differs from the LoLT, there are bound to be restrictions that challenge their competencies. Such challenges often result in poor academic performance by learners, as revealed in South Africa's results in national and international assessments such as TIMSS and PIRLS. Manyike and Lemmer (2014) assert that poor performance has been linked to language-related challenges. The scholars further assert that most learners whose home language is not the LoLT continue to face academic underachievement, as their home language education is primarily neglected by education authorities (Manyike & Lemmer, 2014).

Language reflects a learner's culture, identity, and power (Hugo, 2020; Saneka & de Witt, 2019). As Hugo (2020) notes, one's home language is closely linked to the concept of belonging. Children's home languages form the building blocks that help them connect with their families and integrate into their communities and the larger society (Hugo, 2020). Therefore, the very idea of imposing English on foundation phase learners can significantly undermine their cultural identities and experiences. Salie and Moletsane (2021) highlight that when children do not receive instruction in their mother tongue during the foundation phase, it can severely undermine their linguistic rights. Learning a "foreign" language can be particularly challenging, especially since learners often lack the same linguistic competencies (Saneka & de Witt, 2019).

Although national policies (DBE, 2011b, 2014; DoE, 2001) require teachers to address learners' individual needs, teachers' inability to speak all the official languages poses a challenge. Seifi (2014) proclaims that using learners' home language can enhance their understanding of the curriculum. This, however, is not the case in most schools in South Africa. The responsibility of selecting the LoLT in a school lies with the school governing body (SGB). Also, many parents prefer their children to learn in English to advance their futures. This preference imposes certain restrictions on learners as they struggle to grasp English, while also limiting their ability to express themselves in their home language.

The study reported on here demonstrated the impact of integrating multilingualism and multimodality within a diverse classroom setting. The findings revealed the dynamic ways in which third-grade plurilingual learners take charge of their learning and navigate their learning environments, as evidenced in the observed classroom interactions, accentuating the critical role of translanguaging in promoting understanding and engagement. The learners' use of their linguistic resources significantly enhanced meaning-making during an experiment in science education experiment. This scenario revealed how different languages can serve as a conduit for conveying and clarifying natural science-related concepts between teachers and learners, as well as among learners themselves. The learners' ability to fluidly transition between languages and communication modes to express their observations and understanding was highlighted. Mbirimi-Hungwe (2023) acknowledges this, noting that translanguaging among learners fosters meaning-making and a deeper understanding of the subject matter if they employ all the languages available to them. Through translanguaging, learners feel that their

home languages are being acknowledged when they are used to clarify and understand concepts and thus recognise the diverse linguistic practices they bring to the classroom (Mbirimi-Hungwe, 2023). This approach also demonstrates awareness and acceptance of cultural and linguistic practices in classrooms while preserving learners' autonomy and identities. Mbirimi-Hungwe (2023) agrees that translanguaging has been demonstrated to be a useful pedagogic strategy that considers both the learners' linguistic repertoires and their language practices.

This linguistic repertoire aligns with Vygotsky's (1978) sociocultural theory, which suggests that social interaction plays a fundamental role in children's cognitive development. The learners' interactions underpin how they use their social and linguistic resources to grasp scientific concepts. In this case, learners aided one another as MKOs within the zone of proximal development (ZPD), relying mainly on their peers (and the teacher) to bridge the language gap between their current and potential scientific knowledge and understanding. The interactions between languages and the use of nonverbal cues enabled a deeper understanding of the insect's physical features. Hence, translanguaging can be described and observed as a pedagogical approach that allows learners to (1) draw on all their linguistic resources to improve comprehension, (2) enable meaning-making, and (3) engage in shared participation and varied learning experiences during group discussions. Translanguaging supports not only language but also cognitive development in encouraging reflective thinking that fosters deeper conceptual understanding.

While insufficient proficiency in the language of instruction can impede understanding, the participants in this study adeptly demonstrated how using their varied linguistic capabilities could support others and promote active learning (see also Wei, 2022). The observed interactions among learners using isiZulu, Sesotho, Setswana, English, and gestures and embodied actions suggest that translanguaging facilitates academic understanding and problem-solving. This practice not only supports learners in recognising complex concepts but also demonstrates the effectiveness of translanguaging in establishing meaningful classroom interactions (Fang *et al.*, 2022).

Translanguaging incorporates learners' complete linguistic repertoires, enhancing both teaching and learning. By connecting with learners' cultural and linguistic identities, teachers can foster more effective and engaging educational experiences in foundation phase classrooms (Anderson, 2024). The study also highlighted the broader educational challenges in South Africa, particularly in terms of how language barriers affect performance in international assessments (Robertson & Graven, 2020). Teachers must therefore adapt their strategies to the diverse linguistic profiles of their learners, to ensure that all learners are included, can participate to their full potential, and succeed in their academic trajectories.

7. Recommendations

The research revealed the transformative impact of integrating both translanguaging and multimodal communication, fostering an inclusive and diverse learning environment in a multilingual foundation phase classroom. This integrated pedagogy can enhance learner interactions, enrich learning, and address their linguistic shortcomings. Teachers should permit this type of communication during learner interactions to foster a more responsive learning environment that is sensitive to multilingualism. Translanguaging and multimodal communication have the potential to promote educational change that embraces linguistic

diversity and enhances learning outcomes for plurilingual learners. Learners should be allowed to use their home languages alongside the LoLT to enhance their understanding and participation in the learning experience, thereby embracing diversity and inclusion.

The DBE should implement language policies that recognise and support multilingualism in foundation phase classrooms. These policies and practices should embrace linguistic diversity, rather than viewing it as an impediment to learning. Monolingual inclinations in learning environments, primarily in English-dominated classrooms, can suppress the potential of multilingual learners.

There is a need for transformative learning that incorporates translanguaging and multimodal communication to value learners' linguistic and cultural backgrounds. Translanguaging strategies should be integrated into the curriculum to provoke multimodal expressions of self and one's own knowledge. The DBE should also train teachers to implement these strategies in a multilingual classroom context, to maximise learners' linguistic resources. By empowering learners to draw on their full linguistic repertoire, teachers can facilitate deeper, more meaningful scientific engagement. It is also important to collaborate with the local community and parents to support language use at home and involve them in the transformative learning process. Future research should include the effectiveness of translanguaging and multimodal practices in different educational contexts to inform transformative teaching and learning practices in science education.

8. Conclusion

The study objective was to highlight how culturally and linguistically diverse learners draw on multiple communicative resources during science explorations of the *Living and Non-Living Things* topic. As the findings revealed, the use of linguistic resources by Grade 3 plurilingual learners in the foundation phase significantly enhanced their understanding and the sociocultural construction of knowledge. It supported their learning during their exploration of science education. The learners were able to intuitively and flawlessly use their linguistic repertoire to ask, discuss, and answer questions. They were able to speak in either isiZulu, Setswana, Sesotho, or a combination of isiZulu and Sesotho, and use gestures and embodied actions alongside English during their exploratory and experimental learning session.

Translanguaging can serve as a powerful strategy to (1) encourage learners' cognitive and linguistic development, (2) deepen their understanding, (3) support one another's learning, and (4) simultaneously embrace diversity and multilingualism. Therefore, the DBE and schools should recognise the value of translanguaging and transmodality in facilitating meaningful learning among learners, as demonstrated in the study reported here. The findings have significant implications for curriculum appraisal, policy and practice, and teacher training, particularly for implementation in pluri- and multilingual classroom contexts. The findings advocate a transformative shift in educational practices to recognise and utilise the full linguistic and cultural resources that foundation phase plurilingual learners bring to the classroom.

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