Inclusive Pedagogical Actions Grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 Township schools in Mohlakeng.

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This is a dissertation submitted at the University of the Witwatersrand in partial fulfilment of the requirements for the degree of Master of Education in Inclusive Education

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Dedication

I dedicate this master's degree to my late dad, Thabo Mokoena, who passed away while pursuing his master's. You have always wanted the best for me, and this achievement is a testament to that. I wish you were here to share this moment with me; nonetheless, you are forever in my heart. May your soul rest in peace.

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ABSTRACT

This study was conducted in Gauteng West, Mohlakeng township. The selected schools are primary schools where English is the language of learning and teaching (LoLT) from grade 4 onwards. In the lower grades, specifically the Foundation Phase (Grades 1-3), learners learn in their mother tongue. However, when learners begin the Intermediate Phase (Grades 4-6), throughout the rest of their schooling, subjects such as Natural Sciences (NS) are taught in English. Ideally, this phase requires learners to be proficient in English by grade 4 to succeed at school. NS is a key subject in South African schools designed to help learners develop a deeper understanding of the natural world. This subject has its own specialised language and vocabulary, and can sometimes be challenging for learners to understand the Natural Sciences concepts (NSc) effectively. This study aimed to explore the Inclusive Pedagogical Actions that Grade 7 NS teachers use to improve understanding of NSc in English as a First Additional Language for learners (EFAL). The objectives were to investigate inclusive teaching strategies employed by teachers in predominantly EFAL Senior Phase classrooms, assess ways in which teachers deal with the language gap in EFAL classes, and identify the challenges faced by Grade 7 NS teachers in Mohlakeng primary schools. The study adopted a qualitative research methodology, comprising of lesson observations and interview schedules of teachers as a method of collecting data. The findings revealed that teachers employ code-switching at various points in their teaching to bridge the language gap and ensure inclusivity in a diverse classroom. The study not only showcased a variety of teaching strategies used by teachers to facilitate NS learning and address language barriers, but it also identified a consistent teaching pattern followed by grade 7 educators. This shared teaching approach among the three teachers evolved into a 5-step pedagogical diagram that provides a structured method for teaching NS. This diagram highlights critical stages of instruction, emphasising the importance of ensuring learners' understanding of NSc. The results of this study are informative and offer valuable insights into teaching practices, the challenges faced by teachers, and the methods they employ.

Keywords: Inclusive Pedagogical Actions, Natural Sciences, Code-switching, and English Language

Acronyms and Abbreviations

The following are acronyms that have been used in this chapter.

1. **EFAL**	English First Additional Language
2. **EFA**	Education For All
3. **OBE**	Outcomes-Based Education
4. **NCS**	National Curriculum Statement
5. **CAPS**	Curriculum and Assessment Policy and Statement
6. **LoLT**	The language of teaching and learning
7. **FAL**	First Additional Language
8. **CALP**	Cognitive Academic Language Proficiency
9. **NSc**	Natural Sciences Concepts
10. **FET**	Further Education and Training
11. **NS**	Natural Sciences
12. **DBE**	Department of Education
13. **NECT**	National Education Collaboration Task
14. **SP**	Senior Phase
15. **PIRLS**	Progress in International Reading Literacy Study
16. **SASA**	South African Schools Act

CHAPTER 1

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

Inclusive Education refers to an educational approach that respects human rights and offers learners access to high-quality education in a learning environment where children feel accepted and included in their larger social network despite their differences (Nelis et al., 2023). Inclusive education emerged as a global movement over the past 30 years in response to the exclusion of learners who were perceived as different by the education system (Engelbrecht et al., 2015). This exclusion necessitated a need for an inclusive education movement, which was initially sought through various legal policies, such as the Education for All (EFA) initiative introduced in the '90s (nineties) by the international community. A policy is a systematic set of rules, laws or guidelines adopted by governments or organisations to direct actions and achieve particular objectives (Ainscow, 2005). According to Leijen et al. (2021), EFA ensured quality basic education for all learners regardless of their physical ability, religious status, and racial group. Quality education is a multidisciplinary concept that includes several aspects such as learning resources, technology, peer support, teaching methodology, and others (Batra et al (2023). Hence, South Africa implemented various policies, curricula, and educational reforms to address the inequalities and imbalances created by the apartheid government, which was mostly built on the foundation of racial segregation. These were policies such as Outcome-Based Education (OBE), the National Curriculum Statements (NCS), and the Curriculum and Assessment Policy Statement (CAPS) (Eyitayo, 2022). The adoption of the CAPS document was a crucial step towards accomplishing educational reforms, particularly in transitioning from resource-rich to resource-poor schools (Andrews et al., 2021).

There is no denying that inclusive education has caught attention from all over the world in the recent years. Walton and Engelbrecht (2022) argue that the 2030 Sustainable Development Goals of the United Nations (UN) intend to ensure that all people have access to high-quality, inclusive and equitable education. In South Africa, however, the pre-existing poverty and underdevelopment exacerbate the problem. Township schools are schools that are located in South Africa's townships. Townships are residential areas that were created under apartheid to house Black South Africans (Ndimande, 2016). As argued by Mampane (2020), township

schools face greater challenges due to their limited resources, which leads to inclusive education policies that are frequently not implemented successfully. These limitations usually make it difficult for teachers to deal with persistent behavioural and socioemotional issues, especially as teachers are generally ill-prepared for such circumstances (Mampane, 2020). Akabor and Pasha (2025) state that originally, inclusive education focused on learners who were previously excluded from mainstream schools, particularly learners with disabilities, but inclusive education has now developed into a broad-rights concept that includes everyone who might have been previously marginalised or excluded from the educational system within a country. This educational transformation in South Africa includes learners in township schools. Thus, an inclusive South African curriculum should be embedded with the principles and practices of social and environmental justice and should be cognisant of the complexities of how exclusion was and is still being created and maintained (Walton & Englebrecht, 2024). The CAPS curriculum is built on the values inspired by the democratic South African Constitution, which aims to heal former injustices and promote inclusivity within the educational context (Department of Basic Education (DBE), 2011). Consequently, the CAPS document provides effective guidelines and strategies for teachers to adopt in promoting inclusive education that accommodates the diverse nature of South African classrooms (DBE, 2011). Amongst the many distinct features diversifying the nature of learners in classrooms, language remains one of the significant issues, as there are 12 official languages in the South African context (Reagan, 2020). This introduces complex issues of learner diversity, as the language used for learning is normally English, which is often a First Additional Language (FAL) for most South African learners. Thus, learners must reach a high level of competence in the English language to comprehend the school subjects.

One of the key subjects of interest in this study is Natural Sciences (NS), which aims to give learners the chance to develop a deeper understanding of the natural world. When learners lack conceptual understanding of the subject at the Senior Phase (SP Grades 7-9), they risk struggling with science subjects in Further Education and Training (Grades 10-12) (DBE, 2011). For this reason, Mokala et al. (2025) stress that linguistic diversity has a place in society, and it therefore needs to be accommodated in classrooms as a crucial component of inclusive education. Consequently, the researcher examined the pedagogical methods teachers use to teach NS to Grade 7 learners for whom English is an additional language rather than their native tongue in Mohlakeng township. Pedagogy is concerned with the teaching processes. Teachers at all education levels must make sure that they implement their lesson plans, teaching methods,

and teaching resources in a way that will significantly advance learning (Kaphur, 2020). The goal of this study is to understand the challenges teachers face and evaluate how they address the language gap.

1.2 Background of Study

Children are inherently curious individuals, which makes science an ideal subject for them to learn new things and explore their surroundings since it is an experiential subject in nature (Raven & Wenner, 2023). Based on research that has been done internationally on science, Torff and Murphy (2020) reveal that teaching science to English learners is generally difficult. This is because of the cognitive demands of the subject and the unique science jargon that the learners need to know. The level of difficulty escalates with the higher grades, as they have a more demanding and rigorous curriculum. Therefore, science curriculum requires learners to have a more sophisticated academic literacy in the context of science conceptualisation, which implies that learners must grasp challenging science standards while acquiring the science language.

In South Africa, the content of NS has four strands of knowledge, namely Life and Living, Matter and Materials, Energy and Change, and Planet Earth and Beyond. According to Mofolo (2021), the fourth strand, Matter and Materials, is considered difficult to understand and grasp because of its abstract nature by most learners. For instance, a concept such as Biodiversity in the grade 7 NS curriculum is taught in a very broad sense and encompasses a variety of multidimensional topics. This makes it an abstract concept that is generally considered challenging for learners to perceive as compared to concrete concepts, which are normally improved through learners' personal experiences (Roehrig et al., 2021). Learners enter school with a variety of empirical beliefs about nature that have been formed through discussions with adults (parents or teachers) or mostly by their own experiences. Hence, a learner knowing about plants and animals from their everyday experiences corresponds to fragmentary or incomplete realities that lack the scientific knowledge of their surroundings (Petruţa, 2015).

In grade 7 (SP), teaching science can be exciting and rewarding using lesson plans that have been developed to guide and help teachers in their teaching when it comes to delivering content and skills a However, grade 7 is quite challenging to teach because learners usually struggle to put science skills into practice (Pius, 2019). This is because they are unable to recognise

connections between science concepts and real-life situations, making it difficult for them to apply scientific skills of inquiry to their lives. Furthermore, it is not only the application of science skills that makes it hard to teach grade 7 classes, but also the language gap, lack of resources in schools, time constraints, and internal and external contextual factors like individual learner background (Pius, 2019).

One of the ideas underlying the NCS Grades R-12 is the principle of human rights, inclusivity, environmentalism, and an equitable society (Eyitayo, 2022). The policy specifies how the objective of instruction in NS is to help learners construct a framework of knowledge to assist them in making hyperlinks so that school science can be relevant to their everyday activities (Isaacs & Olvitt, 2016). Nonetheless, learners continue to face language-related challenges where a vast majority of South African learners speak English as a first additional language, yet are taught a wide range of school subjects using English as if it were their mother tongue. Learners are required to grasp what must be learnt in these subjects even if they encounter challenges while switching from mother tongue instructions to English-based instructions (Mamabolo, 2021).

Researchers such as Krajcik and Czerniak (2018), Msimanga et al. (2017), and Windschitl et al. (2020) alluded to the fact that science teaching has three language challenges, namely, home language, instructional language, and science language. The complex division of language into these three different aspects of use introduces a disconnection issue in communication, which affects the comprehension of science content knowledge. Moreover, learners arrive at school with informal ways of communicating which are learnt from their everyday experiences. This places teachers in a position necessitating them to transition learners from informal spoken and written language to formal language (Mamabolo, 2021). As noted by Saleem et al. (2021), learners carry social and cultural factors from their environment into the classroom, which could lead to a schism between what they are taught and what they learn. To correct the misconceptions that learners have about science, teachers must be knowledgeable, patient, and able to connect what learners learn in science classes to what they already know. There must be pedagogically sound approaches in teaching science to English First Additional Language (EFAL) learners. This needs to be done in a manner that meets high standards, fostering the development of academic literacy and critical thinking skills, which includes a variety of inquiry and experimentation methods that are carefully designed and connected to fundamental knowledge skills (Makgabo & Modise, 2020). In a nutshell, teachers

should teach NS to learners in ways that will allow the inclusivity of all learners, despite their underlying capacity or incapacity to learn science arising from the language barrier.

In South African primary school classes, the SP (Grades 7-9), in particular, all learners are required to take the NS subject. The CAPS document challenges teachers to come up with teaching strategies that will support all learners despite their capacity to learn science through planning and sequencing of science concepts (Mamabolo, 2021). However, this is not effectively implemented due to insufficient in-service training on the CAPS curriculum for teachers. As a result, teachers prioritise finishing the curriculum over ensuring that learners understand the taught content (Mdaka et al., 2019). Given the known language struggles, inclusive measures need to be in place. Literature shows that reading, writing activities, and talking about science are examples of pedagogical strategies or practices that can be used in science classrooms. Studies such as Makoni (2016) show that the use of two instructional languages (a mixed language method) can help first-language English speakers overcome difficulties when learning a language that is not their mother tongue. Even with this, research studies such as Van Laere et al. (2014), indicate that science learning is a challenge, especially for learners whose first exposure to English begins in the intermediate phase. In this phase, there are expectations of covering the curriculum and expectations of learners to master academic literacy regardless of their diverse cultural backgrounds and different socialisations. Thus, this research aims to find pedagogical actions shown by teachers in grade 7 NS classes that promote understanding of scientific concepts.

1.3 Problem Statement

This research is motivated by my experience as a senior phase natural sciences educator, where I have encountered challenges related to language in the classroom. Scientific language is often regarded as challenging due to its technical, authoritative, and impersonal nature, which can make it difficult for both learners and teachers to fully comprehend (Msipha & Mavuru, 2017). While some of my Grade 7 learners demonstrate acceptable understanding of English, the majority show low proficiency, yet both groups struggle to grasp key nsc. Without acquiring the targeted language of instruction effectively, it becomes difficult for learners to process the meanings of the content they are required to engage with, making language a significant barrier to inclusive education in South Africa (Cele, 2021).

In the professional domain, this research is crucial in the field of inclusive education as it explores how language barriers impact learners who are not first-language English speakers, particularly in understanding natural sciences. The subject of natural sciences is inherently learner-centred, requiring learners to engage in activities such as investigating, problem-solving, asking questions, and making discoveries (Mabitla, 2020; Ginting, 2021). However, in EFAL classrooms, this approach becomes challenging due to language barriers. By investigating the strategies that teachers use to bridge the language gap, this research aims to identify effective methods that enhance learners' comprehension of science content and contribute to meaningful transformation in South Africa's education system.

Theoretically, the challenge can be explained through the lens of Cognitive Academic Language Proficiency (CALP), which takes approximately seven years to develop (Evans & Nthulana, 2018). CALP refers to the specialised academic language needed for success in cognitively demanding subjects (Bitenelkome, 2010). Many learners struggle with English because they have not fully developed CALP in their native language, yet are expected to meet academic goals in a different language. Vygotsky's theory on language and scientific concepts highlights the difficulty of learning science through a second language, emphasising the difference between everyday language and the formal language of science (Vygotsky, 2012; Kubli, 2005). While this challenge applies across subjects, this study focuses specifically on natural sciences.

1.4 Research Objectives

1. To get an understanding of the challenges, teachers are faced with in Mohlakeng primary schools, in grade 7 NS classes.
2. To assess ways in which teachers deal with the language gap for learners who use English as their first additional language in grade 7 NS classes.
3. To investigate Pedagogical Actions used by teachers to ensure understanding of NS concepts when teaching NS in predominantly EFAL classes in the Senior Phase.

1.5 Research Questions

The main research question guiding this research report is:

What Inclusive pedagogical actions do Grade 7 Natural Sciences teachers use to improve the understanding of Natural Sciences concepts in English First Additional Language learners, in three township schools in Mohlakeng?

The following sub-questions are proposed in a manner covering aspects leading to answering the main question.

1.6 Sub-Questions:

1. How is the English language a challenge when teaching Natural Sciences to Grade 7 learners?
2. What other challenges do teachers experience that specifically hinder the effective learning of Natural Sciences concepts for Grade 7 learners?
3. In what ways do contextual factors (resources, overcrowding) influence the teaching of Natural sciences for Grade 7 learners?

1.7 Purpose Statement

This research aims to identify the pedagogical strategies employed by NS teachers in the SP to improve EFAL learners' understanding of scientific concepts in three (3) schools in Mohlakeng. Specifically, it explores how teachers address language barriers to ensure that EFAL learners can effectively comprehend the NS curriculum as outlined in the CAPS document. Moreover, ‘teaching methods contribute to learner academic performance in the science subject’ (Netshivhumbe & Mudau, 2021, p.300). When teachers use methods of teaching that make subject matter concepts comprehensible while fostering the development of learners’ Language of Learning and Teaching (LoLT), it enhances both teaching effectiveness and learners' ability to grasp content and language simultaneously (Bouzghaia & Bettiche, 2024). There is limited research on the pedagogical strategies teachers use to teach NSc to Grade 7 EFAL learners. This is significant, as these learners are taught in English as an additional language from the Intermediate Phase (IP) through to the SP, yet language remains a persistent barrier to learning.

1.8 Preliminary Literature Overview and Methodological Note

While several studies have shown that learning English can be a challenge when it comes to natural sciences ideas, particularly in multilingual South African classrooms (Mavuru & Ramnarain, 2020), Makalela (2015) suggests translanguaging as a way to support bilingual learners in using their native language. Despite this, Fleisch et al. (2017) refer to the crisis in South African primary education. Their study examines spelling errors made by EFAL grade 4 learners and demonstrates how these errors often represent a misunderstanding between the phonological structures of English and the learners' home language. This then exposes the underlying language transfer issues, which may also impact EFAL learners in science, especially when they are having trouble understanding scientific terminology. This study aims to address the pedagogical methods used by teachers to improve the understanding of science concepts in EFAL learners in grade 7. The study adopts a qualitative research approach to explore how grade NS teachers in township schools support learners for whom English is an additional language. The data is collected using classroom observations and semi-structured teacher interviews. These methods of data collection have allowed the researcher to gain rich, contextual insights into the teachers' experiences and teaching strategies. Participants are three grade 7 NS teachers working in township schools in Mohlakeng. Data was analysed using thematic analysis to help identify patterns, challenges and pedagogical strategies used in EFAL classes.

1.9 Rationale

Msipha and Mavuru (2017) state that secondary school learners in South Africa struggle academically in science subjects, partly due to the language of instruction. Recent research has also shown that the complexity of scientific language contributes to this challenge (Semeon & Mutekwe, 2021). To address this, teachers must engage learners in rigorous, authentic scientific investigations. Effective instruction in the NS requires teachers to have a strong understanding of scientific inquiry and be able to present content in ways that are appropriate for different topics and learner groups, especially for those with limited proficiency in English (Pius, 2019). This study aims to investigate the pedagogical methods used by teachers to teach NS to Grade 7 learners for whom English is an additional language rather than their mother tongue. Investigating these pedagogical methods can shed light on how to address language-related challenges in science education. Direct input from teachers will offer a deeper understanding of how they navigate teaching complex scientific concepts to learners with limited English proficiency.

Academic science researchers have made significant progress in identifying key issues in teaching science at a primary school level, particularly for EFAL learners who have little to no knowledge about specific academic literacy to access the curriculum. However, further research is required to fully elucidate different pedagogical and intervention strategies for overcoming language barriers in SP. Grade 7 teachers who have successfully implemented strategies to address these challenges should share their approaches so that others can adopt and apply them, to have successive generations of high performance in NS in the SP. This study will add to the baseline data that is available for perusal concerning understanding the issues of learners having English as their second language in science classes.

1.10 Significance of the study

This study aims to shed light on how science teachers in township schools facilitate the understanding of NS in EFAL classrooms. It explores how teachers address the challenge of teaching learners for whom English is not the mother tongue, providing new perspectives and insights that may help contribute towards resolving this issue. The findings and recommendations from this study can benefit not only science teachers but also teachers of other subjects, by highlighting the challenges science teachers face when delivering lessons. According to Pius (2019), most studies on science teaching in South Africa focus on secondary schools, with fewer addressing primary schools, particularly Grade 7 as an exit grade in primary school. This gap underscores the significance of this study, and this research will serve as a valuable resource for future researchers interested in exploring teachers' experiences of teaching NS to EFAL learners in Grade 7 classrooms.

1.11 Delimitations of the study

Although this research provides valuable insights, it is based on a small sample of only three teachers from Mohlakeng primary schools in Gauteng West. As such, the findings cannot be generalised to the broader population of teachers in the region. Furthermore, while these teachers are located within the same area, they come from different environments, which may influence the results. Personal biases could potentially impact the findings, as the teachers may have varying commitments and attitudes toward teaching science.

1.12 Conclusion

Chapter 1 highlights that the government has made significant efforts to establish structures that promote inclusivity in the classroom. However, successful implementation of inclusivity requires more than just these structures; it demands strategies to address language barriers. English, as the LoLT in most schools, presents challenges for educators, because many learners lack a strong command of the language. Teaching science becomes even more difficult when learners have limited English proficiency, as science involves complex concepts, the organisation of knowledge around these concepts, and the use of teaching strategies that empower learners to take control of their learning (Mabitla, 2020). A solid foundation in the language of instruction is essential for making teaching and learning more effective for both teachers and learners. Chapter 2 of this research study reviews existing literature on science, science teaching, language, and pedagogical strategies. Drawing on Vygotsky's Learning Theory, the study highlights the interconnectedness between everyday and scientific concepts, demonstrating how both can be employed to explain the processes by which learners acquire knowledge. Chapter 3 provides a detailed, step-by-step account of the processes followed when collecting data, covering the research design, research sampling and data collection instruments. In Chapter 4, the collected data is analysed using thematic and coding procedures. Chapter 5 presents results and a discussion, while the final chapter, Chapter 6 addresses the research questions, presents the major findings of this study, and also discusses the recommendations and limitations.

CHAPTER 2

REVIEW OF THE LITERATURE AND THEORETICAL FRAMING OF THE STUDY

2.1 Introduction

It is a well-known fact that learners generally struggle with science, as it is an abstract subject with demands of higher-order thinking (Hassan et al., 2020). As such, the environment of learning created by the teacher should be a conducive space for learners to critically engage with the teacher in understanding the taught content. It is for this reason that science teachers have a responsibility to use teaching methods requiring active participation of learners by engaging them with questions, solving complex problems, and reconstructing their thinking (Freeman et al.,2014). The language of instruction becomes a powerful tool for teaching in science classrooms as it facilitates engagements and discussions necessary for assisting learners in understanding content knowledge. Hence, the English language barrier is a stumbling block for most Senior Phase (SP) learners in townships, as they are not well-versed in the language, making it difficult for them to acquire Natural Sciences concepts (NSc) (Mabitla, 2020).

In attempting to understand what inclusive pedagogical actions Grade 7 Natural Sciences (NS) teachers use to improve understanding of NSc in EFAL learners. The chapter will provide a background of how language works within learning and discuss constructivism in view of language and learning. Finally, conclude with a focus on the barrier of language specifically within NS. This literature review takes a narrative approach, referencing academic research from both local and international scholarly work that examines the relationship between language, science, and inclusivity. Through focused searches on platforms like Google Scholar, Scopus, and the South African Journal of Childhood Education (SAJCE), sources were found using keywords such as ‘EFAL’, Natural Sciences’, Inclusive Pedagogy, Township Schools’ and so on. This approach made it possible to have a comprehensive understanding of how language influences science learning, particularly in multilingual and under-resourced contexts.

2.2 Language as a barrier to learning

Language is a tool for thought and communication, and when used effectively, it can empower learners to acquire knowledge, interact with others, and express their ideas (DBE, 2011). Home Language (HL) is a mother tongue language that a child has acquired from family interaction; it reflects a child's basic interpersonal communication skills (Cummins, 2000). The First Additional Language (FAL), according to the CAPS document, is a language that a child does not necessarily know when they arrive at school. The CAPS document makes specific mention that by the time learners enter their Senior Phase (grades 7-9), they should be moderately competent in both interpersonal and cognitive academic ability in their FAL (DBE, 2011). This, however, is not the case. Roux et al. (2023) state that various national and international large-scale literacy assessments in the past decade have consistently painted a bleak image of literacy achievement in South African schools. Furthermore, even a second test that was taken in the Progress in International Reading Literacy (PIRLS) in the year 2011 shows low literacy levels as opposed to other countries that were participating (Roux et al.,2023). In recent studies, the PIRLS assessment taken in 2021 reveals low performance levels in learners' reading ability for meaning in South Africa (DBE, 2023). This indicates that, even after the fourth cycle of South Africa's participation, there has not been an improvement in literacy achievement.

In support of this, Fleisch et al. (2017) carried out a large-scale comprehensive investigation with more than 2,000 Grade 4 EFAL learners. They found widespread spelling errors in basic monosyllabic English words, such as vowel substitutions or incorrect application of phonological rules from the home language. This suggests foundational gaps in phoneme-grapheme awareness. Furthermore, these findings imply that learners struggle to internalise English sound-letter relationships due to first language interference, which has implications not only for literacy but also for understanding subject-specific vocabulary in content areas like natural sciences. If learners are unable to decode even basic English words accurately, they are likely to struggle even more with technical scientific terminology (Spaul & Pretorius, 2013).

Deehan et al. (2024) point out that learning science is challenging because of its own jargon that differs from the language that is used daily. This can be concurred on the basis that studying science requires more than just an understanding of scientific principles; it requires both technical and non-technical language comprehension. The current study adopts the stance that language is crucial for learners' comprehension of scientific ideas. Using a second language in

the classroom is one of the things that Sam (2024) claims causes learners in developing countries to perform poorly in science classes. Globally, the issue of language in education is controversial, especially in the South African context, where the educational system requires learners to transfer to English even if it is not their first language.

Unlike learning other subjects, acquiring a second language is a social process that involves assimilating elements of a foreign culture. This, in turn, has an impact on one's sense of self and learner performance (Pavlenko, 2002). Research indicates that commencing fourth grade with a shift from HL to English as the Language of Learning and Teaching (LoLT) has a significant impact on learner performance. This presents substantial challenges for learners as well as educators (Deehan et al., 2024). When learners get to Grade 7, as it is the start of SP schooling, they face the same challenge of using a language they are not familiar with as a LoLT (Makgabo & Modise, 2020). This means that learners require explicit teaching in the LoLT to gain competency.

2.3 Multilingual Approaches to EFAL Learning

Recent South African research, such as Mthethwa and Thobakgale (2020), has emphasised the significance of identifying the learners' full linguistic abilities in the classroom where English is not the primary language. Furthermore, Makalela (2015) introduces the concept of 'Ubuntu Translanguaging' as a multilingual method that enables learners to switch between their native tongue and English with ease in order to make meanings, particularly in cognitively difficult subject matter. The idea of translanguaging describes how speakers of two or more languages use their extensive linguistic range to communicate in various settings (Anwaruddin, 2018). This is especially important in township schools, where learners spend the first six years of their lives immersed in a variety of dynamically linked languages (Makalela, 2015). Setati (2008) contends that learners' native languages are frequently marginalised by English's predominance as the LoLT, which hinders understanding and engagement.

Translanguaging, as opposed to code-switching, is a process of creating meaning and sense. According to Wei (2018), the emphasis is on how language users use various linguistic, cognitive, and semiotic resources to create meaning and make sense. Conversely, code-switching describes the switching between languages within a conversation or a sentence (Rehman et al., 2020). Translanguaging as a pedagogical approach supports a variety of interlingual and intercultural methods that teachers and bi/multilingual learners employ to

actively engage in a range of epistemic activities, as suggested by Maseko and Mkhize (2021). Furthermore, a qualitative study by Maseko and Mkhize (2021) examines how a Grade 3 teacher and learners in a township primary school in South Africa used both isiZulu and English during reading lessons. The authors demonstrate how translanguaging supported comprehension and engagement by allowing learners to apply their own linguistic and cultural resources through observations and interviews conducted in the classroom. Their study also identifies conflicts between the schools and the monolingual English policies and translanguaging practices of teachers. García & Wei (2014) contend that beyond mere code-switching, translanguaging promotes equality and meaning-making and enables learners to express complex ideas using the entirety of their linguistic resources.

2.4 Challenges with more abstract concepts

The main way that abstract ideas are represented is through metaphorical mappings to concrete ideas, making them more challenging to learn and understand (Löhr, 2021). Ultimately, this research aims to get into the gist of how teachers work their way around teaching abstract science concepts to EFAL learners. Mountstevens (2021) argues that concrete concepts are frequently related to prior knowledge. The connection between concrete concepts and prior knowledge can help learners' understanding and remembering of these concepts. Within NS, there are several abstract concepts that learners need to understand, and with the additional barrier of being weak at the LoLT. Teachers face a real challenge in determining effective pedagogical actions (Condy & Blease, 2014). This places a great deal of responsibility on teachers to accomplish their roles as stipulated in the CAPS document because teaching and learning NSc require both theoretical and practical knowledge from teachers (Netshivhumbe & Mudau, 2021).

2.5 Natural Sciences (NS)

NS as a subject is an essential component of the CAPS curriculum. According to the CAPS document, it is a subject that systematically looks for explanations and connects ideas of our natural world (DBE, 2011). It uses methods such as formulating hypotheses, experimenting, and doing tests to discover principles and facts of our natural world. Once learners engage with the content and the material, they gain certain skills, such as access to knowledge, recalling information, measuring, and classifying (DBE, 2011). To support teaching and learning for

comprehension, science education is centred on learning experiences. Thus, teaching in science classrooms must allow pupils to acquire the information and abilities that will strengthen their comprehension of how humans interact with their physical environment to meet their needs (Markula & Aksela, 2022). The CAPS document emphasises that, in all NS grades, a significant amount of time needs to be allocated to doing practical tasks and carrying out investigations. This forms an integral part of the teaching and learning process. All this time spent on the NS subject is to 'build a framework of knowledge for learners and to help them make connections between ideas and concepts in their minds' (DBE, 2011, p.11).

Having said that, Deehan et al. (2024) affirm that science subjects are specific in their vocabulary, and learners can find it quite difficult to learn. While some words can be familiar and easier to use and remember, other words are science-specific and may be difficult to spell and define. The academic language of science is distinct and has its own structure and meanings. This means that with each word that exists in science, there is a meaning that might be a common stumbling block for learners (Deehan et al., 2024). Moreover, NS uses terms that are similar to normal language. However, they have distinct meanings and uses because of knowledge hierarchies, structures, and classifications, as science concepts can be viewed at microscopic, macroscopic, and symbolic levels. Consequently, learners frequently struggle to understand these abstract ideas, which results in the development of misconceptions and skewed scientific ideas (Rahmawati et al., 2022). This is because the concepts are not appropriately connected to the learners' real-world experiences (Harefa, 2024). The speed at which science concepts are introduced is equally pivotal because of the sheer vocabulary load of the subject, especially for learners who are still learning English or have little English understanding (Walters et al, 2016). This is the gap that this study aims to investigate, which speaks to teachers' actions that make learning easier, even with the language barrier as a stumbling block to inclusive education.

2.6 Inclusive Education in EFAL and Science Teaching in Township Schools

According to Lebona (2015), teachers at township schools frequently struggle to meet the needs of diverse learners in overcrowded, under-resourced classrooms, particularly when teaching natural sciences. While some teachers attempt to modify their teaching by using enlarged texts, tactile aids, or modified pacing, many report feeling unprepared to handle the variety of

learning challenges that exist, especially those related to language. In inclusive science education, language is still crucial, particularly in EFAL contexts where learners must understand complex academic terminology and extensive academic texts (Lebona, 2015). Science literature comprehension, according to Arends and Fonseca (2024), goes beyond simple decoding and demands for comprehensive vocabulary, prior knowledge, the capacity for logical deduction, and familiarity with expository writing norms. In multilingual classrooms, when the majority of the learners do not speak English as their first language, these expectations are heightened. Stott and Beelders (2019) similarly find that the township learners' comprehension of scientific concepts is severely hampered by poor reading comprehension in EFAL. This suggests, according to Stott and Beelders (2019), that linguistic access is a significant obstacle to subject mastery. Nevertheless, inclusive strategies can lessen this challenge. Stears (2008) shows how scientific knowledge becomes far more pertinent and accessible when it is linked to the learners' social and cultural realities, which improves learning and engagement. Subsequently, Malebese (2017) proposes an EFAL model that is socially inclusive, actively opposes colonial language hierarchies, and integrates indigenous knowledge.

2.7 Pedagogy

'Pedagogy' refers to the art or science of teaching children (Shar & Campus, 2021). Etymologically, the word 'pedagogy' originates from the Greek *pais* (child) and 'agogus' (leader), meaning 'leader of children'. While the concept is not recent, the term 'pedagogy' became a major focus in the 20th century, and over time, it became synonymous with teaching (Shah & Campus, 2021). This reinforced the idea that pedagogy is primarily concerned with children's education. Pedagogical actions, therefore, refer to different teaching and learning methods that help learners fulfil their learning process (Tobón et al., 2021). Teachers are the ones who execute these actions. This includes lesson planning, teaching, having learning resources, helping learners solve problems, and learning assessment (Tobón et al., 2021). Friesen and Su (2023) argue that pedagogy is part of our everyday experience and corresponds with modes of responding, reflecting, and acting. As such, it is a way this world is 'presented' to children.

2.7.1 Pedagogical Actions

Teaching NS requires effective teaching methods and approaches, as already mentioned that this subject is complex (Deehan et al., 2024). There are several abstract concepts that learners need to understand in NS. With the additional barrier of LoLT, teachers face a real challenge in determining effective pedagogical actions appropriate for transforming content knowledge (Mabitla, 2020). Language and content instruction must be meaningfully integrated while teaching NS (Harefa, 2024). Additionally, Sancheti (2024) concluded that science teachers need to be conversant not only with the language used to construct science content but also with the cultural practices and modes of knowledge that various student groups espouse. To date, there has been little research detailing teachers' teaching practices regarding the teaching of science content to EFAL learners. However, some methods have been used by science teachers for the successful integration of language and content teaching. These methods include approaches that commit to geared learning towards learners, hands-on, inquiry-based instruction, and academic language literacy development (Shivolo & Mokiwa, 2024). Thus, allowing English learners language-pertinent access to science knowledge while simultaneously fostering scientific discourse and English language proficiency. Newton et al. (2018) explain that scientific inquiry, such as allowing learning to understand and explore science, starts when a teacher poses a question or a problem-solving exercise that is meant to pique the interest of learners while simultaneously guiding their scientific thinking. They also suggest that encouraging learners to ask their own questions is vital from a pedagogical standpoint, necessitating a classroom setting that encourages experimentation and cognitive thinking.

Several concrete teaching strategies have been identified as essential to this approach. One key strategy involves presenting science content through various channels and graphical formats. Graphical formats may include videos. Valencia et al. (2023) discovered that by encouraging both interactive teamwork and independent participation, multimedia and video-based teaching can greatly enhance learner outcomes in scientific subjects. Moreover, a key strategy includes an ongoing and deliberate adaptation of oral classroom discourse to ensure comprehension of learners at varying proficiency levels (Quigley, 2021). However, Ntuli et al. (2022) argue that many NS teachers use old and outdated methods of teaching that promote memorisation of NSc, which is certainly not effective. They suggest that there should be a use of teaching methods that are learner-centred and require active participation from the learner's side (Ntuli, 2022). Despite the identification of these methods in literature, there is still a lack of research

to suggest that they are being done, or being done effectively, within classrooms; thus, the gap the research aims to fill.

2.7.2 Current Pedagogical Actions

Carrier (2013) observed that the majority of science teachers employ traditional teaching methods to teach science. Traditional teaching methods, according to Kazeni and Maleka (2020), frequently start with teachers introducing the science vocabulary to learners and assigning tasks like writing words down or looking for the definitions from a dictionary. To foster comprehension, science teachers must integrate language and science content, particularly when the medium of instruction is not the learners' home languages (Swart et al., 2024). Seladi (2024) detests the traditional teaching methods and proposes problem-solving activities, discussions, and collaborative projects as an effective way for teachers to start a lesson. These strategies pique interest and activate prior knowledge. Such introductions foster deeper inquiry and active participation in science classes by setting the tone that assists learners in making connections between prior knowledge and new scientific content. King (2018) implemented a participatory action research programme using visuals such as diagrams and interactive models to teach life sciences terminology to English-second-language learners in South Africa. The visual aids help language-challenged learners understand technical vocabulary by correlating abstract concepts to concrete or common examples. Yoon et al. (2021) illustrate how visual aids like diagrams can be used in the classroom as effective and social tools. According to their research, visual aids in science classes help learners learn more by expanding their knowledge and meaning-making.

For learners to be interested in science, they need to be able to read academic language. In being able to read, they will be able to carry out investigations, do activities, and hold discussions (Yore, Bisanz & Hand, 2003). It then becomes crucial for teachers to decode scientific claims and terminology for learners to understand science (Kazeni & Maleka, 2020). Likewise, Probyn (2006) found that Grade 8 science teachers in Eastern Cape township schools generally adhered to an English-only policy, even when both teachers and learners shared the same home language. This indicates that teachers view English as an essential academic and professional gateway and actively discourage home-language use. While some teachers speak English only, some senior phase teachers that Seabela and Ncanywa (2024) document in South Africa intentionally use code-switching between English and the learners' home language as a

pedagogical tool to enhance comprehension of the subject knowledge. By providing definitions or certain content in both languages, teachers can scaffold complex scientific or even mathematical ideas, promoting learner engagement or cognitive access.

Rose and Van Dulm's (2006) study emphasises the intentional use of code-switching by teachers in multilingual South African classrooms. They discovered that strategic switches help clarify subject content, encourage learner participation, aid classroom management, and even serve social functions that build cultural rapport. These functions align well with inclusive teaching approaches in EFAL science classrooms, where teachers often mediate between home languages and English to make abstract scientific concepts accessible and engaging. Although teachers frequently use code-switching during lessons for academic, managerial, or social reasons (Temesgan & Hailu, 2022), different types of code-switching can occur. Primarily, inter-sentential code-switching involves switching languages either at the beginning or end of a sentence (Esen, 2019). Intra-sentential code-switching occurs when the switch happens in the middle of a sentence without any interruptions or pauses indicating a change. Lastly, extra-sentential or tag switching involves switching a word or phrase from one language to another without altering the sentence structure (Esen, 2019).

Kazeni and Maleka (2020) observed that teacher-centred methods like explanations, Q&A sessions, writing on the board, using dictionaries, demonstrations, and practical examples do not explicitly target the development of scientific language during science instruction. Although these approaches may seem effective initially, they often encourage memorisation instead of fostering a meaningful understanding of science concepts. Conversely, some researchers contend that strategically incorporating examples can actually improve science learning. For example, Aubusson and Fogwill (2006) point out that when examples are contextualised and interactive, such as through role-plays or real-life scenarios, they can promote deeper understanding and greater student engagement. This indicates that while teacher demonstrations alone might not build scientific language skills, carefully selected and student-centred examples remain essential for enhancing comprehension and participation.

2.8 Theoretical Framework

The theoretical framework underpinning this study focuses on Vygotsky's Learning Theory. This extends to Vygotsky's Constructivism, including everyday and scientific concepts. Everyday concepts refer to those learnt through the daily experiences of a learner. The

acquisition of these concepts is unintentional, stemming from interactions with primary carers (Farrugia, 2021). Scientific concepts are systematic and learnt with intent (Farrugia, 2021). In this study, Vygotsky's theory of learning is employed to explain how learners acquire knowledge, which is vital for this research when examining the pedagogical actions teachers take to promote learning in NSc. It is also crucial to understand how teachers build on the prior knowledge that learners bring to class. This relates to the Zone of Proximal Development (ZPD), which considers what a learner can achieve independently compared to what they can accomplish with the help of a more knowledgeable other (Vygotsky, 1986). Additionally, this concept is significant for this study, as it provides insight into how teachers enhance learners' knowledge to support their understanding of NSc through the use of LoLT.

Secondly, Vygotsky's constructivist theory was used to explain what informs the learners' prior knowledge and why they come to a formal setting like a school with different ideologies (Farrugia, 2021). This is a crucial theory that was important in this research, as it underpins that even during science lessons, learners have already created their own meanings of the science concepts that are introduced in the lesson. How learners have been assimilated affects how they receive information, which is why the teachers' pedagogical choices in a science classroom were essential to help learners create new meanings despite their individual experiences. Lastly, the use of Vygotsky's everyday and abstract concepts allowed me to examine the pedagogical actions of teachers when teaching abstract concepts, which is the objective of this research. The general understanding of NSc from everyday experiences was not the focus of the study. However, the study focused on NSc in the context of school knowledge, which means a formal scientific understanding of the concepts. I will now discuss these theories in detail below.

2.8.1 Lev Vygotsky's Learning Theory

The constructivist theory holds that learning begins when learners build new understandings using what they already know. The learners' prior knowledge affects their acquisition of new knowledge (Pathan et al., 2018). Secondly, constructivists concur that learning is more active than passive, and when it is active, learners negotiate their understanding in light of what they encounter in a new learning environment. According to Erbil (2020), Vygotsky explained that learning occurs through interactions with more knowledgeable individuals, a concept known as ZPD, which will be discussed in further detail later. Subsequently, learning is viewed as a

constructive process in which the learner creates an internal representation of facts and a unique interpretation of their meaning. The process of learning is, therefore, active, and when it is active, comprehension and assimilation of the meanings take place (Daodu et al., 2024). This assertion of learning is significant to understand in this study. This is because when children come to school, they have incorrect conceptions formed from generalisations and interactions from their everyday experiences (Daodu et al., 2024). The tools and the teaching methods that will be selected by the teacher during science lessons are important for the formation and development of NSc. The development of NSc plays a critical role in dismissing learners' everyday knowledge regarding scientific concepts. For example, learners may hold ideas such as believing that seeing an owl in daylight means bad luck. Consequently, accurate science concepts help correct such wrong ideas or conceptions about scientific concepts.

Moreover, Akpan et al. (2020) note that Vygotsky asserts the need for social interaction, as it improves language carried out for communicative purposes. For instance, social interaction can happen in the classroom during teaching, where learners get an opportunity to collaborate with the teacher or their peers. The teacher might choose a learning method such as cooperative learning, whereby learners are arranged in small groups to cooperatively work on a task while helping each other learn. In this learning method, the teacher would then assess the learners individually and as a group to check for things like individual accountability and group skills of working as a team (Akpan et al., 2020). To add to this, language plays two crucial roles in the formation of cognition. Firstly, it helps adults (teachers, parents) impart knowledge to their students. Secondly, language is a tool that constitutes the child's cognitive harmony. For children to move from basic to upper-level skills, such as competency in language, problem-solving, and moral reasoning. They would need to interact with peers and teachers in their social environment (Erbil, 2020).

According to Erbil (2020), ZPD is one of Vygotsky's most important theories, defined as a zone where learning takes place when a learner interacts with a more knowledgeable other in understanding content subject matter. This happens in the classroom, where learners learn best when others are involved, under adult guidance or in collaboration with more capable peers (Powell & Kalina, 2009). For learners to improve their learning or even learn a new subject altogether, they will need to get into social interactions with peers who are more competent and knowledgeable than they are. The learners' movement through ZPD would be depicted by

the transition from social to individual to mirror the broader social origins of higher mental functions (Vygotsky, 1986).

This alludes to the importance of cultural tools like language and writing in this regard. Similarly, the teachers act as a scaffold, helping learners build on their prior knowledge. To foster a learning process, teachers provide lesson activities that are beyond the learners' level of what they can do alone (McLeod, 2024). Under this research, ZPD will be an important aspect of the teaching strategies that teachers choose during their lessons to make learners active participants in their learning process. According to Buthelezi (2024), teachers must ensure that their teaching approaches involve pupils because pupils learn better when they are actively involved in the subject matter being taught. Understanding how learners learn is crucial since it aids in the selection of the appropriate teaching approaches for them and assists them in reaching their ZPD.

2.8.2 Constructivism

Constructivism is a theory that focuses on how learners learn and the thinking process rather than having learners memorise and recall information (Nurhuda et al., 2023). Wibowo et al. (2025) make an inference that learning is a way for people to create meaning from their experiences. The conception of constructivism, from Vygotsky's perspective, is that learners build their own meaning from being and do not necessarily flaccidly receive what they are taught in their learning environment. Knowledge that already exists cannot be transferred, but through imparting knowledge, learners can build their own knowledge. Furthermore, the teacher's role would be to provide information and allow learners to develop their learning (Wibowo et al., 2025). According to Erbil (2020), constructivism has a strong impact on the modern teaching and learning process; this is because the teacher can be flexible and construct lessons that can incorporate ongoing experiences in the classroom. Hence, ensuring that the learning environment is democratic, with interactive activities that are learner-centred (Daodu et al., 2024).

Lev Vygotsky was a constructivist who developed a theory of cognitive development. He focused on the social, cultural, and historical artefacts that play a significant role in children's cognitive development (Vygotsky, 1978). Any function in a child's cultural development happens in two stages. First, it takes place on a social level, and then it moves to a psychological

level. Initially, learning occurs between people (inter-psychological), and later, it happens within the child (intra-psychological). On the social level, a child learns with the help of a parent, mentor, or teacher. Over time, they become independent (Pathan et al., 2018). Vygotsky places a lot more emphasis on the role of language in cognitive development. Language is the most privileged cultural artefact. It is a semiotic tool that mediates the higher mental functions of learning (Shah, 2022). Cognitive development results from an internalisation of language. Eventually, through the interaction within the child's sociocultural environment, cognitive development occurs, which is important in children being curious and actively involved in their learning (McLeod, 2024). Vygotsky further argues that children then go on to learn to carry out simple cognitive activities, such as basic perceptions without intent (or unintentionally) (Erbil, 2020).

2.8.3 Everyday and Scientific Concepts

In his writing, Vygotsky (1986) reports that there is a bidirectional integration of two unique forms of awareness: scientific and spontaneous notions that influence one another as a result throughout a person's lifetime. Spontaneous concepts are the everyday, natural concepts that happen outside of school through a child's interpretation of their experiences. Whereas scientific concepts are formal, sanctioned ways of organising the world that belong to disciplines (Vygotsky, 1986). Vygotsky's (1986) view of school was that school instruction has a heightened role as an avenue for mediated learning, which is a major contributor to children's development when children are still in middle school (Rigopouli et al., 2025). Furthermore, the idea of semiotic mediation helps explain how reflection happens through verbal interactions with others. Social relationships, especially human interactions, play a role in learning and development (Shah, 2022).

Vygotsky (1986) argues that these two concepts truly develop from different directions in that scientific concepts need to be understood through explicit instruction, and they provide possibilities for everyday concepts to develop. In contrast, everyday concepts provide avenues for making sense of the developing scientific concepts so that these scientific concepts are explored (Rigopouli et al., 2025). In a school setting, human interactions help teachers connect theoretical and practical knowledge. This means they move between scientific and everyday concepts. Over time, this process helps teachers develop effective teaching practices that are both context-specific and based on a combination of theory, pedagogy, and experience (Shar,

2022). The NSc that this study is looking at is NS as a subject where learners learn vocabulary and concepts, and get assessed on their knowledge of these concepts.

2.9 Conclusion

For learning to take place, the participant (anyone who learns) needs to have acquired tools that will propel them to learn, such as language. Language is acquired through the environments that we immerse ourselves in, formally and informally. South Africa is a diverse country with multiple official languages; it then becomes a challenge to choose the language for teaching and learning in science classrooms (Charamba, 2019). Hence, Makgabo and Modise (2020) allude to the fact that the use of the home language for teaching and learning can lead to ethnic divisions. It may further reduce the global employability of learners, as they will be unable to compete fairly in parts of the world where their home language is not known. This chapter gave an in-depth explanation of how language is important for the success of a learner in the classroom and their social environments. Furthermore, teachers play a pivotal role in ensuring that what is taught in the classroom, learners can comprehend and apply it in their environments. The chapter has attempted to give a comprehensive discussion of Vygotsky's constructivism. This serves as an anchor and foundation for this research report so that the structure and vision for the study are clear.

CHAPTER 3

METHODOLOGY

3.1 Introduction

A research methodology refers to the process undertaken for conducting a research study. It outlines the research paradigm, research design, research approach, data collection and analysis for a study being conducted (Sileyew, 2019). The previous chapter focused on the literature review and discussed the theoretical framework guiding this study. The primary aim of this study is to investigate the pedagogical strategies that Grade 7 Natural Sciences (NS) teachers use to improve the understanding of Natural Sciences concepts (NSc) for English First Additional Language (EFAL) learners. This chapter provides a comprehensive overview of the research processes, detailing the methodology using Braun and Clarke's (2006) thematic analysis and giving a structured approach to the study to ensure a well-founded strategy for addressing the research questions.

3.2 Research Design

Boru (2018) defines a research design as a structured approach for collecting, analysing, interpreting, and reporting data from a study. A research design serves as a strategic framework for aligning conceptual research concerns with practical, feasible research methods (Blair et al., 2023). In essence, a research design outlines the techniques for gathering relevant data and the methodologies for data collection and analysis. It also looks at how these elements contribute to answering the research question. This study adopted a qualitative research design in the form of case study research.

3.2.1 Research Approach

The proposed study followed a qualitative research approach. Muzari et al. (2022) argue that in a qualitative approach, researchers investigate human subjects in seeking to understand how they perceive the world around them. Von Soest (2023) further asserts that in a qualitative approach, individuals are considered experts in their field, whose social position shapes their perception of their environment. This influences how they describe issues, assign meaning, and adopt appropriate strategies. Therefore, the study aimed to prioritise participants' perspectives

by delving into the strategies teachers use when teaching NSc to EFAL learners. Thus, the teachers hold professional qualifications in the subject they teach, which makes them experts in their field and well-suited participants for this research study.

A qualitative research approach has had several advantages for this study. As highlighted by Muzari et al. (2022), a qualitative approach needs to produce a thick (detailed) description of participants' feelings, opinions, and experiences. Since the study focused on the teachers' perspectives on their teaching strategies and challenges, a qualitative approach was most suitable. This is because it helped the researcher gain deeper insights from the teachers themselves by engaging directly with them regarding the teaching methods they use to promote NSc for their learners. Despite these benefits, qualitative research also has limitations. Mwita (2022) argues that the qualitative approach is often criticised for addressing issues with preconceived assumptions. This may restrict its ability to capture meaning-making that emerges from unexpected experiences. For instance, the researcher is an NS teacher, and assumptions that the researcher has may unintentionally shape their findings based on their prior experience or beliefs, rather than letting the data collected speak for itself.

3.2.2 Research paradigm

A research paradigm is shaped by philosophical assumptions about reality and the ways knowledge is understood (Mabitla, 2020). This research was based on an interpretivist paradigm, which focused on understanding social realities from the perspective of participants. Thus, interpretivism is rooted in an idealist perspective. Ontologically, idealism asserts that reality is shaped by an individual's mental processes and interpretations (Nickerson, 2022). Given that the research aimed to look at how NS teachers promote understanding of science concepts in their lessons while also addressing the language issue, the use of an interpretivist approach was appropriate. It allowed the researcher to capture an in-depth exploration of the teachers' experiences and their inclusive pedagogical strategies as they taught NS in EFAL classes. As such, both classroom observations and interviews provided clarity and understanding of the collected data. In agreement with Alharahsheh and Pius (2020), the interpretivist paradigm seeks to capture the richness of insights provided by respondents, considering differences such as culture and circumstances. This approach ensured that this study remained grounded in the teachers' classroom experiences, extensively looking at their teaching practices and how they navigate language. The adoption of an interpretivist paradigm is best suited for a case study approach. As such, a case study of three (3) teachers was studied

to gain in-depth insights concerning the inclusive pedagogical strategies that they implement in their teaching.

3.2.3 Case Study

A case study is an empirical investigation that explores a phenomenon within its real-life context (Priya, 2021). As such, it is through case studies that researchers can thoroughly examine the subject of study, allowing for the appropriate use of data collection methods to gather precise information. This study used a case study method, as it allowed the researcher to gain insights into the pedagogical actions that Grade 7 NS teachers use to enhance EFAL learners' understanding of concepts in Mohlakeng township. By focusing on individual NS classes and a small number of teachers, the study was able to capture raw data that includes the complexities of science teaching in EFAL classes. Case studies have the advantage of focusing on real-life circumstances, providing an in-depth analysis of a specific case, and uncovering unexpected information that may not have been initially anticipated (Martin et al., 2023).

Using a case study, the findings revealed key strategies that teachers used in their lessons, which will be discussed in the later chapters. Overall, the use of the case study approach was effective in unravelling understanding of challenges and allowed for a nuanced analysis of teaching strategies in a township school. While case studies rely on meticulous observation and analysis, case study findings cannot always be generalised. To address limitations, the study employed the triangulation method, which refers to using multiple sources of information or procedures in the research process. This is used to identify repeatable patterns and establish a more comprehensive understanding of the topic (Stahl & King, 2020).

3.3 Research Sampling

In a research study, sampling is a method of identifying research participants that will serve the purpose of the study (Cash et al., 2022). According to Stratton (2024), there are two types of sampling known as purposeful and random sampling. Purposeful sampling focuses on intentionally selecting participants that meet the criteria needed to fulfil the study's objectives. Random sampling is when the researcher uses probability to randomly select participants in a specific population group (Stratton, 2024). In relation to this study, the sampling that was used is purposeful sampling. Hence, three (3) NS teachers were purposefully chosen from three

different schools in Mohlakeng. The criteria for selecting teacher participants for this study required that they have taught NS in Grade 7 for a minimum of five years. This was to allow for the mining of rich data in terms of pedagogical strategies equitable to assist learners in understanding NSc, while considering the English language barrier. As such, experience meant that they are aware of challenges in the NS subject, and they have a well-developed pedagogy to support their learners. Furthermore, choosing three (3) different teachers allowed for a range of teaching approaches and practices. While the focus on public schools was intentional because township public schools tend to have a higher concentration of EFAL learners. As a result, conducting this research in public schools provided valuable insights that may assist fellow teachers who are facing similar challenges in teaching NS to EFAL learners in public schools.

3.4 Data collection and instruments

Taherdoost (2021) defines data collection as the process in which data is collected to gain insights regarding the research topic. The data collection used for this research study involved lesson observations and semi-structured interviews. These were particularly appropriate and used to investigate the pedagogical practices that Grade 7 NS teachers use to support understanding of NSc in EFAL learners. The three (3) participants were observed during their lessons on NS. This was followed up by interviews to gain deeper insights into their teaching practices and discuss challenges that they faced in delivering content and how they mitigate language issues.

3.4.1 Observations

The teachers were observed using a structured observation tool, focusing on specific pedagogical actions aimed at promoting the understanding of NSc in Grade 7 classes, particularly those with predominantly EFAL learners. Through using observations, the researcher was able to compare strategies used during observations in relation to the ones they mentioned during interviews. This helped strengthen the reliability of the study. During key moments in the lessons, the researcher took notes specifically on how teachers were explaining concepts and how they provided clarity while teaching. Furthermore, the lesson observations were able to assist the researcher in identifying certain teaching methods that were not explicitly mentioned, thus going beyond teachers' expressions in the interview.

3.4.2 Observation Tool

An observation tool is used by the researcher to decide on critical aspects to be noticed during the observation process (Taherdoost, 2021). This tool may be formal with an observation schedule of predetermined areas to focus on or notice. The study used an observation tool in **Table 1,** which is divided into four (4) columns. The first column is titled 'Classroom context or observed class'. It is concerned with giving contextual information for the classrooms observed for this study. The second column is 'Science Cognitive/Practical Skills according to CAPS', which contains the skills listed in the CAPS document that the learners will acquire at the end of a topic. The third column, titled 'Pedagogical Action Used', captures the specific pedagogical actions that the teacher utilised to facilitate understanding of the NSc during the lesson. Lastly, the fourth column is 'Science Concept'. This involved concepts that a particular teacher was teaching. The adopted observation tool included an additional page for the researcher to take any supplementary notes should significant or noteworthy events occur during the lesson. Observational data is subject to the researcher's interpretation (Taherdoost, 2021). To avoid any bias, the researcher ensured that the observation tool was consistent across the three teachers. Moreover, the researcher observed the teachers more than once to account for variations in teaching practices in different lessons.

The observation tool used during the NS lessons aimed to write down the teacher's teaching practices. While classroom interactions and learner engagement were being practiced during the data collection process. The primary focus was on observing the teachers' inclusive pedagogical methods when teaching NS to EFAL learners. This allowed the researcher to directly analyse NS lessons, providing real-time insight into the classroom dynamics. Moreover, this included how teachers presented complex concepts, their responses to the learners' questions, and the utilized resources to facilitate learning. A total of six (6) observations were conducted in Grade 7 NS classrooms. Teachers participated in 2 (two) lesson observations, with each lesson lasting between 30 to 45 minutes. The number of learners in each classroom ranged between 35 and 45.

Table 1: Observation Tool

Classroom context or observed class	Science Cognitive/Practical Skills according to CAPS	Pedagogical action used	Science Concept
Participant: **Teacher A** Topic: Biodiversity Resources: use of white board and Drawing	Accessing & Recalling information. Comparing, communicating (DBE, 2011).	Code switching, repetition, questioning, examples and drawing	Vertebrates
Participant: **Teacher A** Topic: Biodiversity Resources: Learners as means of content demonstration (classification)	Comparing, accessing information, sorting and classifying (DBE, 2011).	Practical example, reading and code-switching	Classification
Participant: **Teacher B** Topic: Sexual Reproduction Resources: Digital Video	Observing, comparing, accessing information (DBE, 2011)	Video, questioning, activity, feedback	Human Reproduction - Females
Participant: **Teacher B** Topic: Sexual Reproduction Resources: Classroom Activity	Observing, accessing information (DBE, 2011)	Recall, questioning	Human Reproduction – Males _ Fertilization
Participant: **Teacher C** Topic: Sexual Reproduction Resources: Content Charts (Reproduction organs)	Planning investigations, recording, interpreting information (DBE, 2011)	Recalling, examples, chart, reading, activity	Sexual reproduction in plants
Participant: **Teacher C** Topic: Sexual Reproduction Resources: Content Charts (Reproduction organs)	Communicating, planning investigations, recording, observing (DBE, 2011)	Questioning, drawing, discussion, activity	Pollination

3.4.3 Semi-structured interviews

The interview is a method for gathering qualitative data from spoken narration between the participants of the subject being researched and the researcher (Ruslin, 2022). The use of semi-structured interviews in this study aimed at getting insight into teacher participants' challenges and ideas or conceptions informing their practice in a manner that responds to the research questions. This approach allowed the researcher to understand the teachers' experiences when teaching science in EFAL classes. It gave teachers a platform to speak about their challenges,

methods, and perspectives when teaching science. The set of questions was designed to ensure that the study's questions or objectives were addressed. The interview responses were recorded using a digital recorder and transcribed word for word. This served the purpose of capturing data or any potentially valuable information that arose during the conversation while ensuring that all the teacher's responses were captured correctly and that each teacher was represented fairly. The sample of interview questions that were asked concerning the teacher practices were as follows.

1. Is the English language a barrier in grade 7?
2. Does the number of learners have an effect on how you teach Natural Sciences?
3. How do you normally work with learners who perform below the expected pass mark?

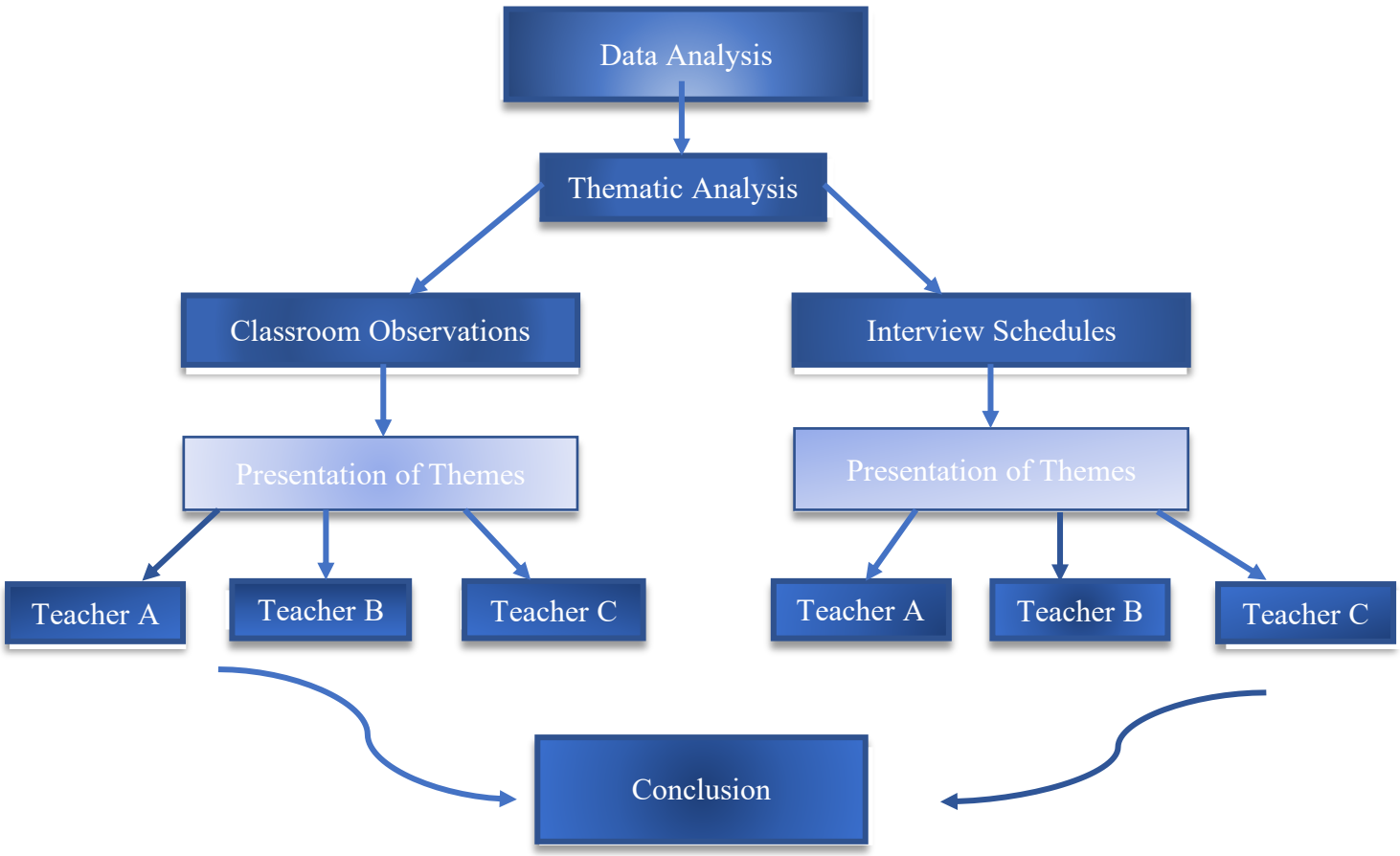
However, a full sample of all the interview questions is attached in Appendix (B).

3.5 Data Analysis

This research study adopted Braun and Clarke's (2006) thematic analysis to analyse the collected data. Thematic analysis is a method used to systematically identify, organise, and interpret patterns of meaning (themes) within a dataset (Braun & Clarke, 2012). It emphasises understanding meaning across the dataset, enabling the researcher to explore and make sense of the collected data. Thematic analysis can be conducted using both deductive (top-down) and inductive (bottom-up) approaches. In the inductive approach, data is coded without attempting to align themes with a pre-existing coding framework or the researcher's preconceived notions about the research (Dawadi, 2020). While the deductive approach is explicitly researcher-driven, it allows researchers to analyse data concerning their theoretical interests in the issues being investigated (Dawadi, 2020). This study followed an inductive approach when analysing and searching for themes. In an inductive approach, themes emerge organically from the data itself and are strongly linked to the data rather than the researcher's theoretical interest in the topic.

The following figure is a visualised representation of the sequence of how data was presented in the analysis chapter.

Figure 1: Visual Representation of Data Analysis



3.5.1 Thematic Analysis – Classroom Observation

The following six (6) steps outline the process used for identifying themes from classroom observations:

Step 1: Becoming familiar with the data

In this step, the researcher immerses themself in the collected data, becoming thoroughly familiar with the depth and breadth of the content. This involves repeatedly reading the data. During this process, every detail is fully understood and accurately interpreted (Braun & Clarke, 2006). For this research, notes that were taken during the lesson observations were reviewed. For example, during *Teacher B's* lesson, it was noted that she consistently used English during her lessons, only switching to isiZulu when learners became disruptive. This detail is significant as it highlights a specific pedagogical pattern and was later used when

generating themes. **Table 3** below shows an example of observer notes that were taken during *Teacher B's* lessons.

Table 3: Observer Notes

Additional Observer notes
Teacher B   o The teacher asks probing questions to get a response from the learners.   o The teacher uses YouTube as a tool to extend/expand on the learners' knowledge. (2 learners on each computer).   o The teacher is an isiZulu speaker in a predominantly Setswana school where the LoLT is English. She adds a bit of isiZulu here and there to reinforce discipline in the classroom.   o As the video watching progresses on the computers, the teacher walks around to check if learners understand what they are watching and if the learners are still watching what they are supposed to be watching (Facilitating)

After each observation, the handwritten notes were transcribed onto a digital device. This transcription process facilitated easier identification of codes, and it ensured that no information was overlooked.

Step 2: Generating initial codes

To code means to put data into small chunks of meaning (Braun & Clarke, 2012). Once all the information was transcribed, the researcher went through the data line by line, using different colours to highlight and circle various elements observed during the lesson, such as teaching strategies, teacher rephrasing, types of questions asked, and the language used. The highlighted information was then grouped into categories to generate codes. During the coding phase, when the text in one participant's lesson observation was similar to that of another participant, a single code was generated to represent this shared idea. Conversely, if a participant's text differed significantly, a unique code was assigned based on its relevance. Depending on its importance, this unique code was either incorporated into the main analysis or set aside. This process was done for both lesson observations and interview data. Through this process, only four primary codes were ultimately deemed necessary, with other codes being excluded.

For instance, in this study, words such as *'video watching, examples, and drawings'* were highlighted using the same colour, as they could potentially be grouped under a single code. In contrast, phrases like *'less movement, code-switching'* were highlighted in different colours, suggesting the need for separate codes.

Step 3: Searching for themes

Searching for themes entailed looking for patterns that capture things that may be significant in the data. The researcher had a long list of different codes that were identified across the data set. The codes were sorted into potential themes, and all relevant coded data extracts were collated within the identified themes. A theme could be built from a single code if it captures a unique, significant concept, or can emerge from multiple codes that collectively represent a broader, unified idea (Naeem, 2023). As such, themes were searched from the coded notes. The following **Table 4** shows an example of this process:

Table 4: Observer Notes

Additional Observer notes
Teacher A's class ○ **Plenty of examples** are used and learners actively participate in class by answering questions that the teacher is asking.
Teacher B's class ○ To end off the lesson, the teacher used the white board to **draw** the female reproductive organ with labels while the **videos** on the learners **computers** were paused. Learners were asked probing questions regarding the work.
Teacher C's class ○ Throughout the duration of the lesson, the learners used English to either ask or answer a question. The teacher would now and then throw a Setswana word or phrase for emphasis.

The red-coded words, which are 'examples, draw, videos, computers', fall under the code 'Science Engagement Techniques'. From this code, a theme is then formed and named. In this case, the theme is 'Approaches to Content Delivery', as it highlights how the teachers

approached their lessons and the different teaching methods that they used. This process happened until four themes emerged.

Step 4: Review Themes

Reviewing themes meant refining and modifying the candidate themes that had been identified in Step 3 (Braun & Clarke, 2012). Two things occurred: at the first level, the data for each theme was read, and consideration was given to whether the themes formed a coherent pattern. When they did, the second level followed. At this level, the researcher assessed the validity of the individual themes in the data set and evaluated whether the candidate thematic map accurately reflected the meanings evident in the data set as a whole. At times during the analysis, there would be a need for re-coding, as coding was an ongoing organic process. The following questions were asked when reviewing the themes:

- Does this theme say something about the research question?
- What are the boundaries of this theme? What does it include or exclude?
- Is there enough data to support this theme?

Themes were carefully reviewed and refined to make certain that they accurately represent the data and that they are in relation to the research questions.

Step 5: Defining Themes

In this phase, the researcher defined and further refined the themes. This step aimed to identify the essence of each theme and determine the aspect of data for the captured theme. Additionally, the researcher assessed whether a theme contained any sub-themes. Sub-themes are themes within a theme and can help structure, particularly a large and complex theme. However, no sub-themes were identified in this study.

Step 6 – Producing a report

This step involved the final analysis and write-up of the report, which is done in the next chapter. This approach ensured an accurate representation of the teachers' reality as depicted in the collected data, reducing potential researcher bias and making it a reputable method for analysing, which made it suitable for this study.

3.5.2 Thematic Analysis – Interviews

In relation to the semi-structured interviews conducted for this study, a thematic analysis was conducted following the six (6) steps proposed by Braun and Clarke (2006), similar to the process of observations recorded. As such, these steps will not be repeated in the interview process, as they were used in the same manner as what is shown during the process of observation analysis. The difference is the data source used, which was the recorded interview dialogue between the researcher and teacher participants. This dialogue was then transcribed to search for codes leading to the formation of themes.

3.6 Ethical Considerations

According to Hwang (2023), in any research, appropriate ethical principles are important. This is to say that if human beings are the subject of the study, they need to be protected by all means possible. Research conducted with children, whether explicitly or implicitly, should ensure the protection of children's rights throughout the research process (Robinson, 2024). For this study, permission from relevant individuals, such as parents, teachers, and principals, was granted. Relevant letters and ethical clearance were obtained (see Appendices C-H) for this study, which means that the study followed all necessary protocols.

3.7 Trustworthiness

Stahl and King (2020) argue that the trustworthiness of a study relates to the level of trust in the data, interpretation, and methodologies employed to verify the reliability of the research. Furthermore, Sumrin and Gupta (2021) contend that various techniques can be used to establish the credibility of the research, such as peer debriefing, member checking, reflective journaling, and evidence of data submitted. These are all techniques used to establish trustworthiness. As earlier stated, this study employed triangulation as a technique to establish credibility. Therefore, the study used teacher interviews and classroom observations. Both these methods provided a cross-verification of data and allowed for the integration of different perspectives on the NSc that teachers use to promote understanding in NS EFAL classrooms. Through triangulation, the researcher had an opportunity to compare observations and interviews to ensure that the findings were based on multiple perspectives, enhancing the validity and reliability of the findings and helping remove researcher bias.

In addition, the study used reflexivity as another method to ensure trustworthiness. Reflexivity is a technique that requires the researcher to engage in self-reflection to analyse their subjectivity and how their personal teaching experiences, biases, and philosophies may influence the research process and findings (Adler, 2022). The researcher is aware that, as both a teacher and an inclusive education student, there may be preconceived notions about the practices of other teachers who are teaching science. Thus, to remove subjectivity, the researcher engaged in continuous self-reflection through journaling the research process, assumptions and unexpected findings. This assisted the researcher in being aware of their expectations and deliberately taking steps to ensure that the findings reflect the participants' voices and their own classroom experiences. By engaging in critical self-reflection, the researcher can identify and address potential biases that could impact the validity and credibility of the research (Jamieson et al., 2023).

3.8 Validity

Validity refers to the degree to which data values are consistent (Olmsted, 2024). To ensure the validity of the results, the study used triangulation, combining teacher interviews with classroom observations to cross-check findings.

3.9 Conclusion

This chapter focused on the research design and methodology that will be used to conduct the study. It has also provided a comprehensive description of the data collection methods and qualitative research tools to be used. The chapter delves into the details of the research participants' sample, how the data will be collected, and how it will be analysed. Furthermore, ethical considerations, which are a crucial aspect of this research, have been carefully addressed.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

The previous chapter outlined the specific methodologies used to gather this research study's data. The gathered data was from three (3) Natural Sciences (NS) teachers coming from three (3) distinct schools in Mohlakeng Township. These schools were identified due to their offering of Grade 7 NS classes to learners who use English as their First Additional Language (EFAL). The collected data included teacher interviews and classroom observations as the main sources of data mining to extract the findings of this study's proposed research questions. Following Braun and Clarke's (2006), who identified thematic analysis as a method of representing patterns of meaning (themes). Their framework is adopted as a guiding lens for identifying themes in the collected data, consisting of lesson observations and interviews (as discussed in Chapter 3). Consequently, this chapter aims to present the process that led to the identification of themes found using the thematic analysis framework.

4.2 Participants' demographic information

The following table presents biographical information of the teachers who participated in this study. This biographical information includes age, experience, and gender. The teacher's experience was considered a valuable factor that influences the professional practice of teaching. Kulgemeyer and Riese (2018), alluded to the fact that experienced teachers are believed to have strong pedagogical knowledge that allows them to assist learners in mitigating difficult concepts while considering language barriers that hinder the acquisition of scientific concepts. This is the reason this study selected teachers with a minimum of five (5) years' experience and above. In ensuring confidentiality, the participating teachers' pseudonyms of Teacher A-C were used instead of their actual names. These details are presented in the following **table 2**.

Table 2: Demographic details of participants

Teacher	Gender	Age	Qualification/s	Teaching Experience	Nr. Years teaching teaching NS
Teacher A	Female	55	B.Ed / doing honours	28 years	28 years
Teacher B	Female	28	Postgraduate Cert. in Education Diploma in ABET	5 years	5 years
Teacher C	Male	29	B.Ed in MST (Maths, Science & Technology), doing Honours	5 years	5 years

Teacher A is a 55-year-old female with a Bachelor of Education degree and is currently pursuing an Honours degree in Education. She has 28 years of experience in teaching NS and currently teaches both NS and Mathematics to Grade 7 learners**.** *Teacher B* is a 28-year-old female with five (5) years of teaching experience; she holds a Postgraduate Certificate in Education (PGCE) and a Diploma in Adult Basic Education and Training (ABET). *Teacher B* has primarily taught NS to Grade 7 learners. In addition, she currently teaches Mathematics and has previously taught Grades 4, 5, and 6. The third and final participant, which is *Teacher C*, is a 29-year-old male with five (5) years of teaching experience. He has a Bachelor of Education degree specialising in Mathematics, Science, and Technology (MST) and is teaching Mathematics, NS, and Technology to Grade 7 learners.

Table 6: Themes and Codes for Lesson Observations

The following table has a list of themes and codes that were derived using Braun and Clarke's (2006) thematic analysis. The steps of how the themes and codes were found have been explained in the previous chapter.

Theme 1: Content Delivery Approaches	**Theme 2**: Classroom Linguistic Practices	**Theme 3:** Classroom struggles: Teacher Perspectives
Code: Science Engagement Techniques ○ Examples ○ Activity ○ Answering questions asked by teacher ○ Video watching ○ Drawing related to content ○ Code-switching ○ Charts ○ Learners reading ○ Whiteboard	**Code:** Instructional Language ○ English ○ Setswana ○ isiZulu ○ Ultimately there was code-switching.	**Code:** Challenges ○ Talking between learners ○ Unsettling ○ Learners using their mother tongue ○ IsiZulu used to reinforce discipline

4.3 Theme One: Content Delivery Approaches

- **Code: Science Engagement Techniques**

This theme stems from the code "Science Engagement Techniques". Science engagement techniques refer to different ways of teaching that include learners in the learning process. As noted from the literature review, Seladi (2024) points out that creative lesson starters are an excellent way to initiate active learning in science classrooms. According to Seladi (2024), when a lesson starts with a problem-solving activity, discussion, and even group projects, learners will be encouraged to take an active role in their own learning. The teaching methods that a teacher uses throughout their lessons are just as important as how they begin the lesson. King (2018) has reiterated that in order for students to learn science effectively, especially EFAL learners, science teachers must utilise visual aids as a tool to assist in comprehension of the content.

The analysis of the lesson observations shows that the teachers in this research study have used various teaching methods, which are identified below.

The lesson observations took place during the first term of the school year. While *Teacher A* was still covering "Biodiversity", *Teachers B* and *C* had progressed to 'Sexual Reproduction', which is a topic ahead of biodiversity.

Teacher A

Teacher A was in the process of teaching the topic of "Biodiversity". Two (2) concepts were taught, namely, "vertebrates" and "classification". The lesson began with assessing the learners' prior knowledge about the fish. *Teacher A* drew the fish and then moved on to explain the different parts of a fish and their uses. In the second lesson on classification, *Teacher A* called learners to the front as part of "resources" for a demonstration to explain classification.

Teacher B

Teacher B's lessons were on "Human Reproduction". To support the lessons, *Teacher B* made learners watch a video and further provided a worksheet for learners to work on and consolidated the lessons with a discussion.

Teacher C

The lesson introduced "Sexual Reproduction" in plants. *Teacher C* had a chart with a drawing of an angiosperm plant. The chart was used throughout the lesson as a supporting mechanism. In the second lesson, learners read notes and answered questions in an activity.

4.4 Theme Two: Classroom Linguistic Practices

- **Code: Instructional Language**

This theme is derived from the code "Instructional Language". Instructional language is the language used to teach and learn. This theme examines the language used during a lesson, takes note of the role of code-switching, and explores where and when it occurs during lessons.

Teacher A

Teacher A frequently switched between English and the learners' mother tongue, which was Setswana, during the lesson. This often occurred when *Teacher A* posed questions, prompting learners to respond. Thus, the use of both languages appeared to be the standard teaching practice in the classroom. Where the teacher and learners will use both languages.

Teacher B

Teacher B would code-switch seldom to IsiZulu, primarily to reprimand the learners. It is worth noting that IsiZulu is not the dominant language in the area where *Teacher B* teaches; Setswana is the primary dominant language. In this case, when learners responded in Setswana, *Teacher B* would make them change the language and respond in English.

Teacher C

A similar approach to *Teacher A* was taken in *Teacher C's* classrooms. English was consistently used during lessons for explanations, and learners would respond in English. *Teacher C* occasionally incorporated the learners' native language in his teaching, which is Setswana.

The lessons that were observed lend credence to Seabela and Ncanya's (2024) assertion that teachers use code-switching as a tool to improve communication or facilitate comprehension of the subject. Although code-switching, according to Seabela and Ncanya (2024) is effective in rural areas such as the Eastern Cape, the same notion can be applied in this context as well. Schools that are in township areas necessitate teachers to blend English with the learners' home language. Having said that, Teacher C's English-only approach reflects Probyn's (2006) evidence from the Eastern Cape Township, where science teachers adhered to strict English-only instructions, which may not always work in multilingual classrooms.

4.5. Theme three: Classroom Struggles: Teacher Perspectives

- **Code: Challenges**

This theme, derived from the code 'challenges', examines the challenges faced by teachers during their NS lessons, focusing on various types of learner behaviours that can be considered difficult. In this theme, contextual challenges such as lack of resources, overcrowding, and time were considered.

Teacher A

Teacher A did not have a print-rich classroom, which could point to a resource-related issue. There was also a notable challenge of overcrowding.

Teacher B

There were challenges of behaviour in *Teacher B's* two lessons. Learners were chaotically moving around the class due to the limited number of computers. About 2-3 learners were required to share the computer with each one. As a result, they were talking amongst themselves when they were supposed to be watching a video.

Teacher C

No notable challenges during the lesson of *Teacher C* were observed.

The challenges noted above are a reflection of what Lebona (2015) points out in the review of literature: despite inclusive education policies that are in place in township schools, it does not necessarily mean that classroom challenges are automatically deflated. Limited resources and overcrowding issues remain persistent. In areas like the natural sciences, teachers struggle to meet the diverse needs of their learners (Lebona, 2015).

Two more themes, 'Types of Teaching Styles' and 'Teacher-Learner Interaction', were identified in this research study using a similar coding process. However, the most relevant themes have been discussed in detail above. This is because these three themes closely align with the research objectives and purposes of this study. As such, the presentation and analysis of the other themes will not be provided.

4.6 Data Presentation for Semi-Structured Interviews

4.6.1 Semi-structured Interviews

Semi-structured interviews were used as a second research tool to engage teachers and gather insights into the inclusive pedagogical strategies they employ to teach NSc to their learners. This was also for gaining insight into the challenges they face that hinder effective teaching. Each interview lasted a maximum of 30 minutes, and the interview consisted of 14 questions (Appendix B). The first six questions gathered biographical information, and the remaining eight questions focused on the research topic.

Following Braun and Clarke's (2006) process of thematic analysis, the following codes and themes in **Table 7** were generated from the interview data.

Table 7: Themes and Codes for Semi-Structured Interviews

Theme 1: Instructional Resources and Methods	**Theme 2**: Fostering English Proficiency in Multilingual Classrooms	**Theme 3**: Barriers to Learning
Theme Definition: The actions of the teacher when it comes to explaining NSc to learners. What methods are the teachers using in the classroom to enhance learning of NSc.	**Theme Definition:** Educators' facilitation in greater accessibility and ease of use of the English language in the classroom. This theme examines the teachers' actions in helping to mitigate the language issue in NS classes for learners in Grade 7.	**Theme Definition:** The theme puts much focus on other challenges that educators have mentioned that they encounter during their NS lessons. These challenges somehow affect the teaching of NS during the lessons and potentially impedes on the learners learning.
Code: Pedagogical Actions a) Visuals (technology), b) Worksheets, c) Pictural drawings, d) Outside learning e) Write notes/keywords, f) Physical representation, g) Examples, h) Tests, i) Different teaching aids, j) Lab, k) One-on-one sessions, l) Extra NS activities, m) Corrections, n) Breakdown of concepts, o) Extra classes, p) Repetition of teaching concepts, q) Internet (cell phones/laptop), r) Codeswitching	**Code: English** a) Breakdown sentences, b)Learners explain using their own words. c) Grade 4 is the transition to English. d) Repetition of what was taught. e) Good foundation of English (relative), f) Codeswitching, g) Individual explanation	**Code: Challenges** **a)** English, **b)** Codeswitching, **c)** Overcrowding, **d)** Behaviour **e)** Lack of resources, **e)** Teacher work overload**,** **f)** Lack of technology

4.7 Presentation of Themes

4.7.1 Theme One: Instructional Resources and Methods

- **Code: Pedagogical Actions**

The first theme centres on the key teaching pedagogical actions used by educators in their NS EFAL classrooms. Pedagogical actions are different teaching methods that support learners in their learning (Tobón et al., 2021). The teachers thoughtfully shared their pedagogical methods, which were then coded during the analysis process. Hence, the highlighted words indicate a code in the teachers' interview responses, which ultimately falls under the same theme. Their responses are shared below:

***Interviewer**: "Can you tell me about the inclusive pedagogical actions that you do as a grade 7 natural sciences teacher to improve understanding of natural science concepts in EFAL learners? Like the methods that you use to make sure that learners understand".*

Teacher A

> *"I use a lot of examples so that they can understand. And before I introduce another lesson, I test their prior knowledge. So basically, it is just about having a lot of real-life examples".*

Teacher B

- "(*Replies in Zulu) yoh ngiwakhohliwe mina ama methods we pedagogy (Yoh, I have forgotten the methods of pedagogy".*

***Interviewer**: "Maybe, like, do you codeswitch? Do you repeat questions? Things like that".*

Teacher B

> *"Oh yes, that I do. I use visuals. I make use of visual material and worksheets to enhance their understanding… Oh, uhm, even different learning teaching aids."*

Teacher C

> *"Like when you were observing my teaching, there were times when you just tell them that: 'it's a stamen, a stamen has 1, 2, 3 and they'll respond by saying it's a male' but they won't have a full sense to say what the 'stamen' has so by giving them pictural drawings it will enhance their learning… "*

***Interviewer**: So, you give them drawings that enhance learning?*

Teacher C

> *"Sometimes I just take them outside. Since we are dealing with 'angiosperms', they will come back with flowers. We cut this flower to make a cross-sectional area, then the microscopes we try to dissect the flower to recognise which part is which. Sometimes, at the beginning, we write the keywords before we give them notes, so I think that also assists them."*

***Interviewer**: NS is a literal subject; it needs practical work.*
Teacher C

"Sometimes, again, the one of labelling the parts of a flower, I have a male part and a female part, so I take one boy who will represent a filament and another boy to represent an anther. Then I say to them this one carries pollen grains, and pollen grains are like expenses from a male so together these two they make a male of which is the stamen. Etcetera with the female."

4.7.2 Theme Two: Fostering English Proficiency in Multilingual Classrooms

- **Code: English**

Teachers often face challenges navigating the use of the mother tongue language, the language of instruction, and having to teach science concepts in an EFAL class. This theme explores the various strategies educators employ to tackle the language barrier during NS lessons.

Interviewer: *"Do you find it easier or difficult to teach natural sciences concepts to EFAL learners?"*

Teacher A

"This is where you need to use examples so that these EFAL learners understand. Because with other children when you speak about something they already get it as opposed to the other ones where you need to explain and make plenty of examples so that they grasp what you are talking about."

Teacher B

"I would say yes, I encounter problems. English is not their medium of instruction at home, so they don't understand Natural Sciences concepts. You can phrase it properly by saying English is not their mother tongue."

Teacher C

"Uhm, not that difficult. What I do, when I'm in class and see that "these" ones can't get what I am saying, I will try Setswana (a different language), those who are laughing will laugh at me. I was once a student, so I was taught by a certain teacher of physical science. We used to laugh at him, but at the same time, he ended up knowing isiZulu as he struggled with it. From my experience, I know that I will reach that point where I am good with Setswana."

Interviewer: *When you encounter terms or concepts in NS that learners find difficult, do you have a method or strategy that you feel works for learners to promote their understanding?*

Teacher A

"Sometimes even the internet. Most of the time I use it in class. Sometimes I come with a laptop to show them on a whiteboard/screen a certain concept."

Teacher B

"I take them to the lab. That will aid their understanding of a certain topic."

***Interviewer**: "Let's say, for example, a concept like photosynthesis. Isn't it that you can't translate it to Setswana, it remains photosynthesis. How do you try to explain it to them, or what do you do for them to get that concept as you know, science has its concepts that remain unchanged, its language, etc.".*

Teacher C

"Normally, I used to break such concepts. Like, for example, ask them 'What does photo mean? It means light and synthesis, it means this, so this is a process whereby plants manufacture their food using light to produce glucose and so on."

***Interviewer**: "So, you break the concept?"*

Teacher C

"Yes, I break it down. With these ones, I'm not having that problem much because I once taught them in grade 5, so I know that in grade 5 I covered whatever concept, and now in grade 7, I just remind them, as it is a continuation. Probably next year, that's when I'll encounter this problem because I don't know them as I wouldn't have taught them."

4.7.3 Theme three: Barriers to Learning

- **Code: Challenges**

The theme focuses on addressing the challenges faced by teachers in NS classrooms. It aims to explore the various issues that teachers encounter while delivering lessons, such as limited resources, curriculum constraints, or classroom management difficulties. Codes that form the theme 'Barriers to learning' are highlighted.

Grade 7 teachers were asked to shed some light on their own classroom experiences. Their responses are recorded below:

***Interviewer:** Are there any challenges that you experience when you are teaching grade 7 learners besides the language issues?'*

Teacher A

"The only thing that delays me is the discipline and the lack of resources, especially physical resources. We don't have a lab. Sometimes one needs to carry the learning instruments from the storeroom and bring them to class, time is ticking, you have to move from one class to the other, the learners remain behind in class while you, as the teacher, are the one moving, so that's a challenge. I don't have my own class where I can say I'm sitting and planning my things properly; I'm waiting for the learners to come."

Teacher B

"Yes, behavioral issues. Behavioral issues I think it's because they are entering the adolescence stage so 'eii' it becomes a problem."

***Interviewer**: "Okay, would you also say lack of resources or maybe you do have resources?"*

Teacher B

"Definitely, we can say lack of resources. Also, because they share laptops so that does cause disruption. Even textbooks as well. We don't have enough textbooks."

Teacher C

"Overcrowding. It becomes a challenge to attend a one-on-one learner, that one on one session. You'll find that in this class we have about 7 to 8 learners who were progressed from the previous grade and who are lacking in the same subject, so how do I attend to these people when I have 45 learners in one room? I have to teach in these 30 minutes, I have to give them work, I have to mark you see? I have to give them homework at the same time. Sometimes I'd have to start by correcting yesterday's work you see so it becomes a lot."

***Interviewer**: "Oh okay. Do you guys have technology like an overhead projector, the lab, and so on? Do you use that?"*

Teacher C

"We don't have. I was fighting with the principal to take this overhead projector that you see here, to one of the classrooms 'mmm yah'."

The above-mentioned themes will be discussed in greater detail in the next chapter. **Table 8** below compares the teachers' responses from the semi-structured interviews with their observed lessons during NS teaching. For example, if the pedagogical action was practised in the classroom and mentioned in the interview, it would be both a tick and a cross. If it was only practised in the classroom and not mentioned in the interview, there would only be a tick and no cross, and vice versa with the cross and no tick. The following keys show the tick and cross used in the table, indicating the difference between what was said in the interview and the actual classroom practice of pedagogical action.

Key

X - The **black** cross represents what they said during the interview.

✓ - The **red** tick represents what they were doing in class.

Table 8: Inclusive Pedagogical actions

	Teacher A	Teacher B	Teacher C
Pedagogical Actions			
Examples	✓ X	✓	✓
Technology (pictures, video, google)	X	X ✓	X
Drawings / charts	✓	✓	X ✓
Code-switching	✓	X ✓	X ✓
Charts			✓
Activities/worksheets	✓	X	✓
Whiteboard	X ✓	X ✓	✓
Question and answering	✓	✓	✓
Outside 'Learning'			X
Notes / writing	✓	✓	X
Test	X		X ✓
Corrections	✓	✓	✓
Breakdown of concepts	✓		X
Repetition	✓	✓	X ✓
One-on-one session		X	X
Natural Sciences Lab		X ✓	
Intervention (extra work/support)		X	X
Reading	✓		✓
Physical representation (physical resources)	✓		X

Table 8 compares the pedagogical strategies observed during the teachers' NS lessons to those described during their interviews. This comparison highlights the alignment (or lack thereof) between their actual classroom practices and their stated teaching approaches. Looking at these disparities reveals potential gaps between tacit teacher knowledge and practice. **Table 8** not only reveals the degree of alignment between their intended and observed practices, but it also highlights certain inconsistencies that could be attributed to various influencing factors, such as time constraints, curriculum demands, and classroom management challenges.

Furthermore, this analysis helps us to detect trends in the teaching approaches across the three teachers, shedding light on common practices or deviations among teachers. For instance, while some teachers may claim to use learner-centred methods, the observed lessons might reflect more teacher-centered approaches, such as continuous teaching. These variances could indicate barriers to implementing active learning techniques, including limited support. **Table 8** also serves as a tool for reflecting on professional development requirements, emphasising areas where teachers might want further assistance in bridging the gap between theory and practice. Understanding these dynamics, educational stakeholders can develop targeted strategies to enhance teaching quality.

4.8 Conclusion

In conclusion, this chapter has effectively used classroom observations and teacher interviews to gain valuable insights into the classroom setting. The observations provided a direct lens into the dynamics of the classroom, revealing how teaching strategies played out in real time. This allowed the researcher to witness first-hand the challenges and successes that teachers face in fostering an inclusive learning environment. Teacher interviews complemented these observations by offering a deeper understanding of the educators' perspectives, their instructional choices, and the rationale behind their approaches. The combination of these methods enriched the data, allowing for a more comprehensive picture of EFAL learners in a science classroom. The thematic analysis served as a critical tool in this chapter has systematically organising and interpreting the collected data. Through coding and categorising recurring patterns in the observations and interview transcripts, key themes emerged naturally from the data. This process not only highlighted significant trends but also helped uncover subtle nuances in the teachers' experiences and classroom dynamics that might have been overlooked otherwise.

CHAPTER 5

DISCUSSION

5.1 Introduction

This chapter presents results from the themes generated in the previous Chapter 4. It discusses how the results support and challenge the principles of inclusivity in a science classroom with learners speaking English as their First Additional Language (FAL). This chapter further considers the effectiveness of pedagogical strategies used in promoting equitable access to scientific knowledge and enhancing learners' overall learning experiences.

5.2 Discussion of the Research Findings

5.2.1 Lesson Observations Discussion

In Chapter 4, there were five (5) themes identified from the lesson observation data, and only two of these themes are considered significant to this study. As such, two themes will be discussed in detail in this chapter which are namely 'Approaches to Content Delivery' and 'Classroom Linguistic Practices'. These themes align most closely with the study's objectives. By exploring these themes, the study aims to offer insights into the teaching methods that teachers used in teaching science concepts in EFAL classes. These themes also showed how teachers navigate language challenges in Natural Sciences (NS) classrooms.

5.2.2 Theme 1: Content Delivery Approaches Discussion

Theme 1 of lesson observations (Content Delivery Approaches) aligns closely with the research question, as it dives right into the teachers' pedagogical methods of teaching NS concepts. The data indicate that teachers use various teaching methods that they have deliberately adapted or instinctively to suit their content presentation. Each concept taught by the teacher was accompanied by a specific teaching approach suitable to accommodate the diverse needs of a classroom. Thus, promoting inclusivity through attempts to consider different learning styles for learners in the classroom. The observed teaching methods include:

- Asking questions
- Examples

- Drawings
- Demonstrations
- Recapping
- Videos
- Activity/worksheets
- Discussions
- Reading and writing of notes
- Corrections

In observing the six lessons, how a teacher starts a lesson is crucial, as it sets the tone for engagement and lays the foundation for effective learning. This observation aligns with Seladi (2024), who emphasises that lesson starters such as provocative visuals, discussions, and problem-solving activities impact positively on learner engagement. Similarly, Aung and Tepsuriwong (2017) assert that it is this moment where the teacher has the opportunity to determine whether the learners will engage with the lesson. Therefore, it is essential to capture learners' attention and foster their desire to learn right from the start of the lesson (Aung & Tepsuriwong, 2017). In this study, the most observed lessons began with teachers asking questions to engage learners and to recap on previous lessons. As explained by Newton et al. (2018), science involves asking questions and seeking answers, fostering curiosity and scientific thinking. In the classroom, teachers usually provide the initial question or problem for learners to explore. The approach of starting a lesson for the teachers in this study could be important, especially in a science classroom, to help activate prior knowledge and ensure that learners recall essential science concepts from earlier lessons. From a theoretical perspective, this approach aligns with Vygotsky's Zone of Proximal Development, which emphasises the responsibility of teachers in providing scaffolding. When teachers guide learners through questioning, discussions and other activities, they create a bridge between what learners already know, and what they will learn next.

Consequently, drawings and visuals, such as watching a video, became the second most commonly used teaching strategy across the six (6) lesson observations. For instance, *Teacher A's* drawing of a fish's structure helped learners understand its anatomy by highlighting key features like fins, gills, scales, and the lateral line. This visual aid made complex concepts more accessible and relatable to real-life observations. This finding aligns with the work of Yoon et

al. (2021), who found that visual representations are essential tools for learning and understanding science. They go beyond supporting verbal or written communication and are crucial for grasping scientific issues, building models, and conveying ideas at every stage of scientific inquiry. Valencia et al. (2023) stated that using video as an academic tool enhances learner performance while promoting collaboration and independent learning. This can be seen in *Teacher B's* lesson. *Teacher B* used a video to explain anatomy, fertilisation, and reproductive processes, ultimately enhancing understanding and catering to both auditory and visual learners. *Teacher C's* drawing of an angiosperm plant simplified its complex structure, while the accompanying chart encouraged learner interaction. Visual aids, especially in bilingual classrooms, bridge language barriers and promote inclusive learning (Mokikwa & Mokhele Ramulumo, 2024).

5.2.3 Theme 2: Classroom Linguistic Practices

This theme focuses on the language used during teaching in class. Rose and van Dulm (2006) present a thorough taxonomy of code-switching usage in multilingual classrooms, demonstrating how teachers purposefully transition between languages to clarify complex content, build participation, support classroom management, and affirm learners' linguistic identities. In this section, the researcher provides examples of teachers using either an English-only policy in their classes or code-switching. If code-switching has been used, where and how has it been accounted for in their lessons?

Lesson Observation 1 and 2: Teacher A

In both of *Teacher A's* lessons, she would code-switch. *Teacher A* would sometimes ask the learners, 'What is this?' in Setswana while pointing at a drawing of a fish on the board. Words like 'akere', which means 'right', were used often and most probably to assess the learners' level of understanding. *Teacher A* constantly switched from English to Setswana without disturbing the smooth flow of the lesson. Furthermore, *Teacher A* would code-switch when asking learners questions. This practice intentionally or unintentionally extended to encouraging learners to respond in Setswana when necessary, creating an inclusive and familiar learning environment. In another class, *Teacher A* began by asking, *'Ha le so starte ka di animal? '*Which translates to, *'Have you not started with animals?'* This initial use of Setswana served to gather information about learners' progress in their studies.

Lesson Observation 3 and 4: Teacher B

Teacher B consistently taught Natural Sciences concepts (NSc) in English throughout her lessons, maintaining this language from start to finish. *Teacher B* maintained a strict stance against learners using their native language to answer or pose questions. *Teacher B* explicitly stated that only English was permitted and encouraged learners to communicate with one another in English. Having said that, during one of her observed lessons, while the learners were watching a YouTube video, some became somewhat disruptive, wandering around and talking with one another. In response, *Teacher B* addressed the learners in isiZulu to manage their behaviour. Despite isiZulu not being the learners' mother tongue since the area is dominated by Setswana-speaking people, the learners promptly listened and followed *Teacher B's* instructions without hesitation. Rehman et al. (2020) suggest that code-switching also serves to maintain discipline and to provide directions to learners for various tasks and projects, as shown by *Teacher B*.

Lesson Observation 5 and 6: Teacher C

Teacher C used English most of the time in his lessons. However, there were times while teaching when he would incorporate Setswana. This happened during his lesson on '*angiosperms*'. He got to the part about pollination, and as he was teaching, he said in Setswana: '*Pollination ke eng?*', which translates to '*What is pollination*?' in English. The incorporation of Setswana to gauge where learners are in terms of knowledge while predominantly using English as a medium of instruction highlights the practice of code-switching. As soon as *Teacher C* asks: *'Pollination ke eng'?* In Setswana, he acknowledges the learners' home language, which, to some, fosters a sense of inclusion. By code-switching, *Teacher C* helps learners understand unfamiliar scientific terms, and by rephrasing these concepts in a familiar language, learners may find it easier to remember or to grasp the meaning, as Setswana is a language that learners relate to.

5.2.4 Theme 2 Discussion

Theme 2 of the observed lessons was about the language used while teaching in the classroom and is directly linked with the main research question, as it focuses on how NS teachers effectively teach NSc to Grade 7 learners who are EFAL speakers. The findings demonstrate that teachers employ various strategies to enhance learners' understanding. A critical pedagogical approach that arose was code-switching. While the teachers were using English,

code-switching was often used. Classroom code-switching involves switching between different languages or linguistic codes during classroom interactions by teachers or learners (Lin, 2017). This practice is particularly significant in multilingual classrooms, as it facilitates comprehension by bridging the gap between the learners' home language and the language of instruction.

This study identifies two types of code-switching that were used by *Teacher A* and *Teacher C*, which were tag-switching and intra-sentential code-switching. Tag-switching involves inserting a single word or phrase, such as 'right', from one language into a sentence in another language without changing the structure of the sentence or breaking grammatical rules (Mubarak et al., 2022). It is usually used for emphasis or clarification. Intra-sentential code-switching occurs within a single sentence, seamlessly switching between languages without interruptions. For instance, 'the process of fertilisation e direga mo ovary' (happens in the ovary). This type of code-switching demonstrates a high proficiency in both languages, as the speaker needs to follow the grammatical rules of both languages simultaneously (Gerungan et al., 2021). These two types of code-switching showed a dynamic use of linguistic skills, used by teachers in a classroom for comprehension and engagement with the learners. *Teacher A* and *C's* classes had an alteration between English and the learner's mother tongue. This indicated that code-switching is a vital and effective tool used in ensuring access to concepts deemed complex. For *Teacher A*, code-switching primarily served as a tool for explanations and helped learners who struggle with the language of instruction to better understand challenging NSc. On the other hand, code-switching for *Teacher C* was employed to foster classroom interaction, such as back-and-forth questioning and answering about '*angiosperms*'.

The choice of *Teacher B* was the exclusive use of English, which has benefits. It is equally important for learners to feel included in the lesson by accommodating them with their home language, as they develop English proficiency. This indicates either a lack of awareness in *Teacher B* or an inability to speak the learners' home language as they stuck to the English language the entire lesson. Considering that *Teacher B* teaches in a class with EFAL learners using the English language only, it can inadvertently hinder comprehension of NSc for the learners who struggle with English. This points to the challenge of insufficient training for in-service teachers to be able to use LoLT to the maximum advantage of benefiting the learners through inclusive measures like code-switching.

5.3 Interview Discussion

Three (3) themes emerged from the analysis of the interviews, and only two (2) will be discussed in detail, as they are relevant to this study's objectives. These two (2) themes are: 'Instructional Resources' and 'Methods of Fostering English Proficiency in Multilingual Classrooms'. These themes provide critical insights into the strategies used in addressing inclusivity in the language of teaching and other classroom challenges.

5.3.1 Theme 1 Discussion

This theme (Instructional Resources and Methods) focuses on the pedagogical actions highlighted by teachers during the interviews as methods they consider inclusive and supportive for the learners, especially those struggling with the English language. According to the participants, these actions emphasise creating an inclusive environment that fosters understanding and engagement for all learner irrespective of existing language barriers. Each teacher demonstrated a different approach to teaching, yet they all aimed at making abstract concepts accessible to learners. The data reveals that teachers said they use:

- Asking questions
- Examples
- Drawings
- Demonstrations
- Recapping
- Videos
- Activity/worksheets
- Discussions
- Reading and writing of notes
- Corrections

During interviews, teachers have justified the use of the above strategies and have mentioned that these strategies are mindful of the diverse learning needs in their classrooms, particularly in addressing language. The use of examples, according to *Teacher A*, deepens learners' understanding of the subject. Observations revealed that *Teacher A* would make use of code-switching as she gives examples, particularly to close the language gap. This approach is consistent with Aubusson and Fogwill (2006), who argue that conceptual understanding in

science education can be greatly improved by using well-constructed examples, particularly when those examples relate to the learners' everyday experiences. Additionally, Setati and Adler (2002) emphasise the value of using learners' home language strategically to support learning in multilingual classrooms. By combining code-switching with concrete examples, Teacher A effectively fosters both cognitive and linguistic access to science content, validating the view that examples, when contextually relevant and linguistically inclusive, are essential tools in promoting understanding.

Teacher B believes in using visual aids as a way to help learners visualise concepts, some of which might be difficult for learners to grasp through text alone. This type of teaching is beneficial for visual or spatial learners **(**Gilakjani, 2017). *Teacher C*, on the other hand, makes use of a combination of visual and hands-on activities to engage learners more actively, as he described it during his interview. According to Gilakjani (2017), learners learn in various ways: visual learners rely on charts, graphs, and pictures, while auditory learners benefit from listening and reading. Kinaesthetic learners thrive through hands-on activities and practical experiences.

Moreover, *Teacher C* believes that keywords need to be written at the very beginning of each lesson, as they can be an excellent strategy for improving vocabulary retention, especially in science, where terms can be challenging. However, *Teacher C's* strategy is not backed by Kazeni and Maleka (2020), who criticise the propensity of teachers who have the tendency to use traditional methods of teaching, such as letting learners write down key words. According to their study, listing keywords without encouraging deeper engagement does not encourage active learning or comprehension. They suggest more interactive learner-centred activities that will allow learners to engage vigorously with the vocabulary rather than simply presenting words.

Engaging with the teachers' responses above, it is evident that teachers need to be meticulous in choosing pedagogical strategies that improve the understanding of science concepts while simultaneously addressing EFAL learners. In agreement with Tufial and Mahmood (2020), science teachers influence student learning by using a combination of teaching methods that encourage interest, conceptual understanding, and practical knowledge. This highlights the importance of adapting teaching approaches according to the needs of both the topic and the learners (Tufial & Mahmood, 2020). *Teacher B* mentioned how she uses visuals to support her

learners' learning of science concepts and, in the process, deals with the language issue by taking her learners to the lab.

Mubarak et al. (2022) contend that when teachers use media to overcome language obstacles, the teacher not only conveys what needs to be learnt but also improves the quality of learning English. Over time, learners even master pronunciation or vocabulary. Similarly, active learning, such as the use of hands-on activities (calling learners to the front for a demonstration or outdoor activities), improves retention of concepts, deepens understanding, and targets language learning (Aditia et al., 2024). By using various teaching methods, teachers strive to create inclusive classrooms that cater to diverse learning styles. This is particularly important in a diverse classroom where learners may have varying abilities. It also speaks to the teachers' flexibility and their awareness of the importance of adjusting their teaching methods to ensure all learners can engage with the content effectively.

5.3.2 Theme 2 Discussion

This theme (Fostering English Proficiency in Multilingual Classrooms) centres on the language used in the classroom. As discussed in the preceding chapters, the teaching of English in primary schools presents a significant challenge for educators, particularly when it comes to conveying NSc. Teachers often find themselves navigating the dual responsibility of instructing learners in scientific terms while simultaneously addressing their English language proficiency. *Teachers A, B*, and *C* offer a multi-faceted view of methods of teaching that they use in their classrooms when they are teaching NSc to EFAL learners. Each teacher's approach differs, and it reveals significant insights into teaching. *Teacher A* focuses more on differentiation through examples. *Teacher B,* without acknowledging whether or not she faces language challenges herself, in her response, points out systematic language barriers, highlighting that English is not the learners' mother tongue. *Teacher C* uses technology when learners struggle to understand NSc and code-switching, when necessary, despite not being fluent in the learner's mother tongue.

Looking at the teacher's responses, it is encouraging that teachers are highly aware of their learners' challenges and, according to what they have identified, implement what they deem necessary to close the gaps. Effective teaching goes beyond content delivery to ensure genuine understanding and engagement from learners. Technology plays an important role in ensuring

that education is inclusive and accessible to all learners. As seen from the teacher's responses, technology has enabled *Teachers A* and *B* to clarify difficult concepts while allowing *Teacher C* to incorporate it as part of classroom resources for independent learning. Such efforts from all three (3) teachers display the teachers' willingness to use inclusive practices tailored to their varying classroom contexts. However, despite the benefits of using technology, language remains a learning challenge. This is because English, which is meant to serve as a medium of instruction that is a common ground for all, often becomes a source of struggle for many learners. As *Teacher B* pointed out, this does point to larger systemic issues within education and needs urgent attention.

5.4 Conclusion

Chapter 5 delved into key themes, patterns, and trends that emerged from both lesson observations and interviews, shedding light on the alignment and divergence in teachers' approaches, the use of teaching aids, and the impact of language on learners' comprehension and engagement. Observations and interviews show a concerted effort by NS teachers to use various learning strategies that facilitate the learning process better. The goal is not only to enhance the understanding of NSc but also to address language barriers that may impact learning.

CHAPTER 6

FINDINGS, RECOMMENDATIONS, LIMITATIONS, AND CONCLUSION

6.1 Introduction

In light of the results in chapter 5, this chapter seeks to respond to the research questions and provide major findings of this study. It will draw attention to the findings about pedagogical practices, inclusive education, and teaching English as a first additional language (EFAL). This Chapter will address the limitations of the study, offer recommendations for future research practices, incorporate the researcher's reflection, and provide an overall conclusion.

6.2 Relating overall findings to the Research Questions

The main research question that was asked in this study is:

What Inclusive pedagogical actions do Grade 7 Natural Sciences teachers use to improve the understanding of Natural Sciences concepts in English First Additional Language learners?

Which was followed by the following research sub-questions:

i. How is the English language a challenge when teaching Natural Sciences to Grade 7 learners in the Senior Phase?
ii. What other challenges do teachers experience that specifically hinder the effective learning of Natural Sciences concepts for Grade 7 learners?
iii. In what ways do contextual factors (resources, overcrowding) influence the teaching of Natural sciences for Grade 7 learners?

To provide thorough insights and evidence-based conclusions for each of the study sub-questions, the results from Chapter 5 will be systematically utilised. This strategy ensures that each sub-question is carefully examined and addressed before synthesising the findings to address the main research question comprehensively. As such, the discussion of themes will be mobilised to give insights into the proposed research questions.

6.2.1 How is the English language a challenge when teaching Natural Sciences to Grade 7 learners in the Senior Phase?

Important insights into the challenges faced by EFAL learners can be gained from the examination of classroom language use from Theme 2 (Classroom Linguistic Practices) of the classroom observations. This extends into the strategies teachers used to help learners understand English language usage from Theme 2 (Fostering English Proficiency in Multilingual Classrooms) of the interviews. The data drawn from these two sources reveal an almost universal issue: the Language of Learning and Teaching (LoLT) seems to be a major sticking point for many EFAL learners. When probed during the interviews, teachers consistently brought up the language barrier as the number one problem. Most learners struggle with the language. They struggle to read for comprehension and understanding. As a result, their performance in class is compromised.

Therefore, the English language is a challenge as EFAL learners often have a limited comprehension of the language, making it difficult for learners to understand NSc and not be able to express themselves during the process of teaching and learning (Molwantoa et al., 2025). This also points out the fact that teachers are not equipped with language training in all South African official languages to address the inclusion needs for the diverse nature of South African classrooms (Savolainen et al., 2012). This can assist in practices like code-switching, where the mother tongue is incorporated to bridge language gaps during the teaching of NS as the need arises. This points to the findings of Theme 2, where the process of code-switching is known as a beneficial teaching strategy; however; it is limited to a specific teacher being able to speak the learners' native language in addressing the language needs (Vilakazi et al., 2024). Furthermore, the NS itself as a subject is authored in English. Thus, making it difficult to be translated into the learner's mother tongue, as there are many official languages (Mlanda & Mabasa, 2021). This speaks to the current matter of decoloniality, which is essential towards teaching our learners in a manner that they will succeed through transforming subjects like NS to be accommodating in language. However, the current efforts of teachers who participated in this study are valuable and show commendable attempts to rise above the challenges of language barriers in promoting inclusive classrooms in NS classes for Grade 7 learners.

6.2.2 What other challenges do teachers experience that specifically hinder the effective learning of Natural Sciences concepts for Grade 7 learners?

Analysing Theme 4 (Classroom Struggles: Teacher Perspectives) from the lesson observations and Theme 3 (Barriers to Science Learning) from the interviews indicates that teachers face plenty of challenges that affect effective teaching and learners' learning of NSc. The data from the findings show that language is not the only significant barrier for teachers. The lack of resources exacerbates the language challenges, putting the acquisition of NSc at risk. Teachers mentioned that they struggle with technological resources. This poses a threat to the quality of teaching (Chigona & Chigona, 2014). In the absence of technology and visual materials, teachers in this study must rely on drawings, the learners' textbooks, and their explanations. Furthermore, the lack of resources meant that 2-3 learners had to share a single computer while watching the video. The circumstances made it a tad impossible for every learner to stay engaged. Some learners would leave their seats to join their friends, causing disruptions in the classroom. As a result, effective teaching and learning are compromised.

The shortage of resources poses a critical challenge for teachers, especially in teaching NSc (Netshivhumbe & Mudao, 2021). It is difficult to address the language barrier when teaching science to EFAL learners and navigating through the lack of classroom resources. In such conditions, it becomes increasingly challenging for teachers to create an environment conducive to effective teaching (Gumede, 2019). Overcrowding has been identified as an impediment to teaching and learning, making it the third challenge after language and resources. It is certainly a national crisis that many teachers are facing, and it is a leading factor contributing to didactical neglect (West & Meier, 2020). This study reveals that in one of the teacher's classes, the teacher has 45 learners, including 7-8 learners who progressed (these are learners who moved to the next grade despite not meeting all academic requirements from the previous grade). With only 30 minutes allocated per lesson, teachers must juggle teaching, marking, assigning homework, and addressing individual learner needs. Despite the well-resourced and print-rich classrooms that some possess, overcrowding limits their ability to support learners effectively.

6.2.3 In what ways do contextual factors influence the teaching of science?

Contextual factors are aspects within teaching and learning that are considered to impede effective teaching and learning of concepts (Lucas et al., 2021). They include, but are not limited to, overcrowded classrooms, limited resources, physical environment, teacher workload, and time constraints. Teachers in this research study have underlined several deterrents to learning science concepts. Time is the primary issue addressed by this sub-question. Time is an important aspect of teaching; particularly, it is more important in a science classroom, where, with more time, teachers can have an added advantage in ensuring the mastery of some of the science concepts that learners struggle to grasp (Gumede, 2019). Time can also allow teachers to deal adequately with the issues of language. For instance, one teacher has expressed that she supports her learners' learning by providing extra NS activities that she gives learners to work on at the back of their workbooks. Nevertheless, she stresses that the school does not allocate time for this extra work.

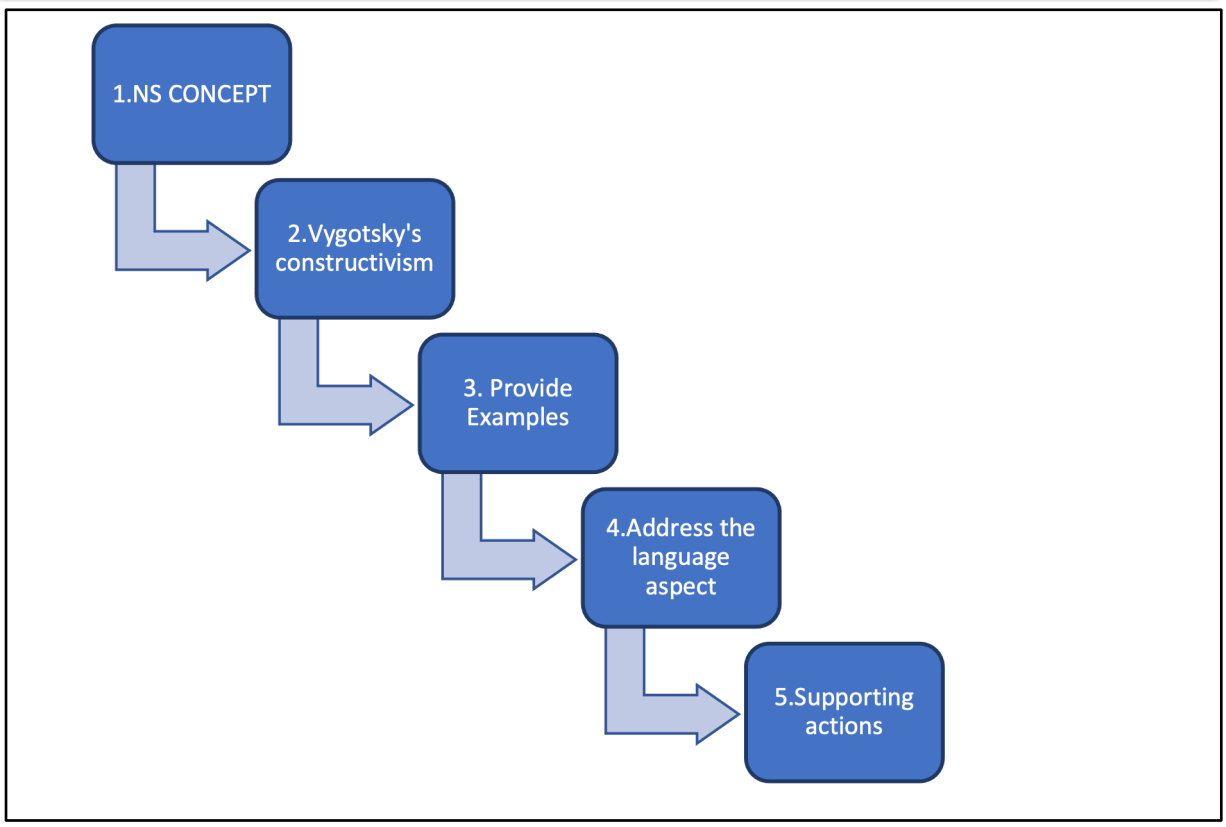
Time has a significant influence on the steps that can be taken during teaching. Teachers need time to introduce the science concept, connect the science concept to the learners' everyday knowledge, provide examples, address the language challenges, and finally incorporate supporting actions (Mdaka & Modiba, 2024). Successfully implementing these steps requires teachers to have thoughtful planning and sufficient time for execution. More time could go a long way in allowing teachers to address science concepts, especially in an EFAL class. With the teaching time (3 hours) allocated by the Department of Basic Education for NS in the Senior Phase per week, additional time would be necessary for targeted intervention. As noted by the participants, schools do not collaborate with teachers in alleviating the issues of time; instead, teachers have mentioned how they are expected to fulfil a range of other responsibilities outside of the classroom. These are activities such as attending workshops, administrative work, and marking, and they are still expected to support struggling learners.

6.2.4 Inclusive Pedagogical actions do Grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 township schools in Mohlakeng.

The four (4) themes - two (2) from lesson observations and two (2) from interviews - collectively provided insights into the teachers' pedagogical practices, underpinning the strategies, approaches, and challenges that shape their teaching methods. Themes 1 and 2 from

the lesson observations illustrate the methods that teachers employ during NS lessons, particularly in addressing language challenges. Similarly, Themes 1 and 2 from the interviews highlight what teachers assert they do in their classrooms to teach concepts effectively, including their strategies for teaching difficult concepts to learners who lack English proficiency. In the data collected, a diagram, **Diagram 1**, referred to as the 'pedagogical diagram', was developed by the researcher. This pedagogical diagram is a five (5) step-by-step approach that visually consolidates and represents the key findings that showcase connections between data and the main themes. **Diagram 1** gives insight into the derived pattern for the three (3) participant teachers in this study. It shows inclusive pedagogical action that teachers implement in teaching NS to Grade 7 learners who are EFAL in Mohlakeng township schools.

Diagram 1: Pedagogical Diagram



Discussion of Diagram 1: Pedagogical diagram

1. **Introduction of NS Concept:** In step 1, *Teachers A, B,* and *C* began by introducing the scientific concept to the learners in English. This introduction aimed to spark the learners' interest. This initial introduction from the teachers served as a foundation to help learners relate the new NSc to their prior knowledge while encouraging them to participate actively in the learning process.
2. **Vygotsky's Constructivism:** Vygotsky speaks about the interaction between scientific and everyday knowledge for cognitive development. He argues that teachers' role is to bridge the gap between these two types of knowledge (Rigopouli et al., 2025). In this study, teachers can be seen applying Vygotsky's principles through their inquest of questioning at the beginning of their lessons to find out what learners already know. At the time they can be seen breaking down scientific concepts and linking them to the learners' existing knowledge.
3. **Providing examples:** The third step is about examples where, during lesson observations, teachers would offer numerous examples to clarify concepts, making them relatable to learners' experiences. By providing examples, learners might be able to remember the NSc, allowing them to grasp abstract science concepts easily.
4. **Addressing the language aspect:** The pattern from the findings shows that once the NSc has been explained right at the beginning of the lesson, teachers typically shift their focus to addressing the language aspect. Code-switching is often used as a strategy to address the language gap during discussion or when a teacher is giving instruction. By code-switching, teachers enhance understanding of knowledge, improve classroom discussion, and foster an inclusive environment. It was evident during observations that learners were more comfortable expressing themselves in their home language.
5. **Supporting actions:** In the fifth and final step, to support the EFAL learners in their understanding of scientific concepts, teachers across the three schools implement various supportive actions that they deem necessary for their lessons. These include using charts, videos, and diagrams.

Consequently, the above **Diagram 1** shows a consistent teaching pattern followed by Grade 7 experienced Natural Sciences (NS) teachers. It shows a holistic view that inclusive pedagogical actions do not exist in isolation for NS classrooms. But effective practices of inclusive pedagogical actions require an interconnected system addressing different components of

learners' needs. This is visible in components or steps of **diagram 1,** such as probing learners' prior knowledge when introducing new scientific concepts, providing multiple examples, addressing language challenges using practices like code switching, and using visual aids to promote learning. This system is believed to promote productive learning within NS classes while being accommodating of language challenges currently existing in the South African context.

However, I acknowledge that the patterns emerging from this study from **diagram 1** cannot necessarily be generalised. This is because of limited empirical evidence to support this data, as the original collected data was only from three (3) teachers. Furthermore, it has not been tested nor verified by relevant research tools to reflect the same results in a similar natural sciences (NS) context. However, it provides a perspective that can be adopted by other studies to investigate outcomes when implementing the suggested steps for promoting inclusive pedagogical actions in NS classes with EFAL learners. The consideration of language practices is believed to instil learner understanding of NSc in a township context. Hence, I can confidently assert that the lesson observations underscored dynamic ways in which teachers adapt their teaching to meet the linguistic and cognitive needs of EFAL learners. This supports both their language development and science learning.

6.3 Significance of the findings in relation to Inclusive Education, EFAL teaching and Pedagogical Practices

A large body of research, such as Cele (2021) and Harefa (2024), has been published on NS, inclusion, overcrowding, and other related topics. Similarly, my research has delved deeply into these areas through lesson observations and scheduled interviews. **Diagram 1** stands as a true reflection of teacher patterns demonstrated by the teacher participants in my study. It accentuates how, in the context of EFAL teaching, teachers use creative methods to accommodate learners whose English skills may be limited. The diagram illustrates the use of code-switching as a teaching strategy once the teacher has introduced the NSc to the learners. The use of code-switching is crucial at this stage, as it is intentional, and it is there to ensure that content is understood effectively. This step in the diagram cannot be skipped, as teachers frequently find themselves in a conundrum about how to deal with language challenges in multilingual classrooms. By understanding the purposeful use of code-switching, the research provides insights into the navigation of language challenges while also trying to foster inclusivity. Code-switching should not be merely viewed as a teaching aid but as a crucial

pedagogical tool that, when used strategically, can assist learners in understanding concepts and enhancing academic success in an EFAL classroom.

From a pedagogical perspective, this research brings to light the resourcefulness and adaptiveness of teachers in finding innovative ways to work with diverse learners. Lesson observations continuously revealed that effective teaching lies in the teachers' ability to use resources that support and enhance the learning process. The developed pedagogical diagram emphasises this, particularly in Step 5, where the teacher incorporates supportive actions for comprehension and inclusivity purposes. This step plays a crucial role in consolidating the lesson and tailoring science concepts to meet learners' needs.

6.4 Recommendations

Based on the findings of the study, the researcher makes the following recommendations:

6.4.1 The Pedagogical Diagram

The researcher acknowledges that this proposed diagram for improving understanding of concepts in NS EFAL classrooms requires testing for efficacy through classroom-based research. Nevertheless, this diagram can be tested as a guiding model for teachers to improve their lessons by following the steps outlined to make science more accessible even for learners who do not have a high level of proficiency in the English language. As such, the study opens up the research floor to interested researchers whereby the order of these steps can be tested in a form of pre- and post-tests to evaluate the outcome of NSc development for learners in a township context. Such studies may add to this body of knowledge and contribute towards the necessary adjustment of the inclusive pedagogical action teaching strategy proposition.

6.4.2 Time

Time has been brought forth as a significant aspect in the teaching of science concepts in EFAL classes. Teachers in this study have attested to the challenge of adequately supporting their struggling learners through challenging concepts due to the issue of having limited lesson periods. The recommendation could be for schools to allocate additional time in their timetables for core subjects like natural sciences. This will be a great help to tackle those learning areas in science that learners struggle with, such as learning concepts and vocabulary.

Furthermore, schools providing additional time within the school schedule could mean having intervention periods where teachers can provide individualised support.

For future research and practice, testing and refining the proposed pedagogical diagram is needed by means of classroom-based research and testing. Secondly, providing additional lessons in the school timetable for natural sciences can be a way to combat the content and language issue. Lastly, it would be a great investment by the government to offer teachers professional development on how to manage overcrowded classrooms with limited resources and teach them how to offer language support teaching strategies in multilingual classes.

6.5 Implications of the Study

The findings of this study present several implications for teachers, curriculum planners, researchers, and school administrators, particularly in the context of teaching natural sciences to EFAL learners.

6.5.1 Implications of the Pedagogical Diagram

This study presents a pedagogical diagram that offers a structured model for EFAL natural sciences teachers to improve student understanding. According to Wilson et al. (2020), their modelling framework emphasises that using structured diagrams and visual tools helps make complex systems and abstract scientific ideas more understandable. Their research highlights how modelling fosters systems thinking, enhances conceptual clarity, and supports inclusive teaching via multimodal representations. Likewise, the pedagogical diagram in this study can assist teachers in scaffolding instruction by simplifying content, integrating language support strategies, and carefully sequencing lessons to promote cumulative understanding.

Furthermore, paralleling Wilson et al.'s (2020) recommendation for classroom-based testing through iterative feedback and adaptation, this study suggests that future researchers implement and assess the proposed diagram within real EFAL science classrooms. Such assessments could include measuring learner outcomes via pre- and post-tests, conducting classroom observations, and gathering teacher reflections. These implications also extend to teacher training programmes, which might incorporate this model into their curriculum to better prepare educators for multilingual and resource-limited settings. By combining a structured

pedagogical tool with explicit language support strategies, the model aims to foster more inclusive and effective teaching in township schools.

6.5.2 Implications of Time

This study identified limited teaching time as a significant challenge, particularly for teaching science to EFAL learners. Du Plessis and Mestry (2019) found that in under-resourced South African schools, time shortages hinder teachers' ability to scaffold content effectively, address individual learner needs, and implement inclusive strategies like code-switching or differentiated instruction. When English is not the learners' first language, the importance of time increases; teachers need adequate periods to introduce concepts, clarify terminology, relate content to real-life situations, and assess understanding.

This study strengthens the growing demand for systemic solutions to issues connected with time. A recommendation is that schools in multilingual and under-resourced areas set aside more time for key subjects such as natural sciences. Additionally, it would be effective for curriculum planners to re-evaluate how much subject content can be taught within limited timeframes. Drawing on Gumede's (2019) argument that intervention periods are necessary for consolidation and remediation in science education, the findings of this study suggest that follow-up teaching time could be used to remediate language challenges. All things considered, more time allocated to NS could play a pivotal role in improving learning outcomes in EFAL classrooms.

6.6 Limitations of the study

This study has several limitations. First and foremost, the sample size was relatively small, with only three (3) teachers and three (3) schools. As a result, the findings cannot be generalised to all schools in Gauteng West or South Africa. The findings provide an in-depth look at the language of teaching in science and the pedagogical actions of teachers, but due to the limited scope, variations across different schools in the district or provinces were not investigated. Vasileiou et al. (2018) suggest that when working with a qualitative sample size, it should be sufficiently large to provide a detailed and nuanced understanding of the phenomenon being studied, yet small enough to allow for in-depth analysis (Vasileiou et al., 2018).

Finally, this study is mainly interested in language used in science classes, i.e., it does not in great detail explore other variables that can be paramount in affecting inclusive education, for

example, socioeconomic aspects, parental involvement, and overpopulation in classrooms. All of these challenges heavily affect learners' learning processes and outcomes; therefore, their exclusion is a limitation of this study.

6.7 Personal Reflection

This research has greatly reassured me that I am not alone in facing challenges as a natural science teacher, particularly in a township school. The lesson observations and teacher interviews have shown that the difficulties extend beyond my personal experience and reveal much broader systemic challenges in schools. Observing the lessons, I have witnessed the dedication and efforts teachers strive to invest in delivering the best possible NS lessons to their learners, which was both inspiring and reassuring. Furthermore, the observations have not only shown me how tirelessly teachers work to create a conducive environment for their learners, but they have also provided me with invaluable insights into the intricate dynamics of NS classrooms. I now have a greater understanding of the challenges NS teachers face, especially in fostering inclusivity in resource-limited settings. In observing the creative strategies employed by teachers, such as simplifying complex concepts and overcoming barriers like language and overcrowding. I came to a soothing realisation that learners are indeed in good hands, and that inspires me to contribute meaningfully to the field of education.

6.8 Conclusion

This research report has successfully attempted to address the main research question it sought to investigate: inclusive pedagogical Grade 7 natural sciences teachers use to improve understanding of natural sciences concepts in EFAL learners in Mohlakeng Township. The use of qualitative methods has ensured reliable findings that have provided valuable insights into the strategies used by Grade 7 teachers in the Gauteng West district. Key methods of teaching that teachers were shown to use were code-switching, visual aids, examples, and interactive activities to reinforce science concepts, making learning accessible. These findings present several positive teaching practices. Further research still needs to be done regarding the pedagogical diagram presented in this research to further refine and strengthen inclusive pedagogy in the science classroom. As such, this is the contribution of this study to the large body of knowledge. I humbly conclude the study.

REFERENCES

Aditia, Y., Waluyo, U., Farmasari, S., & Soepriyanti, H. (2024). An Analysis of Teachers Use of Hands-On Instructional Media on Students' Engagement in The English for Young Learners' Classes (A Case Study at SDN 1 Terong Tawah). *Jurnal Ilmiah Profesi Pendidikan*, *9*(4), 3181-3187.

Adler, R. H. (2022). Trustworthiness in qualitative research. *Journal of Human Lactation*, *38*(4), 598-602.

Akabor, S., & Phasha, N. (2025). Where is Ubuntu in competitive South African schools? An inclusive education perspective. *International Journal of Inclusive Education*, *29*(3), 361-377.

Ainscow, M. (2005). Developing inclusive education systems: what are the levers for change?. *Journal of educational change*, *6*(2), 109-124.

Akpan, V. I., Igwe, U. A., Mpamah, I. B., & Okoro, C. O. (2020). Social Constructivism: Implications on Teaching and Learning. *British Journal of Education, 8*(8), 49-56.

Alam, A. (2023). Connectivism learning theory and connectivist approach in teaching and learning: a review of literature. *Bhartiyam International Journal Of Education & Research*, *12*(2), 1-15.

Alandeom, O. W., Brown, A. O., Su Zhang, W., LeBrun, P., Eaton, L., & Yemen, S. (2021). Fostering creativity in science learning: The potential of open-ended student drawing. *Teaching and Teacher Education, 105*, 1-12.

Alharahsheh, H. H., & Pius , A. (2019). A Review of key paradigms: positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences, 2*(3), 39-43.

Andrews, D., Walton, E., & Osman, R. (2021). Constraints to the implementation of inclusive teaching: a cultural historical activity theory approach. *International journal of inclusive education*, *25*(13), 1508-1523.

Ankomah, Y. A., Koomson, J. A., Bosu, R. S., & Oduro, G. K. (2005). A review on the concept of quality in education: Perspectives from Ghana. *Bristol: EdQual RPC*.

Anwaruddin, S. M. (2018). Translanguaging as transformative pedagogy: Towards a vision of democratic education. *Revista Brasileira de Linguística Aplicada*, *18*(2), 301-312.

Arends, F., & Fonseca, C. (2024). *Academic language and science learning: Challenges in South African classrooms*. Pretoria: Human Sciences Research Council.

Aubusson, P., & Fogwill, S. (2006). Using exemplars and analogies to support learning in science. In P. Aubusson, A. Harrison, & S. Ritchie (Eds.), *Metaphor and analogy in science education* (pp. 52‑64).

Aung , K. S., & Tepsuriwong, S. (2017). Lesson openings: How teachers begin lessons in an English class. *Online Proceedings of the International Conference: DRAL 3/19th ESEA*, 1-12.

Banda , P. (2023). Experiences of teaching Financial Literacy in Economic and Management Sciences: A case study of Grade 9 teachers in three selected schools in Hammarsdale, South Africa. 1-156.

Bangroo, I. S., & Amir, S. (2023). QUAVER: Quantum Unfoldment through Visual Engagement and Storytelling Resources. *arXiv preprint arXiv:2309.11511*.

Batra, P., Pillai, P., & Kaim, P. (2023). Quality education from teachers' perspective. *Research review international journal of multidisciplinary*, *8*(6), 44-52.

Bhandari, P. (2023). Ethical Considerations in Research: *Types and Examples* https://www.scribbr.com/methodology/research-ethics/

Bitenelkome, L. (2010). *Investigating the English language proficiency of Grade 4 pupils in two contexts* (Doctoral dissertation, University of Pretoria).

Blair, G., Coppock, A., & Humphreys, M. (2023). *Research design in the social sciences: declaration, diagnosis, and redesign*. Princeton University Press.

Boru , T. (2018). Chapter 5 Research Design and Methodology 5.1 Introduction Citation: Research Methodology . 1-41.

Bouzghaia, Y., & Bettiche, S. (2024). Teaching English as a Foreign Language in Early Childhood Education Investigating Teachers' Challenges and advantages*: The Case of Third Year Primary School Teachers in Tebessa* (Doctoral dissertation, Université du Martyr Cheikh Larbi Tebessi Tebessa).

Braun , V., & Clarke , V. (2006). Using thematic analysis in psychology. *3*(2), 77-101.

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA Handbook of Research Methods in Psychology, Vol. 2: Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological* (pp. 57–71). American Psychological Association.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589-597.

Brocki, J. M., & Wearden, A. J. (2006). A critical evaluation of the use of interpretative

Phenomenological analysis (IPA) in health psychology. Psychology & Health 21(1).

Buthelezi, P. Z. G. (2024). *The impact of intergrating the history of science into the teaching and learning of life sciences in the further education and training curriculum*(Doctoral dissertation, University of the Western Cape).

Byrne, D. (2022). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality and Quantity, 56*, 1391-1412.

Caravaca, R. V. (2019). Effective questioning in CLIL classrooms: empowering thinking. *ELT Journal , 73*(4), 367-376. Chew, S. (2021). Using Examples to Promote Learning. 1-7.

Cash, P., Isaksson, O., Maier, A., & Summers, J. (2022). Sampling in design research: Eight key considerations. *Design studies*, *78*, 101077.

Carrier, S. J. (2013). Elementary preservice teachers' science vocabulary: Knowledge and application. *Journal of Science Teacher Education, 24*(2), 405–425.

Cele, N. (2021). Understanding language policy as a tool for access and social inclusion in South African Higher Education: a critical policy analysis perspective. *South African Journal of Higher Education*, *35*(6), 25-46.

Charamba, E. (2021). Learning and language: Towards a reconceptualization of their mutual interdependences in a multilingual science class. *Journal of Multilingual and Multicultural Development*, *42*(6), 503-521.

Chigona, A., Chigona, W., & Davids, Z. (2014). Educators' motivation on integration of ICTs into pedagogy: case of disadvantaged areas. *South African Journal of Education*, *34*(3).

Churcher, K. M., Downs, E., & Tewksbury, D. (2014). "Friending" Vygotsky: A Social Constructivist Pedagogy of Knowledge Building Through Classroom Social Media Use. *The Journal of Effective Teaching, 14*(1), 33-50.

Coates, A. (2021). The prevalence of philosophical assumptions described in mixed methods research in education. *Journal of Mixed Methods Research*, *15*(2), 171-189.

Condy, J., & Blease, B. (2014). What challenges do foundation phase teachers experience when teaching writing in rural multigrade classes? *South African Journal of Childhood Education, 4*(2), 36–56.

Cummins, J. (2000). *Language, power and pedagogy: Bilingual children in the crossfire*. Multilingual Matters.

Daodu, M., Elegbede, C., & Adedotun, O. (2024). Effectiveness of Constructivism Theory of Learning as 21st Century Method of Teaching. *Journal of Advanced Psychology*, *6*(2).

Dawadi, S. (2020). Thematic Analysis Approach: A Step by Step Guide for ELT Research Practitioners. *Nepal English Language Teachers' Association, 25*(1-2), 62-71.

Deehan, J., MacDonald, A., & Morris, C. (2024). A scoping review of interventions in primary science education. *Studies in Science Education*, *60*(1), 1-43.

Department of Basic Education (DBE) (2001). Education White Paper 6. *Building an Inclusive Education and Training System* , 3-52.

Department of Basic Education (DBE) (2011). Curriculum Assessment Policy Statement. *National Curriculum Statement (NCS)*, 1-40.

Department of Basic Education. (2023). *PIRLS 2021: South African Preliminary Highlights Report*. Department of Basic Education: Pretoria.

De Wet, C. (2002). Factors influencing the choice of English as the language of learning and teaching (LoLT) - a South African perspective. *South African Journal of Education, 22*(2), 199-124.

Du Plessis, P., & Mestry, R. (2019). Teachers for rural schools–a challenge for South Africa. *South African Journal of Education*, *39(1)*.

Elkhayma, R. (2022). English as a Medium of Instruction: Exploring Benefits and Challenges in the 21st Century. *Jurnal Arbitrer, 9*(2), 158-163.

Engelbrecht, P., Nel, M., Nel, N., & Tlale, D. (2015). Enacting understanding of inclusion in complex contexts: Classroom practices of South African teachers. *South African Journal of Education*, *35*(3).

Erbil, D. G. (2020). A Review of Flipped Classroom and Cooperative Learning Method Within the Context of Vygotsky Theory. *Frontiers in Psychology, 11*(1157), 1-9.

Esen, S. (2019). Code switching: Definition, types, and examples. *Retrieved on*, *14*.

Evans , R., & Nthulana, I. (2018). Linguistic challenges faced by rural Tshivenda-speaking teachers when Grade 4 learners transition to English. *The Journal for Transdisciplinary Research in Southern Africa, 14*(2), 1-9.

Eyitayo, J. A. (2022). Exploring the Nature, and Teachers' Understanding, of the National Curriculum Statement (NCS, Grades R–12): Navigating the Changing Landscape of Science Education Through the Curriculum Assessment and Policy Statement (CAPS) in Post-Apartheid South Africa. In *Complexity and Simplicity in Science Education* (pp. 11-35). Cham: Springer International Publishing.

Farrugia , M. T. (2021). From everyday to scientific (mathematical) concepts: A Vygotskian interpretation of a young child's speech. *AIEM - Avances de Investigación en Educación Matemática, 19*, 86-99.

Fleisch, B., Pather, K., & Motilal, G. (2017). The patterns and prevalence of monosyllabic three-letter-word spelling errors made by South African English First Additional Language learners. *South African Journal of Childhood Education, 7*(1), a481.

Friesen, N., & Su, H. (2023). What is pedagogy? Discovering the hidden pedagogical dimension. *Educational Theory*, *73*(1), 6-28.

Flood, V. J. (2018). Multimodal Revoicing as an Interactional Mechanism for Connecting Scientific and Everyday Concepts. *Human Development*, 145-173.

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*(23), 8410–8415.

García, O., & Wei, L. (2014). *Translanguaging: Language, bilingualism and education*. Palgrave Macmillan.

Geofrey, M. (2021). Children's prior knowledge is very important in Teaching and learning in this era of constructivism. 1-6.

Gerungan, F. N., Olii, S. T., & Andries, F. (2021). An analysis of code switching used in classroom. *Journal of English Language and Literature Teaching*, *5*(1).

Gilakjani, A. P. (2012). Visual, auditory, kinaesthetic learning styles and their impacts on English language teaching. *Journal of studies in education*, *2*(1), 104-113.

Ginting, D. (2021). Student engagement and factors affecting active learning in English language teaching. *Voices of English Language Education Society*, *5*(2), 215-228.

Granström, M., Eisenschmidt, E., & Kikas, E. (2023). Classroom observations: How do teachers teach learning strategies? *Frontiers in Education*, 1-13.

Gumede, S. C. (2019). *Teachers' Experiences of Teaching Natural Sciences and Technology to English First Additional Language Grade Four Learners* (Doctoral dissertation, University of KwaZulu-Natal, Edgewood).

Harefa, D. (2024). Strengthening Mathematics and Natural Sciences Education based on The Local Wisdom of South Nias: Integration of Traditional Concepts in Modern Education. *HAGA: Jurnal Pengabdian Kepada Masyarakat*, *3*(2), 63-79.

Hasja, Y., Halim, A., & Musman , M. (2020). The development of students' worksheets based on a scientific approach on the heat transfer concept . *Journal of Physics*, 1-6.Hassan, F. N. A., Mohamad, Q. A., & Azuddin, S. K. Y. (2020). The implementation of higher

order thinking skills (HOTS) in Malaysia secondary school: post PISA 2009. *International Journal of Psychosocial Rehabilitation*, *24*(5), 5510-5517.

Hwang, H. J. (2023). The importance of anonymity and confidentiality for conducting survey research. *Journal of Research and Publication Ethics*, *4*(1), 1-7.

Hye-Gyoung , Y., Mijung, K., & Eun , A. (2021). Visual Representation Construction for Collective Reasoning in Elementary Science Classrooms. *Education Sciences, 11*(246), 1-18.

Isaacs, D., & Olvitt, L. (2016). An Exploration of what Grade 7 Natural Sciences Teachers Know, Believe and Say about Biodiversity and the Teaching of Biodiversity. *Teaching and Learning for Change*, 66.

Jamieson, M., Talbot, K., Horie, C., & de Visser, T. R. (2023). Reflexivity in quantitative research: A rationale and beginner's guide. *Social and Personality Psychology Compass, 17*(5)

Johansen, G., Bjønness, B., & Rocksén, M. (2018). The use of examples in school science: Developing an analytical tool to enable a discussion in science teacher education. *Nordic Studies in Science Education, 14*(2), 221-236.

Kakilla, C. (2021). Strengths and Weaknesses of Semi-Structured Interviews in Qualitative Research: A Critical Essay. 1-6.

Kang , E., & Hwang, H. (2023). The Importance of Anonymity and Confidentiality for Conducting Survey Research. *Journal of Research and Publication Ethics, 4*(1), 1-7.

Karvonen, H. (2017). English as a medium of instruction; Benefits and Challenges as Viewed By Founders of International Schools in Ethiopia. 1-50.

Kapur, R. (2020). Understanding the meaning and significance of pedagogy. *Understanding the Meaning and Significance of Pedagogy. Date*, *11*, 2021.

Kasim, U., Muslem, A., & Mustafa, F. (2019). Differences in English Proficiency Test Scores between Students of Social and Natural Sciences. *International Journal of Instruction, 12*(1), 479-492.

Kazeni, M., & Maleka, M. (2020). Strategies used by Grade Four educators to decode science terminology: A case study.

King, C. (2018). *Exploring the use of visual aids as tool to understanding subject specific terminology in life sciences*(Doctoral dissertation, Stellenbosch: Stellenbosch University).

Kouicem, K. (2020). Constructivist Theories of Piaget and Vygotsky: Implications for Pedagogical Practices. *Psychological & Educational Studies, 13*(3), 359-372.

Krajcik, J. S., & Czerniak, C. M. (2018). *Teaching science in elementary and middle school: A project-based learning approach*. Routledge.

Kubli, F. (2005). Science teaching as a dialogue–Bakhtin, Vygotsky and some applications in the classroom. *Science & Education*, *14*(6), 501-534.

Kulgemeyer, C., & Riese, J. (2018). From professional knowledge to professional performance: The impact of CK and PCK on teaching quality in explaining situations. *Journal of Research in Science Teaching*, *55*(10), 1393-1418.

Lebona, T. G. (2015). *The implementation of inclusive education in primary schools in the Lejweleputswa education district* (Doctoral dissertation, Welkom: Central University of Technology, Free State).

Leijen, Ä., Arcidiacono, F., & Baucal, A. (2021). The dilemma of inclusive education: inclusion for some or inclusion for all. *Frontiers in Psychology*, *12*, 633066.

Lenyai, E. (2011). First additional language teaching in the foundation phase of schools in disadvantaged areas. *South African Journal of Childhood Education, 1*(1), 68-81.

Levy, P. E., Thibodeau, R. K., & Tseng, S. T. (2020). Giving better feedback in the classroom. *Industrial and Organizational Psychology, 13*, 572-576.

Lin, A. (2017). Code-Switching in the Classroom: Research Paradigms and Approaches. 1-16.

Llosa, L., Lee, O., & Van Booven , C. D. (2015). Teaching content standards to English language learners: Elementary science teachers' use of language development and home language strategies. 1-25.

Lohfeld , L. (2002). Revisiting the Quantitative-Qualitative Debate: Implications for Mixed-Methods Research. 43-53.

Löhr, G. (2022). What Are Abstract Concepts? On Lexical Ambiguity and Concreteness Ratings. *Review of Philosophy and Psychology, 13*, 549-566.

Lucas, M., Bem-Haja, P., Siddiq, F., Moreira, A., & Redecker, C. (2021). The relation between in-service teachers' digital competence and personal and contextual factors: What matters most?. *Computers & Education*, *160*, 104052.

Mabitla , R. H. (2020). Pedagogical Practices in Grade 7 Science Classroom: A Case of Primary Schools in the Morake Circuit. 1-132.

Maffea, J. (2020). Lack of resources in classrooms.

Magashoa, T. (2017). The Impact of English as Language of Learning and Teaching in Primary Schools: A Case Study of the Gauteng Province. *International Journal of Educational Sciences, 17*(1-3), 173-179.

Makalela, L. (2015). Ubuntu translanguaging: An alternative framework for complex multilingual encounters. *Language and Education, 29*(3), 200–217.

Makgabo, C., & Modise, P. M. (2020). Linguistic challenges faced by Grade 7 Setswana learners when writing Science examinations in English. *Journal for Language Teaching*, *54*(2), 35-51.

Makoni, R. (2016). *The relationship between mother tongue and English second language learning strategies*. University of the Witwatersrand, Johannesburg (South Africa).

Malebese, M. L. (2017). A socially inclusive teaching strategy: A pedagogical response to the language needs of Grade 4 learners in a South African school. *Cogent Education, 4*(1), 1‑10.

Maluleke, M. J., Klu, E. K., & Demana, V. N. (2020). The Impact of Using Code Alternation in Teaching Life Science to English First Additional Language learners in South African schools. *Academic Journal of Interdisciplinary Studies, 6*(9), 175-183.

Mamabolo, J. M. (2021). Challenges faced by teachers in the implementation of curriculum changes for primary schools: The case of Mamabolo Circuit, South Africa. *African Perspectives of Research in Teaching and Learning*, *5*, 15-23.

Mampane, M. R. (2020). Academic resilience of adolescents in township school contexts of poorly implemented inclusive education policy.

Markula, A., & Aksela, M. (2022). The key characteristics of project-based learning: how teachers implement projects in K-12 science education. *Disciplinary and Interdisciplinary Science Education Research*, *4*(1), 2.

Martin, D. A., Conlon, E., & Bowe, B. (2021). Using case studies in engineering ethics education: The case for immersive scenarios through stakeholder engagement and real life data. *Australasian Journal of Engineering Education*, *26*(1), 47-63.

Maryam, B., Sören, H., & Gunilla, L. (2020). Putting scaffolding into action: Preschool teachers' actions using interactive whiteboard. *Early Childhood Education Journal*, *48*, 79-92.

Maseko, K., & Mkhize, D. N. (2021). Translanguaging mediating reading in a multilingual South African township primary classroom. *International Journal of Multilingualism*, *18*(3), 455-474.

Mavuru , L., & Ramnarain , U. (2017). Teachers' Knowledge and Views on the Use of Learners' Socio-cultural Background in Teaching Natural Sciences in Grade 9

Township Classes. *African Journal of Research in Mathematics, Science and Technology Education*, 1-12.

Mavuru, L. & Ramnarain, U. (2020). *Language affordances and pedagogical challenges in multilingual Grade 9 Natural Sciences classrooms in South Africa*. *International Journal of Science Education*, 42(14), 2472‑2492.

Mavuru, L., & Shubani , M. (2022). English Second Language Learners' Challenges in Comprehending Physical Sciences Concepts . *Education and New Developments*, 320-324.

McLeod , S. (2024). Constructivism Learning Theory & Philosophy of Education. *Simply Psychology* , 1-13.

McLeod, S. (2024). Vygotsky's Zone of Proximal Development. *Simply Psychology. https://www. simplypsychology. org/zone-of-proximal-development. html*.

Mdaka, M. J., & Modiba, M. (2024). Instructional time as social time: Teachers' curriculum literacy and expertise in teaching mathematics. *South African Journal of Education, 44*(2), 1‑8.

Mdaka, M., Modiba, M., & Ndlovu, P. (2023). Teachers' curriculum literacy and expertise in teaching mathematics. *Journal of Educational Research and Practice, 13*(1), 1–15.

Meier, C., & West, J. (2020). Overcrowded classrooms–the Achilles heel of South African education?. *South African Journal of Childhood Education*, *10*(1), 1-10.

Mlanda, T. C., & Mabasa, L. T. (2021). *Mother tongue education in teaching mathematics and life skills in the Foundation Phase: Teachers' experiences in the uThungulu District*. *South African Journal of Childhood Education, 11*(1), 1–10.

Mofolo, S. B. O. (2021). *Comparative analysis of representations in natural sciences textbooks and senior phase curriculum and assessment policy statement* (Doctoral dissertation, University of the Free State).

Mokala, N., Mtanha-Matariro, M., & Makalela, L. (2025). *Teaching African languages through digital platforms: A pedagogical model for enhanced learning*. In *Proceedings of the 19th International Technology, Education and Development Conference,* 1817–1821.

Mokaleng , M., & Möwes, A. D. (2020). Issues Affecting the Implementation of Inclusive Education Practices in Selected Secondary Schools in the Omaheke Region of Namibia. *Journal of Curriculum and Teaching, 9*(2), 1-13.

Mokikwa, H., & Mokhele-Ramulumo, M. (2024). Navigating language diversity in multilingual stem classrooms: strategies for inclusive education. *International Education Trend Issues*, *2*(2), 92-106.

Molobela , T. T. (2023). Politics-Administration Dichotomy: Navigating through the Conundrum of the Politics-Administration Interface in South African Municipalities. *African Renaissance, 20*(4), 161-184.

Molnár, Z., Gyuris, Á., Radács, M., Nemes, P., Bátori, I., & Gálfi, M. (2023). Complex natural science and the challenges of its education in the 21st century . *Cogent Education*, 1-14.

Molwantoa, A., Olifant, F. M., & Cekiso, M. P. (2025). Exploring Grade 8 English First Additional Language learners' reading comprehension challenges. *Reading & Writing: Journal of the Literacy Association of South Africa, 16*(1), 1-9.

Moroi , T. (2020). Quantitative and Qualitative Research and Philosophical Assumptions. *TESOL, Educational Psychology*, 127-132.

Mountstevens, L. (2021). Linking abstract and concrete knowledge in science learning. *Journal of Science Education and Technology, 30,* 456–468.

Mpu , Y., & Adu , E. O. (2021). The Challenges of Inclusive Education and its implementation in schools: The South African Perspective *Perspectives in Education, 39*(2), 225-298.

Msimanga, A., Denley, P., & Gumede, N. (2017). The pedagogical role of language in science teaching and learning in South Africa: A review of research 1990–2015. *African Journal of Research in Mathematics, Science and Technology Education*, *21*(3), 245-255.

Msipha, M., & Mavuru, L. (2022). The Impact of Scientific Language on the Teaching and Learning of Grade 7 Natural Sciences. 1-5.

Mthethwa, L., & Thobakgale, T. (2020). A language policy shift at a multilingual township school in Gauteng. *South African Journal of Childhood Education, 10*(1), 1–10.

Mubarak, M. Z., Dewi, U., & Siregar, D. (2022). The use of code-switching by teachers in classroom interaction at Man 2 Model Medan. *Vision Journal, 18*(2), 149-165.

Mudaly, V., & Singh, K. (2018). LANGUAGE: A barrier when teaching and learning business studies. *International Journal of Sciences and Research, 74*(9/1), 56-71.

Muzari, T., Shava, G. N., & Shonhiwa, S. (2022). Qualitative research paradigm, a key research design for educational researchers, processes and procedures: A theoretical overview. *Indiana Journal of Humanities and Social Sciences*, *3*(1), 14-20.

Mwita , K. (2022). Strengths and weaknesses of qualitative research in social science studies. *International Journal of Research in Business and Social Science* , 619-625.

Naeem , M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. *International Journal of Qualitative Methods, 22*, 1-18.

Naimah , A. (2022). The Use of Video as a Learning Media in Science Learning (A Systematic Review). *Al-Ishlah: Jurnal Pendidikan, 14*(4), 6941-6920.

National Education Collaboration Trust. (2019). *NECT Annual Report 2019*. NECT.

Ndimande, B. S. (2016). School choice and inequalities in post-apartheid South Africa. *Global Education Review, 3*(2), 33‑49.

Negi, S. (2023). Constructivist Approach of Vygotsky for Innovative Trends in Learning and Teaching. 1-9.

Nelis, P., Pedaste, M., & Šuman, C. (2023). Applicability of the model of inclusive education in early childhood education: a case study. *Frontiers in Psychology*, *14*, 1120735.

Netshivhumbe, N. P., & Mudau, A. V. (2021). Teaching challenges in the senior phase natural sciences classroom in South African schools: a case study of Vhembe district in the Limpopo province. *Journal for the Educational Gifted Young Scientists, 9*(4), 299-313.

Newton, D. P., Newton, L. D., & Abrams , P. (2018). A Study of Children's Classroom Questions in Relation to Elementary Science Teaching. *International Journal for Talent Development and Creativity, 6*(1), 39-50.

Nickerson, C. (2022). Interpretivism paradigm & research philosophy. *Simply Sociology*, *5*, 1-16.

Ngema , M. H. (2016). Factors that cause poor performance in Science Subjects at Ingwavuma Circuit. 1-193.

Nguyen, H., & Chu, D. (2022). Recapping: effective pedagogy to ensure inclusivity and optimise learning and teaching experiences. *Compass Journal of Learning and Teaching, 15*(2), 1-16.

Ntuli , T. G., Mudau, V. A., & Nkanyani , T. E. (2022). The influence of instructional strategies on natural science teachers teaching practices in rural classrooms. *International Journal of Research in Business and Social Science*, 258-266.

Nurhuda, A., Al Khoiron, M. F., Azami, Y. S. I., & Ni'mah, S. J. (2023). Constructivism Learning Theory in Education: Characteristics, Steps and Learning Models. *Research in Education and Rehabilitation*, *6*(2), 234-242.

Olmsted, J. (2024). Research Reliability and Validity: Why do they matter?. *American Dental Hygienists' Association*, *98*(6), 53-57.

Pathan, H., Memon, R. A., Memon, S., Khoso, A. R., & Bux, I. (2018). A critical review of Vygotsky's socio-cultural theory in second language acquisition. *International Journal of English Linguistics*, *8*(4), 232.

Pavlenko, A. (2002). Bilingualism and identity: The case of Russian-speaking women in the United States. In P. Auer & L. Wei (Eds.), *Handbook of bilingualism* (pp. 489–514). Blackwell.

Petruţa, G. P. (2015). Formation of some concepts of natural sciences during primary education. *Procedia-Social and Behavioral Sciences*, *180*, 688-695.

Pius, M. S. (2019). Exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. 1-136.

Powell , K. C., & Kalina , C. J. (2009). Cognitive and Social Constructivism: Developing tool for an effective classroom. *130*(2), 241-250.

Prado-Yépez, L. E., Mayorga-Benavides, W. S., Román-Jaramillo, M. A., & Arévalo-Arteta, M. J. (2021). Pedagogical analysis of Flipped Classroom method in the Development of Reading Comprehension and Oral Production in the English language. *Revista Publicando, 8*(30), 67-86.

Probyn, M. (2006). Language and learning science in South Africa. *Language and education*, *20*(5), 391-414.

Priya, A. (2021). Case study methodology of qualitative research: Key attributes and navigating the conundrums in its application. *Sociological Bulletin*, *70*(1), 94-110.

Putri, N. D., Wardana, K. I., & Joni, W. D. (2024). The significance of teacher correction on student confidence and writing achievement. *Jurnal Santiaji Pendidikan, 14*(1), 66-76.

Quigley, M. T. (2021). Concrete Materials in Primary Classrooms: Teachers' Beliefs and Practices about How and Why They Are Used. *Mathematics Teacher Education and Development*, *23*(2), 59-78.

Quillin, K., & Thomas, S. (2015). Drawing-to-Learn: A Framework for Using Drawings to Promote Model-Based Reasoning in Biology. *CBE–Life Sciences Education, 14*, 1-16.

Rahmania, I. (2021). Project based learning (PjBL) learning model with STEM approach in natural science learning for the 21st century. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *4*(1), 1161-1167.

Rahmawati, Y., Zulhipri, Hartanto, O., Falani, I., & Iriyadi, D. (2022). Students' conceptual understanding in chemistry learning using PhET interactive simulations. *Journal of Technology and Science Education, 12*(2), 303–326

Raphothe, P. N. (2022). Natural Sciences Teachers' Views on Indigenous Knowledge and How to Use it in Teaching and Learning in South African Classrooms. 1-120.

Raven, S., & Wenner, J. A. (2023). Science at the center: Meaningful science learning in a preschool classroom. *Journal of Research in Science Teaching*, *60*(3), 484-514.

Rehman , Z., Bashir , I., & Rehman , A. R. (2020). An exploration of teachers' code-switching: The case of English language classroom. *Competitive Social Science Research Journal, 1*(2), 54-71.

Reagan, T. (2020). A twelfth official language? The constitutional future of South African Sign Language. *Southern African Linguistics and Applied Language Studies*, *38*(1), 73-85.

Rigopouli, K., Kotsifakos, D., & Psaromiligkos, Y. (2025). Vygotsky's Creativity Options and Ideas in 21st-Century Technology-Enhanced Learning Design. *Education Sciences*, *15*(2), 257.

Robinson, C. (2024). Ethical considerations of children's involvement in school-based research: balancing children's provision, protection, and participation rights. *Research Ethics*, 1747016124127287

Roehrig, G. H., Dare, E. A., Ring-Whalen, E., & Wieselmann, J. R. (2021). Understanding coherence and integration in integrated STEM curriculum. *International Journal of STEM Education*, *8*, 1-21. 20

Rose, S., & Van Dulm, O. (2006). Functions of code switching in multilingual classrooms. *Per Linguam: a Journal of Language Learning= Per Linguam: Tydskrif vir Taalaanleer*, *22*(2), 1-13.

Roux, K., Van Staden, S., & Tshele, M. (2023). *Progress in International Reading Literacy Study 2021: South African main report*. Department of Basic Education.

Ruslin, R., Mashuri, S., Rasak, M. S. A., Alhabsyi, F., & Syam, H. (2022). Semi-structured Interview: A methodological reflection on the development of a qualitative research instrument in educational studies. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, *12*(1), 22-29.

Sahabuddin, E. S., Liskawati, & Syamsiah. (2023). Teaching Science through Demonstrations: An innovative approach to improve students' environmental Science Literacy. *Klasikal: Journal of Education, Language Teaching and Science, 5*(1), 138-147.

Saladi, V. S. (2024). *Using lesson starters in science teaching*. https://doi.org/10.13140/RG.2.2.32017.85604

Saleem, A., Kausar, H., & Deeba, F. (2021). Social constructivism: A new paradigm in teaching and learning environment. *Perennial journal of history*, *2*(2), 403-421.

Sam, R. (2024). Factors causes students low English language learning: A case study in the National University of Laos. *Available at SSRN 4850858*.

Sancheti, P. (2024). Language and science: Some problems and solutions. In *Roadmap for Humanities and Social Sciences in STEM Higher Education* (pp. 131-146). Singapore: Springer Nature Singapore.

Sarifa, N., & Jabeen, R. (2024). Challenges and Predicaments in Teaching "English for Science" in an ESP Classroom: A Research Study to Pinpoint Problems and Solutions. *International Journal of English Language Teaching, 12*(1), 80-89.

Savolainen, H., Engelbrecht, P., Nel, M., & Malinen, O. P. (2012). Understanding teachers' attitudes and self-efficacy in inclusive education: implications for preservice and in-service teacher education. *European Journal of Special Needs Education, 27*(1), 51‑68.

Seabela, M. M., & Ncanywa, T. (2024). Code-switching as a pedagogical practice for senior phase teachers teaching content subjects in OR-Tambo district. *African Journal of Teacher Education and Development*, *3*(1), 39.

Semeon, N., & Mutekwe, E. (2021). Perceptions about the use of language in physical science classrooms: A discourse analysis. *South African Journal of Education, 41*(1), 1–12.

Setati, M., & Adler, J. (2002). Between languages and discourses: Language practices in primary multilingual mathematics classrooms in South Africa. *Educational Studies in Mathematics, 43*(3), 243‑269.

Setati, M. (2008). Access to mathematics versus access to the language of power: The struggle in multilingual mathematics classrooms. *South African Journal of Education, 28*(1), 103‑116.

Stott, A., & Beelders, T. (2019). The influence of science reading comprehension on South African township learners' learning of science. *South African Journal of Science*, *115*(1-2), 1-9.

Shah, M. A. (2022). Teachers as reflective practitioners: From individualism to Vygotskian social constructivism. *Alberta Journal of Educational Research*, *68*(3), 297-307.

Shah, R. K., & Campus, S. (2021). Conceptualizing and defining pedagogy. *IOSR journal of research & method in education*, *11*(1), 6-29.

Shanmugavelu, G., Ariffin, K. B., Vadivelu, M., Mahayudin, Z., & Sundaram, M. A. (2021). Questioning Techniques and Teachers' Role in the Classroom. *Shanlax International Journal of Education, 8*(4), 45-49.

Sharma , R., & Shukla , S. (2023). Constructivist Approach in Education: Projecting the insights of Piaget and Vygotsky into future. *International Journal and Research Culture Society, 7*(3), 79-84.

Shivolo, T., & Mokiwa, H. O. (2024). Teaching experiences connected to the implementation of inquiry-based practical work in primary science classrooms. *Journal of Education in Science, Environment and Health, 10*(2), 129–145

Sileyew, K. J. (2019). *Research design and methodology* (pp. 1–12).

Siregar, A. S. B., Tobing, E. G. L., & Fitri, N. R. (2021). Developing of teaching materials: using animation media to learning English vocabulary for early childhood. *ETDC: Indonesian Journal of Research and Educational Review*, *1*(1), 9-16.

Smit , N., Van Dijk, M., De Bot, K., & Lowie, W. (2022). The complex dynamics of adaptive teaching: observing teacher-student interaction in the language classroom. *60*(1), 23-40.

Sol, K., & Heng, K. (2022). Understanding epistemology and its key approaches in research. *Cambodian Journal of Educational Research*, *2*(2), 80-99.

Spaull, N., & Pretorius, E. J. (2013). Reading in South Africa: Progress and challenges. In N. Spaull & L. Taylor (Eds.), *South African schooling: The enigma of inequality* (pp. 139‑154).

Stahl , N. A., & King , J. R. (2020). Expanding Approaches for Research: Understanding and Using Trustworthiness in Qualitative Research. *Journal of Developmental Education* , 26-28.

Stratton, S. J. (2024). Purposeful sampling: advantages and pitfalls. *Prehospital and disaster medicine*, *39*(2), 121-122.

Stears, M. (2008). Learning science in the foundation phase: Children's conceptual development and teachers' instructional strategies. *African Journal of Research in Mathematics, Science and Technology Education, 12*(1), 31–44.

Sumrin, S., & Gupta, S. (2021). Establishing validity and reliability in case study research projects. In *The Routledge companion to marketing research* (pp. 119-131). Routledge.

Swart, S., Reyneke, E. M., Romylos, S., & Dudu, W. (2024). Physical science teachers' use of reading strategies in a South African context. *Per Linguam: a Journal of Language Learning= Per Linguam: Tydskrif vir Taalaanleer*, *40*(1), 56-74.

Taber, K. S. (2018). Scaffolding learning: Principles for effective teaching and the design of c classroom resources. *Effective Teaching and Learning: Perspectives, Strategies and Implementation*, 1-24.

Taherdoost , H. (2021). Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. *International Journal of Academic Research in Management (IJARM), 10*(1), 10-38.

Temesgen, A., & Hailu, E. (2022). Teachers' codeswitching in EFL classrooms: Functions and motivations. *Cogent Education*, *9*(1), 2124039.

Tewfail, I., Cheng, M. M., & Eames, C. (2022). Science teachers' teaching actions in their classrooms: Pedagogical content knowledge and skills. *Journal of Science Education, 4*(1), 41-56.

Tobón, S., Juárez-Hernández, L. G., Herrera-Meza, S. R., & Núñez, C. (2021). Pedagogical practices: Design and validation of SOCME-10 rubric in teachers who have recently entered basic education. *Psicología Educativa. Revista de los Psicólogos de la Educación*, *27*(2), 155-165.

Torff, B., & Murphy, A. F. (2020). Teachers' beliefs about English learners: Adding linguistic support to enhance academic rigor. *Phi Delta Kappan*, *101*(5), 14-18.

Tufail, I., & Mahmood, M. K. (2020). Teaching methods preferred by school science teachers and students in their classroom. *International Journal of Teaching, Education, and Learning*, *4*(2), 332-347.

University College Dublin (2021). Informed Consent in Research: *Research Ethics* https://www.ucd.ie/researchethics/

Uugwanga , J. S. (2020). The effects of Authentic Learning Activities on achievements and attitude toward Natural Science among grade 7 learners in Khomas and Omusati Educational Regions . 1-285.

Valencia , R. A., Reyes, M. E., Puelles, E. Y., & Valdiviezo, J. M. (2023). Effectiveness Associated with Learning with Video and Multimedia Content in Engineering Students' Classroom Sessions. *Journal of Higher Education Theory, 23*(19), 271 - 284.

Van Laere, E., Van Braak , J., & Aesaert, K. (2014). The Role of Students' Home Language in Science Achievement: A multilevel approach. *International Journal of Science Education, 36*(16), 1-25.

Vasileiou, K., Barnett, J., Thorpe, S., & Young , T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology, 18*(148), 1-18.

Venketsamy, T. R., & Sibanda, S. D. (2021). Exploring strategies teachers use to develop literacy skills among English First Additional Language learners in the Foundation Phase.

Vilakazi, Z., Mavuru, L., & Ramaila, S. (2024). *Multilingual education in Life Sciences: Teachers' and learners' beliefs about code-switching*. *Journal of Baltic Science Education*, 23(6), 1291‑1309.

Von Soest, C. (2023). Why do we speak to experts? Reviving the strength of the expert interview method. *Perspectives on Politics*, *21*(1), 277-287.

Vygotsky, L. S. (2012). *Thought and language* (Vol. 29). MIT press.

Vygotsky, L.S. (1986). *Thought and language*. (A. Kozulin, Ed.). Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Walton, E., & Engelbrecht, P. (2024). Inclusive education in South Africa: Path dependencies and emergences. *International Journal of Inclusive Education*, *28*(10), 2138-2156.

Wei, L. (2018). *Translanguaging as a practical theory of language*. Cambridge University Press.

Wibowo, S., Wangid, M. N., & Firdaus, F. M. (2025). The Relevance of Vygotsky's Constructivism Learning Theory with the Differentiated Learning Primary Schools. *Journal of education and learning (EduLearn)*, *19*(1), 431-440.

Wilson, K. J., Long, T. M., Momsen, J. L., & Bray Speth, E. (2020). Modeling in the classroom: Making relationships and systems visible. *CBE—Life Sciences Education*, *19*(1), fe1.

Windschitl, M., Thompson, J., & Braaten, M. (2020). *Ambitious science teaching*. Harvard Education Press.

Xiong , X. (2022). Critical Review of Quantitative and Qualitative Research. *Advances in Social Science, Education and Humanities Research, 670*, 956-959.

Yoon, S. Y., Lee, J. H., & Choi, H. (2021). Video learning analytics: Investigating behavioral patterns and learner clusters in video-based online learning. *Educational Technology Research and Development, 69*(4), 2061‑2084.

Yore, L., Bisanz, G. L., & Hand, B. M. (2003). Examining the literacy component of science literacy: 25 years of language arts and science research. *International journal of science education*, *25*(6), 689-725.

Yurtyapan, E., & Kandemir, N. (2021). The Effectiveness of Teaching with Worksheets Enriched with Concept Cartoons in Science Teaching Laboratory Applications. *Participatory Educational Research, 8*(3), 62-87.

Zajda, J., & Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. *Globalisation and education reforms: Creating effective learning environments*, 35-50.

Appendix A: Classroom Observation Tool

Teacher : _____ **Observer:** _____

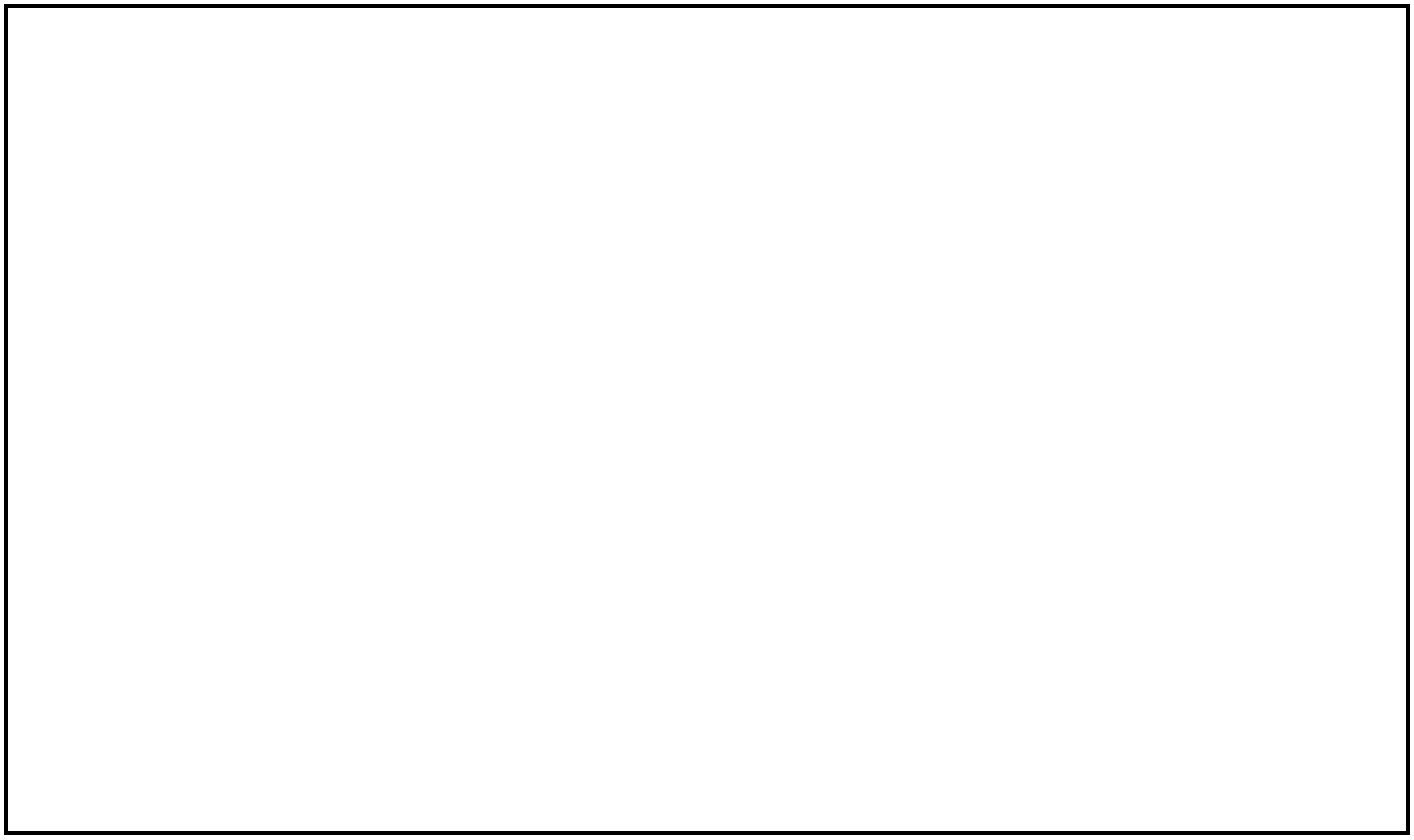
Date/ Time: _____ **Number of Students:** _____

Content Area: _____

Classroom context or observed class	Science Cognitive/Practical Skills according to CAPS	Pedagogical action used	Science Concept

Which teacher in the research? What topic? Resources used?	**Examples:** Accessing & Recalling information. Comparing, communicating.	**Examples:** Codeswitching, repetition, questioning, examples, drawing	**Example:** Vertebrates

ADDITIONAL OBSERVER NOTES



Appendix B: Teacher Semi-structured Interview Questions

Natural Sciences Grade 7 Teachers

Introduction

Thank you for agreeing to participate in this interview. I am interviewing you to better understand what pedagogical actions you practice in your classroom when you are teaching Natural Sciences concepts to learners who have English as their first additional language. There is no wrong or right answer, this is about your reality with EFAL learners and I am interested in the methods that you employ so that learning of NS concepts is improved.

Participation in this study is voluntary and your decision to participate will not affect or compromise your job in any way. With your permission, I would like to audio record the interview because I do not want to misquote you. This study will not reveal who you are and the responses that are included in the report will not identify you as a respondent. You may at any point decline to answer any question or stop the interview at any point and for any reason. Do you understand what I have just said and are there any questions about what I have just explained?

Guidance:

- Allow the participant to answer to the fullest. Do not cut them short.
- If the participant is uncomfortable, do not probe any further, move to the next question.
- Do not identify who the teacher is in any written records.

The following are some biographical questions that will provide context to the participants.

1. How many years have you been a teacher?

   _____

2. What are your major subjects?

   _____

3. How long have you been a Natural Sciences teacher in Grade 7?

   _____

4. Which other grades do you teach?

_____

5. What qualifications do you have?

_____

6. What is your age?

_____

The information collected will be responses to the following questions:

1. Is the English Language a barrier in grade 7? And can you elaborate more on how the English language either enhances or restricts your lessons?

_____

_____

_____

2. Does the number of learners you have in class have any effect on how you teach Natural Sciences? Please explain

_____

_____

_____

3. Can you tell me about the inclusive pedagogical actions that you do as a grade 7 Natural Sciences teacher to improve understanding of Natural Sciences concepts in EFAL learners?

_____

_____

_____

4. Do you teach other subjects besides Natural Sciences? And if you do, do you teach those subjects the way that you teach Natural Sciences? Explain why or why not.

_____

_____

_____

5. Do you find it easier or difficult to teach Natural Sciences concepts to EFAL learners? Please elaborate

_____

6. When you encounter terms or concepts in Natural Sciences that learners find difficult, do you have a method or a strategy that you feel works for the learners to promote their understanding?

   _____

   _____

   _____

7. How do you normally work with learners who perform below the expected pass mark?

   _____

   _____

   _____

8. Are there any challenges that you experience when you are teaching grade 7 learners besides the language issue? Please explain

   _____

   _____

   _____

Thank you very much for your time and the information you shared today.

Appendix C: Consent Form (Participant)

Title of project:
Inclusive Pedagogical actions grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 township schools in Mohlakeng.

Name of researcher:
Limpho Mokoena

I……..., agree to be a participant in this research project.

(Please circle the relevant options below)

The research study was explained to me. I understand what this research is about.	YES	NO
I understand that I can volunteer to take part in this study.	YES	NO
I agree that the researcher may observe and write notes during my Natural Sciences lesson.	YES	NO
I agree that the interview may be audio recorded.	YES	NO
I agree that direct quotations from my interview may be used by the researcher in their research report.	YES	NO
I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report.	YES	NO
I agree that other researchers may use the information I provide in my interview (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on.	YES	NO

…… (signature of participant)

…… (name of participant)

…… (date)

Appendix D: Consent Form (Learner Parents)

Title of project:
Inclusive Pedagogical actions grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 township schools in Mohlakeng.

Name of researcher:
Limpho Mokoena

I……, parent of …….
in grade 7, agree/disagree that my child will be present in the Natural Sciences classroom during the classroom observation.

(Please circle the relevant options below)

The research study was explained to me as a parent. I understand what this study is about.	YES	NO
I understand that my child is NOT directly part of the research.	YES	NO
I understand that I can agree or disagree that my child should be present during the classroom observation.	YES	NO
I understand that my child's presence in the classroom will remain anonymous (my child's name or identifying data will not be used by the researcher in their research).	YES	NO
I understand that my child will not be exposed to any harm or danger during the classroom observation.	YES	NO

…… (signature of parent)

…… (name of parent)
…… (name of learner)
…… (date)

Appendix E: Participant Information Sheet

Dear Sir / Madam

My name is Limpho Mokoena. I am a Masters student and pursing a Masters in Inclusive Education at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Cameron Martin, and I am conducting a research study about inclusive ways of teaching that teachers use when they are teaching Natural Sciences to English First Additional Language learners who are in grade 7. The study title is: *Inclusive Pedagogical actions grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 township schools in Mohlakeng.*

I am inviting you to take part in both a lesson observation where I will be observing your Natural Sciences lesson while I take notes and participate in an interview where I will ask you a few questions with the aim to assist me in answering my research question. If you decide to take part, your participation in this research study will last about two hours. An hour for the lesson observation and an hour for the interview. The lesson observation and the interview will take place at any day of your convenience. At the time of your choice (during work hours).

With your permission, I would like to audio record the interview. This data will be stored in my google drive for safety and I will be the only person who has access to the recordings. Furthermore, the recordings will be stored for five (5) years, then will be deleted.

During the research activity, I will need to ask for some personal information about you, including; your age, what qualification/s you have and the number of years you have been a teacher.

The interview will be confidential and anonymous, and I will not in any way mention who are you or where you teach. When I share the results of the research study, I will not include your name or anything else that could identify you.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits or rights you would normally have if you decide not to join. Taking part in the research study will not cost you anything. You will not be paid for being in this research study.

The risks for this research study are no more than what happens in everyday life.

This research study will be written up as a research report. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,

Limpho Mokoena

Researcher:
Limpho Mokoena
1443231@students.wits.ac.za

Supervisor:
Dr Cameron Martin
Cameron.martin@wits.ac.za

Appendix F: Interview Formal Consent

Title of project:
Inclusive Pedagogical actions grade 7 Natural Sciences teachers use to improve understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 township schools in Mohlakeng.

Name of researcher:
Limpho Mokoena

The interview will take place on the 14th of February 2024. We do not anticipate that there are any risks associated with your participation however, you have the right to stop the interview or withdraw from the research at any time.

(Please circle the relevant options below)

Do you agree that you have been given sufficient information about issues of confidentiality and anonymity?	YES	NO
Are you aware that the interview is voluntary, and that you do not have to participate if you do not want to?	YES	NO
Do you agree that the interview will be audio recorded and a transcript will be produced?	YES	NO
Do you understand that the data collected during the interview will be analysed by the researcher?	YES	NO
Do you understand that the data collected during the interview will be used in the research report?	YES	NO
Do you understand that access to the interview data will be limited to the researcher?	YES	NO
Do you understand that the interview data (written & audio) will be kept for 2 years and then destroyed?	YES	NO

…… (signature of participant)

…… (name of participant)

…… (date)

Appendix G: Ethical Clearance Certificate

SCHOOL OF EDUCATION ETHICS COMMITTEE

CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: 2024ECE001M**
PROJECT TITLE	Inclusive Pedagogical actions that grade 7 Natural Sciences teacher use to promote understanding of Natural Sciences Concepts to English First Additional Language (EFAL) learning in 3 primary schools in Mohlakeng.
INVESTIGATOR	**Limpho Mokoena**
SCHOOL/DEPARTMENT OF INVESTIGATOR	**WSoE**
DATE CONSIDERED	15 January 2024
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	LOW RISK
EXPIRY DATE	Date of submission of the Research Report
ISSUE DATE OF CERTIFICATE	05 February 2024
CHAIRPERSON	Dr. Lawan Abdulhami

cc: Dr. Cameron Martin

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

_____ _____/_____/_____

Signature **Date**

Appendix H: GDE Research Approval Letter

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	**13 February 2024**
Validity of Research Approval:	**08 February 2024– 30 September 2024** **2024/605**
Name of Researcher:	**Mokoena L**
Address of Researcher:	**1005 Extension 2**
	Chief Mogale
Telephone Number:	**078 3403656**
Email address:	**Limpho.mokoena17@gmail.com**
Research Topic:	**Inclusive Pedagogical actions that grade 7 Natural Sciences teachers use to promote understanding of Natural Sciences Concepts in English First Additional Language (EFAL) learners in 3 different primary schools in Mohlakeng.**
Name of University:	**Wits**
Type of qualification	**Masters**
Number and type of schools:	**3 Primary Schools**
District/s/HO	**Gauteng West**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

13/02/2024

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

1. *Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. ***Because of the relaxation of COVID 19 regulations researchers can collect data online, telephonically, physically access schools or may make arrangements for Zoom with the school Principal. Requests for such arrangements should be submitted to the GDE Education Research and Knowledge Management directorate.***
4. ***The Researchers are advised to wear a mask at all times, Social distance at all times, Provide a vaccination certificate or negative COVID-19 test, not older than 72 hours, and Sanitise frequently.***
5. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
6. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
7. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
8. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
9. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
10. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
11. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
12. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
13. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
14. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
15. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
16. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

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Dr Gumani Mukatuni

Acting CES: Education Research and Knowledge Management

DATE: 13/02/2024

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