DEVELOPING OF TSHIVENDA SCIENTIFIC LANGUAGE REGISTER FOR TEACHING AGRICULTURAL SCIENCES

BY

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DECLARATION

I, **Ocktovia Livhuwani Phalandwa** with student number 64013790 declare that the dissertation entitled "*Developing of Tshivenda scientific language register for teaching Agricultural Sciences*" is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I have not previously submitted this work or part of it for examination at Unisa for another qualification or at any other higher education institution.

_____   <u>11 FEBRUARY 2024</u>

SIGNATURE   DATE

DEDICATION

This dissertation is dedicated to my sister Phalandwa Olive, who taught me that it is never too late to chase your passions.

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ABSTRACT

South Africa is a country known for its diversity, boasting 12 official languages, including Tshivenda, XiTsonga, SeSotho, SeTswana, SiSwati, SePedi, IsiNdebele, IsiZulu, IsiXhosa, Sign language, English, and Afrikaans. However, despite this linguistic richness, English and Afrikaans dominate as the primary languages of instruction in most schools, particularly in the teaching of Agricultural Sciences, which lack scientific language registers in indigenous languages. The South African government aims to rectify this by introducing indigenous languages as mediums of instruction in schools, presenting a significant opportunity for black African learners to engage with Agricultural Sciences in their native languages. Yet, the readiness and availability of teaching and learning resources in languages like Tshivenda pose critical challenges.

To address this gap, a study was undertaken to develop a Tshivenda scientific language register specifically tailored for teaching Animal Studies at the grade 10 levels. In its development, the researcher collaborated with various stakeholders, including Tshivenda curriculum advisors, teachers, textbook authors, and community elders. Their input was invaluable in identifying and creating Agricultural Sciences terms were lacking in Tshivenda. The study, conducted as a qualitative interpretative case study, aimed to explore the development and application of the Tshivenda scientific language register for Animal Studies. Through observations, semi-structured interviews, and diary entries, data were collected from teachers, learners, and parents using purposive sampling techniques.

Guided by social constructivism theory, which emphasizes language as a critical tool for communication and thought development through social interaction, the study revealed that the absence of Agricultural Sciences terminology in Tshivenda initially raised skepticism among some stakeholders. However, with collaborative efforts and a positive attitude towards indigenous languages, progress is evident. Despite challenges, the implementation of the Tshivenda scientific language register has shown promise in shaping classroom interactions and fostering meaningful learning experiences, ultimately leading to improved performance in Agricultural Sciences. The study recommends further development of scientific language registers for Agricultural Sciences, extending beyond Animal Studies to encompass other topics.

MANWELEDZO (TSHIVENDA)

Afurika Tshipembe ndi shango lo tanganelanaho nga nyambo dza tshiofisi dzine dza lingana fumi mbili, idzo nyambo ndi dzi tevhelaho, Tshivenda, Tshitsonga, Tshisuthu, Tshitswana, Tshiswati, Tshibeli, Tshindevhele, Tshizulu, Tshithoza, luambo lwa saini, Tshiisimane khathihi na Tshivhuru. Kah idzo nyambo dzothe Tshiisimane na Tshivhuru ndi dzone dzine dzo themendelwa nga uvha na vhudavhidzani zwikoloni zwinzhi, dzidovha dzavha dzone nyambo mbili dzine dzo nwaliselwa kha saintsi ya vhulimi.

Muvhuso wa fhano Afurika tshipembe una tshipikwa tsha u disa u shumiswa ha nyambo dza sialala sad zone nyambo dza vhudavhidzani zwikoloni. Hezwi zwidoneavho tshikhala vhana vha vharema, sa izwi vha tshi do kona udi phina nga u guda thero ya saintsi ya vhulimi nga luambo lwavho lwa damuni. Musi ho dzinginyiswa iyi tshanduko khulwane ngau to rali, mbudziso khulwane ndi ya uri ro lugela na u funzwa nga Tshivenda? Nahone ri na zwishumiswa zwo teaho na zwine zwo nwaliselwa nga nyambo dza tshirema u khunyeledza uyu muhumbulo? Phundulo ndi hai. Hone ha tshipikwa tshihulwane tsha iyi ngudo ndi u kuvhanganya zwishumiswa zwine zwado thusa musi hutshi bveledzwa uyu muhumbulo. Hone ha registara ya saintsi ya luambo kha saintsi ya vhulimi yo bveledzwa kha murole wa vhufumi, yo livhanywa fhedzi kha zwifuwo.

Musi regisitara ya saintsi ya Tshivenda itshi bveledzwa, rathoduluso o wanulusa uri huna maipfi a tshisaitsi matuku kha luambo lwa Tshivenda. Rathoduluso odo di kwamanya na vhathu vhoyaho ngau fhambana, sa vhadivhi vha kharikhulamu ya Tshivenda, Vhadededzi vha Thero ya Tshivenda, vhanwali vha bugu dza Tshivenda, vhahulwane vhakha vhupo vhune a dzula khaho. Mushumo muhulwane wa vhathu avho wovha wa u thusedza u wana maipfi e mutodulusi wa iyi ngudo a kundelwa u a wana. Themendelo na u dzhenelela havho zwo thusedza u bveledzisa registara ino ya tshisaintsi nga Tshivenda.

Iyi ndi ngudo isi ya lisalambalo ine yo tutuwedzwa nga mbudziso dzi tevhelaho: Zwovhahani u bveledza na u shumisa regisitara ya saintsi nga luambo lwa Tshivenda kha zwifuwo? Ndi vhufhio vhuleme ho wanulusiwaho nga khau bveledza regisitara ya saintsi nga luambo lwa Tshivenda kha zwifuwo? Ndi zwifhio zwikhala zwo wanuluswaho nga khau bveledza regisitara ya tshisaintsi nga luambo lwa

Tshivenda kha zwifuwo? Avha vhano kwamea vhone vhari mini nga khau bveledza regisitara ya tshisaintsi nga luambo lwa Tshivenda kha zwifuwo? Kushumisele kwa iyi regisitara ya tshisaintsi kha luambo lwa Tshivenda I tutuwedza hani kupfesesele kwa ngudo?

U lavhelesa, Nyambedzano na dayari zwo shumiswa u kuvhanganya mawanwa ubva kha vhadededzi, vhagudiswa na vhabebi. Mutodulusi oto nanga vhane vhatea uvha tshipida tsha mawanwa u itela uri mawanwa avhe one one. Heyi ngudo yo tutuwedziwa nga ngudo ya khonsitiravisithizimu ine I dzhiela ntha vhudavhidzani, luambo lu laedza sa tshithu tsha vhukati hune u guda zwa bveledzwa hone. Mawanwa a iyi ngudo o bvukulula uri u savha hone ha manwe a maipfi a saintsi ya vhulimi nga Tshivenda zwo ita uri vhanwe vha vhathu vha sivhe na kuhumbulele kwavhudi nga khau shumisa Tshivenda u funza saintsi ya vhulimi. Hone ha nga udi nekedzela ha vhathu vhanzhi uya nga maimo a u fhambana fhambana na kuhumbulele kwavhudi nga kha nyambo dza tshirema holu luambo nalwo lunga bveledzisea.

Hone ha u shumiswa ha regisitara yo bveledzwaho nga luambo lwaTshivenda kha saintsi ya vhulimi zwo sumbedzisa uri hungavha na nyambedzano ine ya do ri swikisa kha u pfesesa ha vhudi, zwine huvha na ngudo ya mathakheni kha thero. Iyi ngudo I khou themendela u bveledziwa ha dzi regisitara dza tshisaintsi tsha saintsi ya vhulimi zwikoloni kha dzine thoho nga u angaredza.

Khii ya maipfi: *Tshivenda, Regisitara ya tshisaintsi, Saintsi ya vhulimi, Vhuleme, Zwikhala, Vhupfiwa ha vhathu, Kupfesesele kwa ngudo.*

NKOMISO (XITSONGA)

Afurika-Dzonga I tiko leri nga fuwa hi tindzimi ta xifumo to hambanahambana leti katsaka, Xivenda, Xitsonga, Xisotho, Xitswana, Xizulu, Xiswati, Xepedi, Xixhoza, Xindebele, Xingezi, Xibunu na Ririmi ra Swikoweto. Kambe tindzimi ta Xingezi na Xibunu hi tona ti tirisiwa ka eka timhaka ta dyondzo eswikolweni swa hina. Naswona I tindzimi timbirhi leti nga na marito ya vuthekiniki na sayense ya vurimi. Mfumo wa Afurika-Dzonga wu le makungwini yo nghenisa tindzimi ta xintu tanihi hi tindzimi ta dyondzo eka swikolo swa Afurika-Dzonga. Leswi swi tisa nyanyuko na ku vuyeriwa eka vadyondzi va va ntima va Afurika-Dzonga, leswi swi ta endla leswaku vadyondzi va oloveriwa ku twisisa matsalwa ya dyondzo ya vurimi.

Leswi swi kunguhatiweke hi mfumo swi tisa swivutiso swo tanihi, xana hi tiyimeserini ke? Hina swona switirhisiwa leswi nga ta laveka ku dyondzisa dyondzo ya vurimi hi Xivenda, kumbe tindzimi ta xintu, xana marito ya xithekiniki ya dyondzo ya vurimi hina wona naa? Ku endlela leswaku dyondzo leyi yi dyondzisiwa no dyondziwa hi ririmi ra manana? Nhlamulo eka swivutiso leswi I Hai, kambe ndzavisiso lowu wu ta kota ku pfuna hu fikelela no pfuna mfumo ku fikelela xivono lexi na ku pfuna hi ku kuma switirhisiwi leswi nga ta pfuna. Eka ririmi ra Xivenda marito ma xithekiniki lama nga pasisiwa ma kona, kambe eka mpfapfarhuto wa xiphemu xa dyondo ya swifumo eka dyondzo ya vhurimi.

Loko mpfapfarhuto wa marito ma Xivenda eka dyondzo ya vurimi ma tumbuluxiwa, mulavisisi u kumile leswaku marito ma xithekiniki ma kayivela swinene, mulavisisi u tihlanganisile na vativi va ririmi, vadyondzisi va ririmi, vatsari na vadyuhari eka miganga yo hambana hambana ku pfuna ku fikelela ku kuma marito ya xithekiniki xa dyondzo ya vurimi. Lowu I ndzivisiso lowu lavaka ku fikelela mbuyelo lowu hetisekeke no pfumala vukanakanisi eka timhaka ta ku tirhisiwa ka tindzimi ta le kaya eka dyondzo ya vurimi lowu faneleke ku hlamula swivutiso leswi: Xana ku tumbuluxiwa na ku tirhisiwa ka ririmi ra Xivenda eka dyondzo ya vurimi ya le ka utounga eka dyandzo kumbe xiphemu xa swifuwo? Xana mintlhontlho yi paluxiwile na swintshuxo swa kona? Xana vatekaswiave va swi vonise ku yini, kumbe mavonelo ya vona eka mhaka leyi ya mpfapfarhuto wo dyondzisa dyondzo ya vurimi

hi ririmi ra Xivenda? Xana rixaka ri ta vuyeriwa hi ndlela yihi, naswona leswi swita pfuna hu ndlela yi ku kurisa?

Mavonelo eka ku xiyixiya swikambelo na mimburiano ya masiku hinkwawo swi hlengeletini ku suka eka vatekaswiave hinkwavo ku katsa, vadyuhari, vadyondi na vatswari. Ntsavulo eka timhaka wu endliwile ku endlela leswaku ndzivisiso wu va lowu fambelanaka na marungula lama ma hlengeletiweke. Marungula lama ma hlengeletiweke ma xiyisisiwile hi tindlela hinkwato ta vuthekiniki bya vutumbuluxamarito. Dyondzo kumbe ndzavisiso lowu wu kuceteriwile hikokwalaho ka timhaka ta ximunhu la ha vanhu na swilaveko swa vona swi faneleke ku rhanga emahlweni hikuva ririmi hi rona xilo xo sungula eka ku humelela ka dyondzo ya vana. Leswi kumekeke eka ndzavisiso lowu swi paluxa ku onha loku nga kona ku endliwaka hi ku pfumaleka ka marito ma xithekiniki eka tindzimi ta xintima loko swi fika eka tidyondzo to tanihi hi ta vurini na tinwana tidyondzo.

Leswi kumekeke eka ndzavisiso lowu, swi kombisa leswaku ku pfumaleka ka marito ma xithekiniki ya ririmi ra Xivenda ma dyondo ya vurimi swi na xiave xo biha eka vatekaxiave lava va ngheneleleke eka mhaka yo tisa dyondzo ya vurimi hi ririmi ra le kaya. Endwaku ka lawa vatekaswiave va ringeteke hakona hi ku languta na mbuyelo lowu ngata va kona eka vadyondzi, swi ta pfuna rixaka ku ya emahlweni ku pfumeleka ka mitirho leyi fambelanaka na vutsari na vutumbuluxi bya marito swi na xiave xo biha eka ku humelerisa ku dyondza ka dyondzo ya vurimi hi ririmiu ta le ka ya.

Hambiswiritano, ku tirhisa na ku tunbuluxiwa ka marito ma xithekiniki hi ririmi ra Xivenda swi kombisa ku tisa utikelo lowunene eka dyondzo ya vurimi. Ndzavisiso wu kondletela ku pfapfarhutiwa na ku tumbuluxiwa ka marito ma xithekiniki ma dyondo ya vhurimi hi ririmi ra Xivenda eka mitlawa hikwayo wa swikolo swa Afurika-Dzonga handle ka xiphemu xa swifuwo ntsena.

Nkombiso: *Xivenda, Ntlawa wa ukondletilo wa tindzwimi na vutsarisi, Dyondwo ya vurimi, Mitlhoutlho, ku vuyeriwa lokunene, Vatikaswiave na mavonelo ya vona eka mavonelo ya vona eka madyondelo lamanene.*

GLOSSARY OF ACRONYMS

DoE   Department of Education

LiEP   Language in –Education policy

LoLT   Language of Learning and Teaching

OECD   Organization for Economic Cooperation and Development.

PanSALB   Pan South African Language Board

SGB   School Governing Body

UNESCO   United Nations Educational Scientific and Cultural Organization

UNICEF   United Nations Children Emergency Fund.

GLOSSARY OF TERMS

Tshivenda: South African official and indigenous language.

Agricultural Sciences: Science dealing with food, fibre production and processing.

Register: A set of lexical items which are distict and for specific topics and social situations.

Scientific language register for Agricultural Sciences in Tshivenda: A register with set of Agricultural Sciences lexical items written in Tshivenda.

Meaningful learning: Act of higher order thinking and development through intellectual engagement that uses pattern recognition and concept association.

Interaction: The action or influence of people, group, or things on one another.

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CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY

1.1   INTRODUCTION

In the rich tapestry of South Africa's linguistic landscape, the preservation and promotion of indigenous languages stand as pillars of cultural identity and empowerment. However, within the realm of education, the dominance of English and Afrikaans as mediums of instruction has posed challenges for learners, particularly in the realm of Agricultural Sciences. Despite the country's linguistic diversity, the availability of scientific language registers in indigenous languages remains limited, hindering meaningful engagement with critical subjects like Agricultural Sciences among native speakers.

This study embarked on a crucial endeavor to bridge this linguistic gap by focusing on the development of a Tshivenda scientific language register tailored explicitly for teaching Agricultural Sciences. Tshivenda, one of the 12 official languages of South Africa, holds significant cultural and historical significance, particularly among communities in the Limpopo Province. The significance of this study is underscored by the imperative to ensure equitable access to quality education for all learners, irrespective of their linguistic backgrounds. By harnessing the potential of indigenous languages as mediums of instruction, this research endeavored to enhance the educational experience of Tshivenda-speaking learners, providing them with a platform to engage meaningfully with Agricultural Sciences within the context of their cultural and linguistic heritage.

The developed Tshivenda scientific language register has represented a pioneering effort to address the dearth of linguistic resources in indigenous languages, specifically tailored for the teaching of Agricultural Sciences. Through collaboration with stakeholders and a rigorous research methodology, this study sought to explore the challenges and opportunities inhered in this endeavor, shedding light on the perceptions and experiences of educators, learners, and community members.

As South Africa moves towards a more inclusive and culturally responsive education system, the findings of this study are poised to inform policy and practice, advocating for the integration of indigenous languages in the teaching of Agricultural Sciences.

By empowering learners to engage with complex scientific concepts in their mother tongue, this research contributed to the broader goals of linguistic and educational equity, fostering a learning environment that celebrates diversity and promotes academic excellence.

1.2   BACKGROUND

South Africa, renowned for its cultural diversity, proudly boasts twelve official languages, including Tshivenda, Xitsonga, SeSotho, SeTswana, SiSwati, SePedi, IsiNdebele, IsiZulu, IsiXhosa, Sign language, English, and Afrikaans (Omidire & Ayob, 2020). Despite this linguistic richness, the predominant languages of instruction in most schools remain English and Afrikaans (Desai, 2016). This preference is largely due to the Language-in-Education Policy (LiEP) of the National Department of Education, which granted School Governing Bodies (SGB) and parents the autonomy to select the Language of Learning and Teaching (LOLT) from grade 3 onwards (Departments of Education, 1997). Consequently, English often emerges as the chosen LOLT, with learners transitioning to English instruction by grade 4 (Gordon, 2019; Kola, 2018; De Wet, 2002). The decision stemmed from the scarcity of educational materials available in African languages (Mapelo & John, 2021), prompting the urgent need to address this gap.

In response to this pressing issue, Minister of Basic Education, Mrs. Angie Motshekga, articulated during a parliamentary session on July 23, 2022, that there is a potential shift towards teaching children in their mother tongues across all provinces (Writer, 2022). Mrs. Motshekga underscored that poor academic performance is often attributed to instruction in English, a language alien to many learners. She emphasized the detrimental effect of assessing learners based on language proficiency rather than cognitive development and comprehension, signaling the government's commitment to reforming the education system (Writer, 2022). The announcement garnered support from cultural experts like Professor Sihawu Ngubane, heralding it as a victory for language advocates (Writer, 2022).

Further endorsement came from Minister Motshekga during the Eastern Cape mother language education program on February 22, 2022, where she lauded the success of the mother tongue pilot project and urged nationwide adoption (Writer,

2022). The sentiment was echoed during the Council of Education Ministers meeting on March 3, 2022, where Minister Motshekga commended the Eastern Cape's strides in promoting indigenous languages beyond the foundation phase (Writer, 2022). Dr. Naleda Mbude, head of the Eastern Cape Department of Education, emphasized the right of all individuals to be taught in their chosen official language (Writer, 2022).

President Cyril Ramaphosa emphasized the importance of preserving indigenous languages during his Heritage Day address on September 24, 2022, citing instances of academic papers being written and submitted in African languages, a testament to progress (Writer, 2022). These sentiments align with previous remarks made by President Ramaphosa on Heritage Day in 2021 and 2019, underscoring the significance of promoting African languages (Writer, 2021).

The imperative for access to literature in native languages was reiterated by former Minister of Sports, Arts, and Culture, Nathi Mthethwa, during a conference on indigenous languages in 2019 (Writer, 2019). Chief Justice Mogoeng Mogoeng echoed this sentiment in 2020, advocating for the prioritization of mother tongues to preserve cultural identity (Writer, 2020). Similarly, Professor Somadoda Fikeni emphasized the critical role of language in preserving heritage and identity (Writer, 2020).

In an interview with SA News, Lance Schultz, CEO of the Pan South African Language Board (PanSALB), stressed the need to elevate indigenous languages to official status, emphasizing their influence on worldview (Writer, 2022). Nelson Mandela's quote, "If you speak to a man in a language he understands, the words will reach his head, but if you speak his language, the words will reach his heart," epitomizes the importance of linguistic diversity and cultural pride.

Amidst these developments, the crucial question arises: Are we prepared to learn Agricultural Sciences in our mother tongues? Addressing this query necessitates an assessment of the availability of teaching and learning resources in indigenous languages (Mapelo & John, 2021). This study endeavored to contribute to this discourse by developing a Tshivenda scientific language register for Agricultural Sciences, aligning with the national agenda of linguistic inclusivity and educational equity.

1.3 PROBLEM STATEMENT

Based on my observations as a teacher working in rural communities, it is evident that many learners encounter significant challenges understanding English-based instruction. In response, teachers often resort to using the learners' native languages, particularly when teaching Agricultural Sciences. It has been my experience that learners exhibit greater enthusiasm and comprehension when instruction is delivered in their native tongue, leading to increased participation and engagement. However, as a grade 10 Agricultural Sciences teacher in a rural setting where not all learners share the same home language, those whose home language differs from the language of instruction struggle to grasp both English and the Agricultural Sciences concepts. This struggle is exacerbated by the fact that these learners predominantly communicate in Tshivenda, both at school and at home. Witnessing their difficulty in engaging with English instruction is disheartening. Such challenges could be mitigated by permitting instruction in learners' native languages. Therefore, the development of a Tshivenda scientific language register, specifically tailored for teaching Agricultural Sciences with a focus on Animal Studies, presents an opportunity to empower these learners by allowing them to study in their native language.

1.4 AIM

To explore the development and application of Tshivenda scientific language register for animal studies.

1.5 OBJECTIVES

●To understand the challenges in developing of Tshivenda scientific language register for animal studies.

●To evaluate the opportunity of developing the Tshivenda scientific language register for animal studies.

●To categorise the stakeholders' perceptions in developing the Tshivenda scientific language register for animal studies.

●To explore how the application of Tshivenda language register shape meaningful learning in class.

1.6   RESEARCH QUESTIONS

Main question:

How can the development and the application of the Tshivenda scientific language register for animal studies be carried out?

Sub-questions:

●What are the challenges identified in developing the Tshivenda scientific language register for animal studies?

●What are the opportunities in developing the Tshivenda scientific language register for animal studies?

●What are the stakeholders' perceptions in developing the Tshivenda scientific language register for animal studies?

●How does the application of Tshivenda language register shape meaningful learning?

1.7   RATIONALE OF THE STUDY

Language plays a pivotal role in preserving group identity (Marup et al., 2021). In South Africa, particularly in rural areas where this research is centered, most learners are instructed in English across all subjects, except for their native language. Consequently, these learners typically use English as their First Additional Language (FAL). Despite speaking their home language at home with their families and at school, their exposure to English is limited, presenting challenges in the classroom environment due to both teachers and learners not being native English speakers. It is imperative for learners in rural areas to receive instruction and assessment in their native Tshivenda language. Utilizing indigenous languages for teaching Agricultural Sciences holds promise in addressing food security issues in the country, as learners better understand concepts related to food crop production, animal husbandry, and farm equipment maintenance (Ndem & Nwigwe, 2022).

The statements made by South African President Cyril Ramaphosa, Minister of Basic Education Angie Motshekga, Chief Justice Mogoeng Mogoeng, researchers,

and others regarding the significance of using indigenous languages for teaching and learning served as evidence of South Africa's readiness to embrace native languages for education across all subjects. However, the pressing questions remain: are we adequately prepared for implementation? Do we possess sufficient teaching and learning resources in indigenous languages? This study addressed these concerns by developing a scientific language register in Tshivenda. Despite learners demonstrating understanding and comprehension when taught in their native language, challenges persist regarding unclear career guidance and the availability of teaching and learning materials (Mapelo and John, 2021). Thus, this study aimed to fill this gap by providing a primary resource in the form of a scientific language register in Tshivenda for teaching Agricultural Sciences, thereby enriching the existing resources.

1.8   DELIMITATION OF THE STUDY

This study selected three schools within the Luvuvhu circuit, along with three grade 10 Agricultural Sciences teachers and their respective learners from each school. Additionally, fifteen parents were chosen from these schools. The decision to limit the number of participants was made to ensure manageable data collection and analysis processes.

1.9   RESEARCH STRUCTURE

This section provides an overview of the structure and organization of the chapters included in this study:

Chapter 1: Introduction - This chapter encompasses the following sections: Research Background, Problem Statement, Research Questions, Rationale, Aims and Delimitations of the Study, Structure of the Research, Chapter Summary, and a Concluding Discussion.

Chapter 2: Literature Review and Theoretical Framework - This chapter consists of the following subsections: Introduction, Language of Learning and Teaching in South Africa, Scientific Language Register, Code-Switching, Bilingual Education, Multilingualism, Translanguaging, Parents' Perspectives on the Use of Home

Language for Teaching and Learning, Issues of Language Use in Science in African Countries, and Theoretical and Conceptual Frameworks.

Chapter 3: Methodology - This chapter delineates the following components: Research Approach, Case Study Approach, Research Paradigm, Research Context, Rigor, and Ethical Considerations. The chapter also discusses the utilization of Purposive Sampling to select participants (Teachers, Learners, and Parents), as well as the three data collection tools: Interviews, Observations, and Diaries.

Chapter 4: Dynamics of the Scientific Language Register for Agricultural Sciences in Tshivenda - This chapter encompasses the analysis and discussion of data, along with the presentation of findings.

Chapter 5: Summary of Findings and Recommendations - This chapter offers a synthesis of the research findings, addresses the research questions, highlights the contributions of the study, provides recommendations, and discusses the limitations of the research.

1.10   SUMMARY OF THE CHAPTER

This chapter presents information pertaining to the research background, problem statement, research questions, rationale, aims, and the delimitations of the study. Additionally, it outlines the structure of the subsequent four chapters. The following chapter delves into the literature reviews, theoretical framework, and conceptual framework.

CHAPTER 2: LITERATURE REVIEW, THEORETICAL AND CONCEPTUAL FRAMEWORKS

2.1 INTRODUCTION

South Africa boasts twelve official languages, comprising nine indigenous languages, sign language and two foreign languages (Desai, 2016). Among these languages is Tshivenda, an indigenous language spoken in the country. The definition of indigenous language varies among researchers. According to Ndem and Nwigwe (2022), an indigenous language is one that is native to a country and serves as the mother tongue for indigenous people. Conversely, Ohiri-Aniche (2014) defines it as the language acquired by a group of people in their early years within a specific area. Oyedeji (2018) views language as a medium for transmitting the culture and traditions of its speakers, while Nwigwe (2020) emphasizes that language not only facilitates communication but also serves as a conduit for conveying cultural values and norms. Language is instrumental in shaping human identity, evaluating traditional societies, and is indispensable to human and social existence (Ndem et al., 2020).

Through language, individuals acquire knowledge, understanding, and the means to express themselves (Carstens, 2016). However, many learners in rural areas grapple with understanding scientific concepts due to language-related challenges in science education. These difficulties include grasping specialized vocabulary and keeping pace with the introduction of new scientific terms, posing challenges for both learners and teachers in comprehending and fostering scientific language acquisition (Smith-Walter et al., 2016). Consequently, this study aims to address these challenges by developing a scientific language register for teaching Agricultural Sciences in Tshivenda. The Tshivenda scientific language register will be utilized as a tool for instructing learners in the classroom, offering a potential solution to the language barriers in science education.

2.2 LANGUAGE OF LEARNING AND TEACHING (LOLT) IN SOUTH AFRICA

English often assumes the role of the Language of Learning and Teaching (LOLT) from grade 4 onwards in South Africa, marking the transition from learning in the home language from grade R-3 to learning in English (Desai, 2016; Klapwijk & Van

de Walt, 2016). Code-switching becomes prevalent at this stage, where teachers engage in translanguaging practices to aid learners' performance in classrooms where two languages are in contact (Krause & Prinsloo, 2016). This shift from the home language to English not only impacts the continued development of indigenous languages in the educational sphere but also diminishes learners' opportunities to attain balanced proficiency in language skills essential for future learning endeavors (Trudell, 2021).

Despite the constitutional stipulations regarding language usage in South Africa (DoE, 1997), English remains dominant as the language of instruction across primary, secondary, and tertiary levels (Desai, 2016; Klapwijk and Van der Walt, 2016). Local languages are relegated to being taught only as subjects from grade 4 onwards (Wildsmith-Cromarty and Balfour, 2019). Studies indicate that the implementation of language policies in education, such as the Language in Education Policy (LiEP) (DoE, 1997), has encountered challenges, partly due to ineffective language literacy teaching practices (Wild-smith-Cromarty and Balfour, 2019; Reeves et al., 2008). This is exacerbated by the general lack of reading materials available in African languages like Tshivenda (Shiora, 2019). Despite South Africa's status as a multilingual country with 12 official languages, remnants of the colonial and apartheid eras persist, shaping language policies and curricula that continue to prioritize white supremacy and dominance (Desai, 2016; Heleta, 2016).

The language shift to English poses significant challenges in science education, given the specialized language with its unique grammar and vocabulary (Helmenstine, 2019; Hewitt-Bradshaw, 2012; Jarrett, 1999). Science concepts are often conveyed using graphs, charts, mathematical symbols, and equations (Helmenstine, 2019; Jones, 2000), underscoring the importance of presenting these concepts in learners' home language, such as Tshivenda in this study. Teaching science in a second language presents challenges in navigating the interaction between the language of instruction and subject content, particularly given the unique vocabulary associated with scientific language, posing difficulties for both teachers and learners (Essien, 2018; Mensah, 2007). Ogunniyi (2019) highlights that scientific language can hinder comprehension when conveyed in a language other than the learners' home language.

Issues persist in implementing language policies in the country, with researchers attributing the problem to the lack of resources (Ndalamba, 2019; Govender, 2009; Alexander, 2004). English second language learners in science classes typically demonstrate improvement when guided by their teachers using their home language (GroBmann and Wilde, 2019). However, learners who are still developing proficiency in English face challenges, prompting Hodge and Cobb (2019) to advocate for greater understanding and support from teachers. Conversely, Semeon and Mutekwe (2021) argue that English proficiency is not the sole challenge in science classrooms; rather, the lack of proficiency in the language of science among teachers also poses a significant hurdle. This aligns with the findings of Mokiwa (2020), suggesting that the poor performance of multilingual learners may be attributed not only to their limited proficiency in English but also to the quality of science teaching and learning in a multilingual classroom. In classrooms where both teachers and learners lack proficiency in English, teaching in such a language becomes exceedingly challenging (Msimanga et al., 2017). Learners in South Africa, particularly those in rural communities, often experience a decline in performance from grade 4 onwards due to instruction in English (Time Media, 2017).

Teachers who are second language English speakers encounter challenges when teaching Agricultural Sciences in English, with difficulties arising from classroom interactions (Dos Santos, 2019). Some teachers argue that the use of English for instruction leads learners to lose touch with their home language, resulting in disconnect from the content being taught (Kretzer and Kaschula, 2020). Furthermore, teaching and learning materials predominantly prepared in English, with little provision for African languages, exacerbate the challenge of implementing indigenous languages (Hibbert, 2011). Research findings indicate that poor academic achievement and high dropout rates are prevalent among learners whose home languages are not utilized in instruction (Moeketsi & Maile, 2008; Strydom & Mentz, 2010). The researcher asserts that learners' success and achievement hinge on the language used for instruction.

2.3   SCIENTIFIC LANGUAGE REGISTER

According to Yule (2010), a register denotes a specific manner of utilizing language suitable for a particular setting, which could be classified as Situational (e.g., in a

church), Occupational (e.g., among lawyers), or Topical (e.g., discussing languages). In a study by Kabellow et al. (2019), it was found that both teachers and learners employ non-standard forms of English during classroom interactions. This study revealed that utilizing these non-standard forms of English in English language classrooms aids in language learning and acquisition among learners, as well as minimizing communication breakdowns both among learners and between learners and teachers during oral exchanges. Within a particular occupation, colleagues utilize specific language to communicate exclusively with each other, fostering group identity and solidarity (Kabellow et al., 2019). In the context of this study, a scientific language register for Agricultural Sciences in Tshivenda will encompass Tshivenda lexical terms that Agricultural Sciences teachers will utilize to impart Agricultural Sciences concepts.

2.4   CODE-SWITCHING

Code-switching entails transitioning between two languages (Prinsloo et al., 2018). It involves the shift between English and the indigenous language (Mokhata, 2015). In this study, code-switching refers to the utilization of both Tshivenda and English in the classroom. Science teachers often encounter challenges when instructing non-English speaking learners, prompting them to resort to code-switching to clarify complex concepts (Prinsloo et al., 2018). However, accommodating all learners from diverse linguistic backgrounds can be problematic if teachers are not proficient in all languages spoken by the learners, limiting the benefits of code-switching to only those learners sharing the teacher's language (Prinsloo et al., 2018). Code-switching remains prevalent, particularly in South Africa, where English serves as the primary medium of instruction in most schools (Alang and Idris, 2018). It is believed that employing code-switching in the classroom aids in teaching and learning and enhances learners' comprehension (Mokhata, 2015).

While some advocate for code-switching and its supportive role in facilitating comprehension, others, such as Fareed et al. (2016), argue that it may restrict learners' exposure to English. Ellis (2015) notes that some learners feel uncomfortable proceeding with tasks if they do not comprehend the instructions, leading teachers to utilize the learners' first language to explain tasks effectively. Code-switching can alleviate anxiety, nervousness, and low self-esteem among

learners (Fareed et al., 2016). Mathematics and Science texts are often written in formal language, posing challenges for learners. To address this, teachers employ code-switching to aid learners in conceptualizing lessons and acquiring knowledge through their home language (Chikiwa and Schater, 2016; Kenyon, 2016). Code-switching allows speakers to view their first language as a resource rather than a deficiency, facilitating improved communication (Itmeizeh et al., 2017; Wang 2016).

Teachers who utilize code-switching in English classrooms foster positive relationships with learners, promoting mutual understanding (Opic, 2016). Despite concerns from some quarters that code-switching signifies linguistic weakness; proponents like Maluleke (2019) argue that it enhances learner engagement and performance. Code-switching also aids in effective learning, particularly when English is a foreign language (Kim, 2015). In this study, employing the learner's home language exclusively and developing a scientific register in Tshivenda can eliminate the need for code-switching.

Sibongile and Ansurie (2021) found that limited exposure to English hampers successful teaching and learning, prompting teachers to utilize code-switching to enhance understanding. These findings suggest that teachers recognize the value of code-switching. The researcher in this study believes that teaching learners in their home language will yield success in teaching and learning. While code-switching remains a focal point in linguistics and education, its widespread practice in local schools and institutions where English is the medium of instruction indicates its utility in bridging language gaps and aiding learner comprehension (Flores & Balmeo, 2021; Alang and Idris, 2018).

2.5   BILINGUALISM EDUCATION

Bilingualism refers to an individual's ability to speak and write proficiently in two languages (Hoffmann, 2014). Adika and Asante (2015) elaborate on this, defining bilingualism as competency in two languages, acknowledging that proficiency levels may vary due to language usage frequency. Gottardo and Grant (2008) view bilingualism in terms of proficiency levels and the circumstances surrounding language acquisition. It encompasses at least two languages within a single individual, with varying levels of ability in each language (Baetens, 1982). Henriksen

(2010) characterizes bilingual education as the use of multiple languages as mediums of instruction in classrooms, with one language possibly being favored over another based on learner needs. Bilingualism also fosters development of problem-solving skills by utilizing multiple languages for communication (Lelkin, 2013). In this study, bilingualism entails teaching and learning content subjects using both an indigenous language and a second language, recognizing learners' ability to utilize their indigenous language for instruction and learning English as a subject.

Bellas (2014) underscores one advantage of bilingualism, noting that learners can develop proficiency in their indigenous language first, facilitating the acquisition of English proficiency. Moreover, bilingual individuals are more likely to form friendships across language and cultural boundaries, fostering positive attitudes and respect for diverse cultures (King & Mackey, 2007). Exposure to multiple languages also enhances vocabulary development and opens opportunities in the competitive job market, where proficiency in multiple languages is highly valued (Thordardottir, 2011). Supporting the use of indigenous languages and the development of scientific language registers in these languages enables learners to study content subjects in their home language while also learning English as a subject.

2.6   MULTILINGUALISM

Multilingualism involves the utilization of at least two languages as the Language of Learning and Teaching (LOLT), with the possibility of incorporating a third language (Madiba, 2013). Additionally, multilingualism can encompass the use of three or more languages (Alcauce, 2016; De Groot, 2010). It refers to the social practice in which individuals are proficient in and utilize two or more languages (Moore & Gajo, 2009). At the individual level, multilingualism pertains to an individual's ability to proficiently use more than two languages, while at the societal level, it pertains to the utilization of multiple languages within a speech community (Department of Higher Education and Training, 2015). Multilingualism encompasses the diverse languages spoken within a community, as well as proficiency in various languages (Prah, 2006). GrosJean (2010) characterizes multilingualism as the concurrent maintenance and development of one's native language while acquiring a second language. In this study, multilingualism refers to the use of more than two languages in the classroom

setting. An individual is considered multilingual if they can effectively utilize, communicate, and interact in three or more languages (Ruiz de Zarobe, 2015).

Multilingualism offers significant advantages by expanding employment opportunities, as many contemporary jobs require proficiency in multiple languages to cater to diverse linguistic needs (Kufakunesu, 2021). Embracing multilingualism can effectively address diversity within the classroom, particularly in South African educational settings (Gorter & Cenoz, 2017). Its use enables learners to express themselves more comfortably and confidently, fostering successful teaching and learning experiences (Kioko et al., 2014). Multilingualism also promotes the simultaneous development of learners' cognitive and linguistic skills, enhancing their reasoning abilities (Hardman, 2016; Biseth, 2009). Kufakunesu's (2021) study revealed that maintaining proficiency in one's native language alongside additional languages has significant implications for identity, as language and culture are intertwined. Therefore, preserving one's native language facilitates deeper engagement with one's cultural heritage and strengthens intergenerational family ties. Developing a scientific language register in Tshivenda will contribute to the promotion of the Tshivenda home language.

2.7   TRANSLANGUAGING

Translanguaging refers to the process of communication across various languages and language varieties, encompassing elements of previously covered languages while promoting multilingualism (Heugh, 2015). It entails the acquisition of understanding and knowledge through the utilization of two languages (Baker, 2011). Translanguaging can be understood as the transition between two languages, involving individuals utilizing one language or the other employing a second language (Alam, 2020). It entails learners receiving information in one language and expressing themselves in another to ensure a deeper and clearer comprehension of the topic at hand (Garcia et al., 2017). Makalela (2013) suggests that when learners engage with two languages, they develop a better understanding of the subject matter. In this study, translanguaging will involve the use of both English and Tshivenda languages in the classroom setting.

Research conducted in South Africa indicates that certain learners who struggle with understanding science subjects perform better when provided with opportunities to engage in their native languages (Probyn, 2015; Rollnick & Rutherford, 1996). An investigation conducted in Bolobedu, within the Mopani district, observed translanguaging practices in the science classroom. Both teachers and learners utilized translanguaging as a teaching strategy, particularly when learners appeared passive during English-based questioning. However, when the same questions were posed in Khelobedu, learners became more active and engaged with the lesson (Ramothwala et al., 2022). Mokgwathi's (2011) findings indicate that translanguaging enhances learner participation and understanding in the classroom. Adebola and Pravina (2019) suggest that implementing translanguaging in all schools ensures equal engagement with both indigenous and English languages. However, Shinga (2019) holds a different perspective, suggesting that translanguaging merely repeats information rather than conveying new concepts in the classroom.

Many researchers assert that teachers often incorporate vernacular languages into the classroom through translanguaging, particularly when learners struggle to comprehend the material being taught (Shinga, 2019; Probyn, 2009). Ramothwala (2019) suggests that teachers resort to translanguaging due to their limited proficiency in English. In this study, the researcher believes that utilizing the Tshivenda home language in teaching Agricultural Sciences will enhance learners' comprehension of agricultural science concepts.

2.8   PARENTS' PERSPECTIVES ON THE USE OF HOME LANGUAGE FOR TEACHING AND LEARNING

The viewpoint of parents in the education system holds significant importance, particularly in South Africa where they are regarded as essential stakeholders actively involved in their children's education (Donald et al., 2010). Evans & Cleghorn (2014) define a parent or guardian as an adult responsible for the legal custody of a child's physical and emotional well-being. South Africa has language policy frameworks that advocate for diversity and multilingualism (Nkoala, 2020). Within this context, the South African government permits school governing bodies (SGB) in consultation with parents to select a second language, often resulting in English being chosen as the medium of instruction (Gordon, 2019; Kola, 2018; De Wet,

2002). Consequently, many learners transition to English as the primary language of instruction from grade 4 onwards.

Mutase's (2015) study suggests that parents perceive English as a pathway to their children's success, believing that proficiency in English ensures better job prospects, given the preference for English fluency in the job market. Similarly, Kufakunesu (2019) notes a negative attitude toward indigenous languages among parents and children, with English viewed as a solution to socio-economic challenges. African languages often lack recognition or equal status in government administration, science, technology, medicine, engineering, and other fields, contributing to negative attitudes toward indigenous languages among parents and learners (Kaschula & Maseko, 2014). The scarcity of educational materials in indigenous languages further reinforces the preference for English as the language of instruction (Desai, 2003; Hibbert, 2011). Consequently, dropout rates and academic performance suffer among learners whose home languages are not used in teaching and learning contexts (Strydom & Mentz, 2010).

The language barrier persists in science education, as science is predominantly taught in English, posing challenges in translating scientific concepts into indigenous languages. In this study, the researcher aims to explore parents' perspectives on the use of indigenous languages for teaching and learning. The researcher advocates for the development of language registers in all indigenous languages in South Africa to facilitate learning among learners.

2.9   ISSUE OF LANGUAGE USE IN SCIENCE IN AFRICAN COUNTRIES

South Africa, alongside several other African nations, experienced colonization, leading to the adoption of foreign languages in the educational system, influenced by the colonizing country (United Nations, 2019). The researcher has included other African countries facing similar circumstances to South Africa to investigate and analyze the challenges arising from the absence of using their native language in schools.

DEMOCRATIC REPUBLIC OF CONGO (DRC)

The Democratic Republic of Congo (DRC) holds the distinction of being the largest country in terms of land area, with an estimated population of 84,068,091 million (UIS, 2018). Despite its size, the DRC is among the poorest nations globally, boasting a gross national income per capita of $870 (World Bank, 2017). Like South Africa, the DRC is characterized by multilingualism, with over 200 ethnic groups, predominantly Bantu, and an estimated 242 languages spoken across the nation (Ethnologue, 2019). In 2009, the DRC government introduced a language policy stipulating those one of the four national languages (Lingala, Kiswahili, Chiluba, and Kikongo) should serve as the language of instruction from grades 1 to 4, with French, a foreign language, taught as a subject. Gradually, French would transition to becoming the primary language of instruction by grade 4, while national languages would continue to be taught as subjects (Global Partnership for Education Secretariat, 2020).

Despite French being considered a foreign language in the DRC, it maintains its status as an official language, a legacy from the country's independence (Mputubwele, 2003). Numerous studies have highlighted the challenges stemming from discrepancies between the language of instruction and the languages spoken and understood by both learners and teachers, citing its detrimental impact on effective education delivery (University Research Co., 2019). Research conducted by Tibategeza and Kutabe (2023) underscores the weak language proficiency of learners transitioning from the national language, Kiswahili, to French, the medium of instruction in secondary schools.

The implementation of language policies faces significant hurdles, notably the lack of appropriate teaching and learning materials. While the DRC's national language policy is undergoing pilot phases, its full implementation remains elusive due to the dearth of instructional materials in national languages. Consequently, teachers often default to teaching in French, exacerbating the language gap (Tibategeza & Katabe, 2023; Chemonics Inc., 2020). Tibategeza and Katabe (2023) emphasize the importance of mother tongue instruction in achieving educational objectives, stressing the need for enhanced support and relevant resources to facilitate policy implementation. Drawing parallels with countries like China, Japan, and Russia, which prioritize indigenous languages in education, underscores the potential benefits of embracing local languages in educational settings, as highlighted by

Mogoeng Mogoeng. Kagema (2018) underscores the pivotal role of teacher involvement, training, and familiarity with curriculum implementation for its success. Additionally, long-term planning processes should encompass the availability of instructional materials in local languages and teacher training, as emphasized by the United States Agency for International Development (USAID, 2015). This study aligns with these perspectives, advocating for the development of teaching and learning materials in indigenous languages to support effective education delivery.

NIGERIA

Nigeria, like many other countries, still grapples with the dominance of English in its education system, despite having policies advocating for the use of indigenous languages (NPE, 2013). However, findings from Oyinioye et al. (2019) underscore the stark reality that Nigerian secondary schools are yet to implement indigenous language policies, with the practice of using mother tongues frowned upon and policies left unimplemented due to the absence of Nigerian indigenous language instruction.

The endangerment of indigenous languages in Africa persists due to prolonged dominance by foreign languages (United Nations, 2019). UNESCO (2022) emphasizes that language preservation hinges on its continued use, be it in written or spoken form. Despite the United Nations' call for effective policies to safeguard indigenous languages and combat discrimination against indigenous peoples (United Nations, 2019), the impact of colonization and globalization still threatens indigenous languages (Adedigba et al., 2023). Adedigba et al. (2023) advocate for stakeholders to promote and support indigenous language usage in Nigeria to preserve culture and enhance learning effectiveness.

While the National Policy on Education (NPE, 2004) idealizes the use of a child's mother tongue as the medium of instruction for the first three years of basic education, Nigeria faces numerous challenges hindering the attainment of educational goals (Jalaludeen & Sadiya, 2016), with poor planning being a significant factor. The lack of competent teachers proficient in indigenous languages, alongside the absence of relevant teaching and learning materials, exacerbates the situation (Jalaludeen & Sadiya, 2016). Additionally, Nigeria's reliance on English as the language of instruction contributes to student failures attributed to inadequate

English proficiency (Modupe, 2015). Mere fluency in a language does not suffice for teaching; proper training of graduate teachers in indigenous languages, coupled with adequate teaching and learning materials, is essential for effective instruction (Adegbija, 2008). Adegbija (2008) underscores the importance of teaching and learning materials, such as textbooks and laboratory equipment, for quality education delivery, highlighting their absence as compromising educational quality in Nigeria.

KENYA

Kenya, a multilingual country with over 70 indigenous languages alongside Kiswahili and English as a foreign language, follows an official language of instruction policy granting children the right to be taught in their mother tongue from grade 1 to 3, with English being taught as a subject (Kenya Institute of Education, KIE, 1992). In urban areas, Kiswahili serves as the language of instruction in lower primary schools until grade 4, where the medium shifts to English (Oluoch, 2017), mirroring the practice in South African schools.

While Kiswahili and English are the official languages according to the Kenyan constitution (Republic of Kenya, 2010), the utilization of mother tongue for instruction has been a contentious issue (Oluoch, 2017). Despite its benefits, such as aiding literacy development, mother tongue instruction faces resistance, particularly in rural areas, where it is perceived as inferior to English (Chiatoh & Akumbu, 2014). A study in Kenya highlighted the deprivation of basic literacy skills among rural children due to the early introduction of foreign languages in education (Oluoch, 2017). However, despite government support, many Kenyan schools do not implement mother tongue instruction in early grades due to logistical and political challenges, including a lack of instructional materials in local languages and community resistance (Piper et al., 2016; Dubeck et al., 2012). In primary school, children predominantly learn in Kiswahili and English, often their second or third language (Piper et al., 2016).

Attitudes from teachers and parents further hinder the development and use of local languages, with concerns about poor learning outcomes and increased dropout rates associated with mother tongue instruction (Begi, 2014). With a majority demonstrating fluency in Kiswahili and limited proficiency in English, debates about language of instruction persist (UNICEF, 2016). The lack of orthography in many

African languages, including those in Kenya, exacerbates the challenge by limiting written materials to support learning (Oluoch, 2016).

To address these issues, Kenya must provide greater support for its language policy, especially considering the significant number of learners reading below grade level and the high rates of out-of-school children and youth (Mandillah, 2019; UNESCO, 2014). Overcoming challenges related to teaching and learning materials and providing adequate training in mother tongue education are crucial steps in implementing the policy (Mandillah, 2019). Research underscores the importance of education through the mother tongue for quality learning outcomes (Alimi et al., 2020; Adedigba, 2016).

MOZAMBIQUE

Despite the United Nations (2020) emphasizing the importance of indigenous languages for maintaining well-being, self-esteem, and identity, Mozambique, like many other African nations, still lacks the privilege of receiving education in its mother tongue due to its colonial history. Colonized by the Portuguese, Mozambique's language ideology and citizenship education post-independence continue to center around the perceived role of Portuguese, maintaining its dominance as the language of instruction in education while relegating indigenous languages to the margins (Chimbutane, 2018).

Only in 1993 did Mozambique introduce its first pilot Bilingual Education Project in Gaza, ending the exclusive use of Portuguese as the medium of instruction (Henriksen, 2010). The Ministry of Education opted for a transitional bilingualism model aiming to enhance learners' proficiency in Portuguese, thereby improving academic performance. Bilingual education based on local languages was later introduced in 2003 (Mozambican Ministry of Education and Human Development [MINEDH], 2019). Despite local languages being widely used in daily interactions, particularly in rural areas, Portuguese retains its dominance in government, educational systems, and urban settings (Chimbutane, 2022).

The new Bilingual Education Expansion Strategy 2020-29 issued by MINEDH (2019) acknowledges major implementation challenges faced by the bilingual education program, including inadequate teacher training in bilingual education and a lack of

teaching, and learning materials in local languages. Consequently, parents often resist enrolling their children in bilingual education. Studies by Chimbutane (2011) and Terra (2021) highlight the scarcity of standardized teaching and learning materials as a key issue undermining the bilingual program. Terra (2021) also notes that teachers often lack proficiency in the local languages used in schools, further complicating successful implementation.

Despite challenges, some teachers demonstrate adaptability and willingness to take on bilingual classes despite the lack of training and resources (Chimbutane, 2021). Stakeholders involved in bilingual education consistently report higher levels of motivation, class participation, and academic performance among learners compared to those in monolingual education (Mirade & Martin, 2017). Addressing the shortage of materials could significantly contribute to the success of bilingual education in all aspects.

BOTSWANA

Botswana, a multilingual nation with 29 listed languages, all of which are actively spoken (Fennig et al., 2013), maintained English as its official language upon gaining independence from Britain in 1966 (UNICEF, 2017). Despite Setswana being spoken by nearly 80 percent of the population (Fennig et al., 2013), Nyati (2004) contends that the government favors English over other languages. In contrast to Mozambique, Botswana's language in education policy leans toward monolingualism rather than bilingualism. For the first two grades, only Setswana is used as the language of instruction, excluding other languages. After grade 2, Setswana is replaced by English as the sole medium of instruction (Bagwasi, 2016). Learners whose first language is different from Setswana, such as Seherero, San, Sengologa, Sekgalagadi, Afrikaans, Sekgothu, and Ndebele, face challenges in learning due to the dominance of Setswana, leading to poor academic performance (Mokibelo, 2014). Transitioning from Setswana to English after grade 2 poses further difficulties for learners, as they encounter English concepts for the first time (Mokibelo, 2016). Despite Botswana's multilingualism, its educational language policy fails to foster an environment conducive to bilingualism and multilingualism (Mampoloki, 2020).

2.10 THE USE OF MOTHER TONGUES AS MOTHER TONGUE IN EUROPEAN COUNTRY VS THE USE OF FOREIGN LANGUAGES AS MEDIUM OF INSTRUCTION IN AFRICAN COUNTRY

African nations are being educated in foreign languages, while European nations receive instruction in their native tongues. The researcher is drawing a comparison between two African countries and the European nation that formerly colonized them:

MOZAMBIQUE VS PORTUGAL

PORTUGAL

Research conducted by Nishanth (2020) indicates that individuals who are proficient in their mother tongue experience faster cognitive development and intellectual growth. Moreover, it has been observed that students educated in their mother tongue tend to achieve greater educational success compared to those instructed in a different language. In Portugal, learners are educated using Portuguese, their native language (World Bank, 2005). Teaching students in their mother tongue has been shown to reduce dropout rates, as learners can better comprehend concepts and engage with each lesson (Adedigba, 2016).

Evidence supporting the effectiveness of mother tongue instruction, as outlined in PISA (2018), demonstrates that Portugal's performance in reading, mathematics, and science is around the OECD average, with significant improvements in learner performance. This improvement is attributed to Portugal's use of the native language in education. Alimi et al. (2020) further support this view, stating that learners guided by mother tongue-based instruction show improved performance and achievement. Nolasco's study (2012) also found that when learners master their first language, spoken in their immediate environment or across the country, they develop critical reasoning and problem-solving skills beneficial for lifelong learning.

MOZAMBIQUE

Most students in developing nations such as Mozambique are receiving inadequate education due to being instructed in a foreign language, resulting in high dropout

rates (Nishanth, 2020). In Mozambique, students are taught in Portuguese, a language not commonly spoken in their homes (Chimbutane, 2018). Local languages, particularly minority and indigenous ones, serve as vehicles for transmitting culture, values, and traditional knowledge, thereby playing a crucial role in fostering a sustainable future (UNESCO, 2017). Unfortunately, the survival of indigenous languages in Mozambique is threatened as they are not utilized as mediums of instruction. Utilizing indigenous languages enhances the quality of education at the primary school level, underscoring the importance of safeguarding them from extinction (UNESCO, 2020). African students educated in a second language are distanced from their cultural heritage and denied the opportunity to connect with their own roots (Nishanth, 2020).

DEMOCRATIC REPUBLIC OF CONGO (DRC) VS FRANCE

FRANCE

Numerous discussions were held in the French parliament regarding the incorporation of regional languages into education, but no significant changes were made until 1925, when the Minister of Education at the time, A. de Monzie, mandated that only French be used in all schools (Nikolovski, 2018). Since then, the French education system has entrenched a deeply rooted ideological stance that promotes monolingualism, with French being the sole medium of instruction despite being the indigenous language of France (Costa & Lambert, 2009). Education was long viewed as a primary tool for enforcing desired monolingualism in a country where French only became universally spoken by the mid-20th century (Martel, 2007). Although French language policy in the latter half of the 20th century emphasized French as the language of education, little consideration was given to the languages of minority groups, leaving them to learn in a foreign language (Nikolovski, 2018). In the PISA (2018) assessment, French students scored 493 points in science, slightly above the OECD average of 489 points, ranking between 16th and 23rd in science. It can be inferred that this commendable performance is correlated with the use of their indigenous language in school.

DEMOCRATIC REPUBLIC OF CONGO (DRC)

Students in the Democratic Republic of Congo (DRC) are also instructed in a foreign language, namely French, which stems from the country's colonization by France (Eberhard et al., 2020). The adoption of a foreign language as the medium of instruction in DRC has had detrimental effects on student performance, beginning at the early stages of education. Research conducted in DRC during the 2015-2016 school year revealed that reading instruction was conducted for 45 minutes daily in grades 1-4, yet literacy levels in primary schools remained low (USAID & DFID, 2015). Preliminary findings from an Early Grade Reading Assessment (EGRA) conducted by the World Bank in 2020 further indicated that 64% of grade 4 students were unable to read a single word from a text appropriate for their grade level in French (World Bank, 2020). This poor performance can be attributed to the use of a foreign language for instruction.

REFLECTION

The performance gap between learners in European countries, who are taught in their native languages, and those in African countries, where foreign languages are prioritized, is evident. African students often encounter difficulties in subjects like Mathematics, Science, and Technology due to instruction in languages not spoken at home, but only during school lessons. To bridge this gap, it's essential to prioritize the use of indigenous languages in education. Despite challenges such as the lack of teaching and learning resources available in African languages, it's crucial to address these issues to facilitate the implementation of indigenous language instruction. This study aims to develop a scientific language register for teaching Agricultural Sciences in Tshivenda, which will contribute to the availability of resources for teaching Agricultural Sciences in Tshivenda and ultimately improve students' performance in the subject.

## 2.11 THEORETICAL AND CONCEPTUAL FRAMEWORKS

The theoretical framework serves as a foundational review of existing theories, providing a roadmap for developing arguments in a study (Vinz, 2023). Additionally, it focuses the research and links to the research problem, guiding the choice of research design and data analysis plan (Adom et al., 2018). Collins and Stockton

(2018) argue that a robust theoretical framework enables researchers to uncover existing predispositions about a study and aids in data coding and interpretation.

This study is grounded in social constructivism theory by Vygotsky, which emphasizes the roles of language and culture in human experience, communication, and understanding of reality (Vygotsky, 1978). According to Vygotsky (1978), language and culture are integral to human intellectual development and perception of the world, with concepts learned in Agricultural Sciences transmitted through language. Social constructivism posits that children's understanding is shaped not only through encounters with the physical world but also through interactions with others in cultural contexts, significantly mediated by language (Akpan et al., 2020). Kapur (2018) observes that knowledge construction occurs through various interactions, such as group or class discussions, aligning well with this study's focus on collaborative knowledge construction opportunities in Agricultural Sciences class.

Furthermore, this research is informed by Cummins's (1978) transitional bilingual educational theory, which underscores the importance of learning one's mother language before acquiring a second language. Proficiency in the home language facilitates transfer of skills to a second language, leading to competence in both languages (Cummins, 1978). Failure to grasp the home language first may impede understanding of the second language and result in low academic achievement. Given the study's emphasis on using learners' home language and developing a scientific language register in Tshivenda for classroom instruction, Cummins's theory aligns well with its objectives.

Ntuli (2022) examines the evolution of a scientific language register in isiNdebele by utilizing the Classroom Language Analytical Framework (CLAF) to assess its influence on classroom interactions and discourses. CLAF consists of three spheres: the social space where teaching and learning occur, teaching and learning tools (isiNdebele and English), and classroom interaction and discourse. This framework aids in addressing the research question regarding how the application of Tshivenda language register shapes meaningful learning by observing learner interactions with teachers in the classroom. The diagram below represents the CLAF:

CLASSROOM[A]　　　　a　　　　LANGUAGE USE [B]

c　　　　b

CLASSROOM INTERACTIONS AND DISCOURSES

[c]
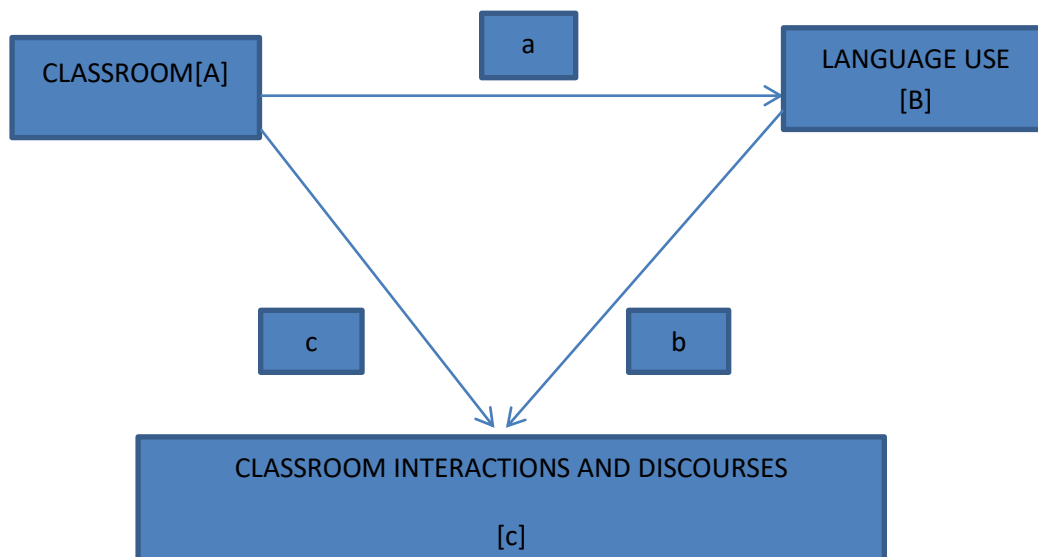
Figure1:   Describing the framework

The theoretical framework drew inspiration from Mortimer and Scott's (2003) theory, which underscores the significance of interaction and discourse. Employing the Tshivenda language register aimed to foster meaningful learning among the learners, enabling teaching and assessment in their native language. Mudau (2015) utilizes the Classroom Practice Diagnostic Framework (CPDF) to diagnose teaching challenges by integrating instructional strategies, interactions, and discourse. The integration of the Tshivenda language register in Agricultural Sciences classes encouraged interaction between teachers and learners, facilitating comprehension of the subject matter.

2.12   SUMMARY

In this chapter, the researcher has examined literature from various scholars who have conducted similar studies, focusing on South African education and the utilization of indigenous languages in schools, as well as comparing practices in African and European countries. This broad exploration was undertaken because language in education is a globally relevant topic. Additionally, this chapter elucidates the theoretical and conceptual frameworks. The next chapter will delve into the methodology and research design.

CHAPTER 3: METHODOLOGY AND DESIGN

3.1 INTRODUCTION

This study focuses on the development of a Tshivenda scientific language register for the instruction of Agricultural Sciences. The research was guided by the following research questions:

Main question:
How can the development and the application of the Tshivenda scientific language register for animal studies be carried out?

Sub-questions:

●What are the challenges identified in developing the Tshivenda scientific language register for animal studies?

●What are the opportunities in developing the Tshivenda scientific language register for animal studies?

●What are the stakeholders' perceptions in developing the Tshivenda scientific language register for animal studies?

●How does the application of Tshivenda language register shape meaningful learning?

3.2 RESEARCH PARADIGM

The paradigm, as defined by De Vos et al. (2011), signifies the researcher's framework for perceiving the study. In this research, the Interpretivism paradigm was embraced, which is anchored in the subjective realities of individuals, as described by Creswell and Poth (2018). Within Interpretivism, the focus is on delving into the lived experiences of individuals and comprehending various contexts from their unique perspectives, as highlighted by Cohen et al. (2018). The rationale behind adopting Interpretivism was to allow participants to respond based on their individual viewpoints, empowering them to construct their own meanings and interpretations rooted in their lived experiences. Within the Interpretivism paradigm, the study explored the distinct perspectives and experiences of parents, teachers, and learners concerning the utilization of the scientific language register. Furthermore, as pointed out by Maree (2019), interpretive studies aim to grasp phenomena through

the meanings ascribed to them by individuals. This paradigm facilitated the researcher in addressing the research question regarding stakeholders' perceptions regarding the use of the scientific language register in Tshivenda. Interpretivism is sometimes equated with constructivism because it underscores individuals' ability to construct meaning (Maree, 2019).

3.3   RESEARCH APPROACH (QUALITATIVE APPROACH)

According to Creswell and Creswell (2023), a research approach encompasses the framework and procedures guiding research endeavors, spanning from overarching assumptions to specific methodologies for data gathering, analysis, and interpretation. Similarly, Mertens (2020) defines a research approach as the systematic methods employed in research, covering the progression from broad assumptions to the practicalities of data collection, analysis, and interpretation. In this study, a qualitative research methodology was chosen due to its compatibility with the naturalistic settings of school environments. As outlined by Matee et al. (2022), qualitative research involves selecting participants based on their relevance to the research questions, thereby facilitating data collection. The decision to adopt a qualitative approach in this study was motivated by the natural setting of data collection and the face-to-face interaction with participants (Creswell and Creswell, 2023).

Direct engagement with participants allowed for more comprehensive data gathering and a deeper understanding of the context (Creswell and Creswell, 2023). Qualitative research emphasizes capturing participants' perspectives and experiences (Mertens, 2020), enabling the researcher to comprehend stakeholders' perceptions in developing the Tshivenda scientific language register for Animal Studies. This approach, which focuses on gathering and analyzing non-numerical data to explore concepts and experiences (Pritha, 2020), facilitated addressing research questions concerning stakeholders' viewpoints. By employing a qualitative approach, the researcher encouraged collaboration with participants and maintained direct communication during data collection (Creswell and Creswell, 2023). This methodology enabled the researcher to attentively listen to teachers' opinions regarding the utilization of both Tshivenda and English scientific registers in teaching Agricultural Sciences.

3.3   CASE-STUDY APPROACH

In this study, the researcher utilized a case study approach, in accordance with Yin's (2018) definition of this method as an in-depth exploration of a phenomenon within its real-world context. Employing the case study approach enabled the researcher to immerse themselves in the lived experiences, events, and phenomena of the participants. By engaging with the real-world contexts of the participants, the researcher could develop a comprehensive understanding of the phenomenon (Creswell and Creswell, 2023). Visiting three selected schools facilitated data collection through interactions with teachers and learners in classroom settings. Given the presence of multiple schools in the study, the use of multiple cases was justified due to the diverse geographical locations of the stakeholders. Each school served as a distinct case study, allowing the researcher to investigate participants' perceptions regarding the use of Tshivenda as the language of instruction for Agricultural Sciences and the impact of the developed scientific language register on meaningful learning in the classroom.

Throughout the study, the researcher considered not only the perspectives of individual participants but also those of relevant participant groups and the dynamics between them. In case studies, presenting data in accessible formats is crucial, as it enables readers to relate their own experiences to the findings (Maree, 2019). Therefore, the researcher focused on providing ample evidence to instill confidence in readers that all aspects of the cases were thoroughly explored and clearly communicated. Ultimately, the case study approach was selected for its emphasis on understanding the investigated phenomenon from the participants' viewpoints, aligning with the goals of this study.

3.5   RESEARCH CONTEXT

3.5.1 Research settings

This research was conducted in Limpopo province, one of South Africa's nine provinces. Tshivenda, Xitsonga, and Sepedi are among the languages spoken in this region. Limpopo province is comprised of 10 districts: Vhembe West, Vhembe East, Mopani West, Mopani East, Capricorn South, Capricorn North, Sekhukhune South, Sekhukhune East, Waterberg, and Mogalakwena. The study specifically focused on

the Vhembe East district, one of these 10 districts. Within the Vhembe East district, the research was conducted in the Luvuvhu circuit, which includes seven secondary schools located in rural areas. These schools primarily teach English as a First Additional Language (FAL) and offer Tshivenda as a home language. The researcher selected this circuit due to its alignment with the study's objectives. Although there are seven schools in the Luvuvhu circuit, data collection occurred at only three selected schools. This deliberate selection aimed to ensure manageable data collection and analysis processes. The figures below depict the South African map highlighting the location of the Vhembe district and the research context.
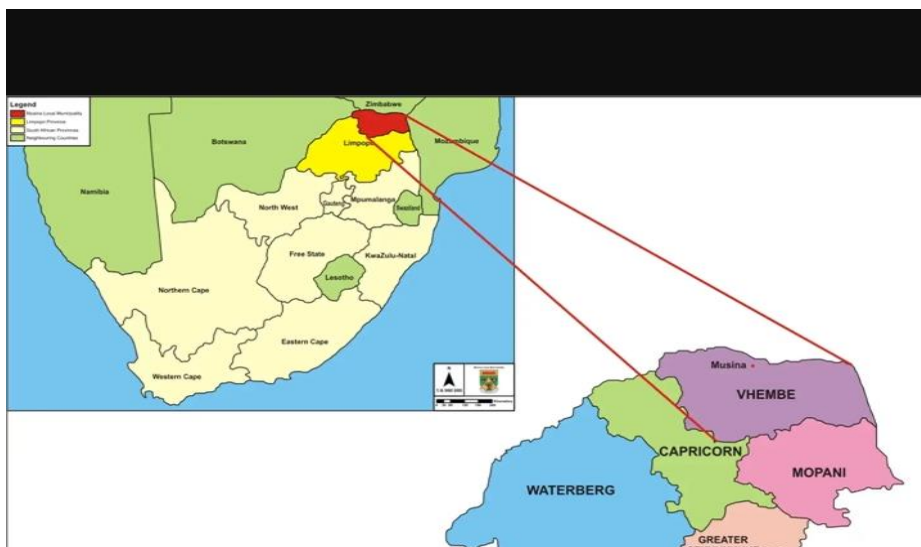
FIGURE 2: South African map
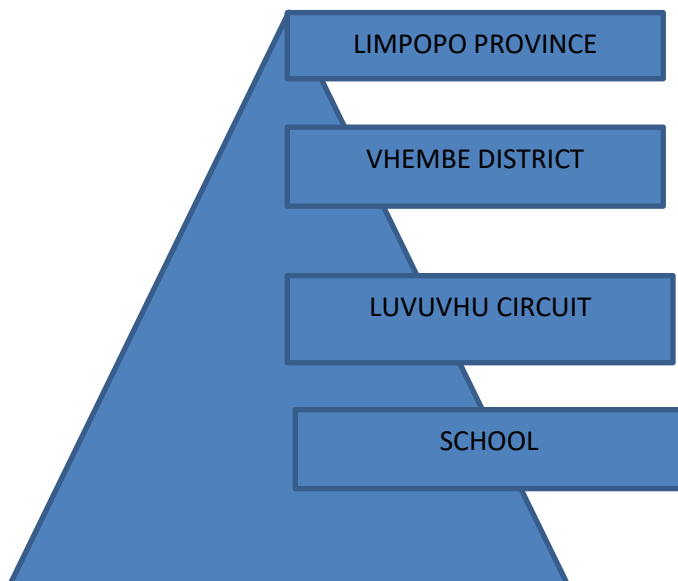
FIGURE 3: Research context

3.5.2 Population and Sampling

The research utilized purposeful sampling to identify participants, a method in which individuals are intentionally selected based on their relevance to the study's objectives (Denzin and Lincoln, 2018). This approach ensures that only those participants who can make significant contributions to the study's findings are chosen (Etikan et al., 2016). By employing purposeful sampling, the researcher could gather relevant data by selecting individuals with pertinent knowledge of the study topic. In this study, Grade 10 learners who are studying Agricultural Sciences in English as their First Additional Language (FAL), along with their teachers who have Tshivenda as their home language and teach Agricultural Sciences at the Grade 10 level, were selected. Additionally, five parents from each of the three chosen schools participated in the study. Data collection occurred in three schools within the same Luvuvhu circuit, where three Agricultural Sciences teachers from each school were selected to enable comparative analysis.

The inclusion of Agricultural Science teachers and learners who are native speakers of Tshivenda, along with their parents, was deliberate to ensure the acquisition of pertinent data essential for addressing the research questions. The criteria for selecting participants in this study were as follows:

- Participants (teachers) were actively teaching Agricultural Sciences to Grade 10 students, particularly within the Luvuvhu circuit.
- Both teachers and learners were proficient in Tshivenda.
- Participants demonstrated willingness to participate in the study.
- Parents were selected from the designated schools.

By adhering to these criteria, the researcher ensured that participants could provide valuable insights, contributing to the study's objectives effectively.

3.5.3 CASES

The objective of this study was to create a Tshivenda scientific language register for teaching Agricultural Sciences, focusing on Grade 10 learners from three secondary schools within the same circuit. The study involved three teachers from the selected schools, as well as fifteen parents and learners. To ensure confidentiality,

pseudonyms were employed instead of real names for all participants. Additional information about the cases studied is provided below:

CASE 1: MURI FROM MUSWIRI HIGH SCHOOL

Muri High School is in a rural setting, where the primary mode of communication among students and educators is predominantly Tshivenda, their primary home language. Most of the learners at the school reside in the village, while some come from nearby areas, relying on scholar transport to travel to school. Muri, a male educator at the school, possesses a secondary teacher's diploma and an advanced certificate in education, specializing in Agricultural Sciences and Geography.

CASE 2: MPHO FROM MUNNGO SECONDARY

Munngo is a rural secondary school located in a village within Limpopo. Tshivenda is the sole home language offered at this school, with most teachers and students using Tshivenda for communication. The learners reside in the same village as the school. English is taught as the first additional language to the students. Mpho, a black male educator at Munngo Secondary School, possesses a Post Graduate Certificate in Education, specializing in teaching senior phase and FET. His primary subjects of instruction include Agricultural Sciences and Natural Sciences.

CASE 3: THENDO FROM MUSESE SECONDARY

Musese is a rural secondary school where the students primarily use Tshivenda, their home language, for communication. Most of these students live within the village where the school is located, serving grades 8 through 12. English is taught as a second language to the learners. Thendo, who has six years of teaching experience in Grade 10 Agricultural Sciences, specializes in Agricultural Sciences and Mathematics. He holds a BED FET qualification.

3.6   DATA MANAGEMENT

In this section, the researcher conducted a thorough exploration of the data collection process, which included discussing the methodologies utilized, the interpretation and analysis of the acquired data, and the presentation of the collected data.

3.6.1 Data collection techniques (Phase 1)

This section delineates the diverse data collection methodologies employed in the study and their implementation. The researcher utilized interviews, observations, diaries, and the developed scientific language register for Agricultural Sciences in Tshivenda to procure data. The methodology of the study is segmented into two phases: the initial phase elaborates on the data collection methodologies employed during the development of the scientific language register for Agricultural Sciences in Tshivenda, whereas the subsequent phase delineates the data collection instruments utilized following the development of the registers.

3.6.2 Interviews

An interview is defined as a bilateral conversation involving two individuals, typically the interviewer and the interviewee, where the interviewer poses questions, and the interviewee responds (Denzin and Lincoln, 2018). Maree (2019) similarly characterizes an interview as a dialogue aimed at gathering data and obtaining insights into participants' ideas, beliefs, views, opinions, and behaviors. During the process of developing the scientific language register for teaching Agricultural Sciences in Tshivenda, the researcher encountered challenges in explaining certain scientific concepts and terms in Tshivenda. To overcome this obstacle, the researcher conducted face-to-face interviews with senior citizens in the village and sought assistance via telephone from Tshivenda curriculum advisors, authors of Tshivenda literature, and creators of Tshivenda dramas. These interviews were conducted to identify equivalent terms used to explain concepts in the register. The interviews with the senior citizens, curriculum advisors, authors, and creators continued until the register was fully developed.

3.6.3 Diaries

A diary functions as a private journal where individuals can freely write down their thoughts, ideas, emotions, or experiences (Blanka, 2015). In this research, the researcher also incorporated the use of a diary to chronicle the entire process of crafting the scientific language register. The diary documented diverse facets, such as the challenges encountered during the register's creation and the strategies

implemented to tackle them. It captured the interactions with various stakeholders who assisted with scientific terminology in Tshivenda, elaborating on the methods of consultation employed. Additionally, reflections on the register by different stakeholders and any insights or information contributing to its development were recorded in the diary.

3.6.4 Scientific language register for teaching Agricultural Sciences in Tshivenda

This study focuses on crafting a scientific language register tailored for teaching Agricultural Sciences in Tshivenda, focusing specifically on animal studies, which holds significant relevance to learners due to its connection with animals encountered in their daily lives. The researcher delved into two animals, exploring various aspects such as breed variations, origins, and characteristics, with the goal of enhancing learners' ability to discern between different breeds they encounter. Throughout the development of the register, the researcher faced challenges concerning scientific terms and concepts. To tackle these challenges, consultations were conducted with Tshivenda teachers, curriculum advisors, authors of Tshivenda literature, creators of Tshivenda dramas, and local senior citizens. Furthermore, for quality assurance and rigor, the developed register underwent review by Tshivenda teachers, curriculum advisors, and supervisors. Their feedback and recommendations were sought to refine and enhance the register.

3.6.5 Data collection techniques (phase 2)

Before commencing data collection, a consent letter was sent to the Vhembe-east district and Luvuvhu circuit office to request permission. Upon receiving approval from the office, the researcher arranged meetings with the school principals and teachers from the three participating schools, particularly those teaching Agricultural Sciences and proficient in Tshivenda. During the initial meeting, the researcher outlined the study's objectives, detailed the procedural steps, established the data collection timeline (to be conducted after school hours to minimize disruption to teaching and learning), and assured the principals that data collection would not disrupt their schedules. Furthermore, the researcher emphasized that the collected data would be solely utilized for research purposes and encouraged teachers to freely participate and seek clarification as needed.

In the initial meeting with the teachers, the researcher explained the purpose of the scientific language register for Agricultural Sciences in both Tshivenda and English, providing copies for review within the following week. Teachers were given the opportunity to offer comments and suggestions on the register, with plans to collect feedback in the subsequent week. Additionally, the researcher requested the names and contact details of the School Governing Body (SGB) members to involve them in the study, arranging telephone interviews with them. Parent interviews were conducted on the final day of data collection.

A second visit to the selected schools was arranged, during which the researcher collected the registers from the teachers and discussed the comments and suggestions provided. All inputs were recorded on the registers after thorough discussion. Furthermore, a workshop was held with the teachers to acquaint them with the registers and their usage, organized after school hours. Subsequently, teacher observations were conducted during the third week, with teachers observed teaching using the Tshivenda and English scientific registers alternately to assess their interaction and discourse, providing valuable insights to address the research questions.

3.6.6 Observation

Observation entails systematically documenting the behavioral patterns of participants, objects, and events without engaging in direct questioning or communication (Maree, 2019). Maree (2019) underscores observations as a valuable tool for researchers to gain deeper insights and understanding of the observed phenomenon, providing an insider's perspective on group dynamics and behaviors in various settings. In this study, observation served as a data collection technique to ensure the validity and reliability of the gathered data. Given the qualitative nature of the study, observations were conducted in the natural environment of three selected schools within the Luvuvhu circuit.

Three Agricultural Sciences teachers from the chosen schools were observed while teaching Agricultural Sciences using both English and Tshivenda scientific registers in their classrooms. During these observations, the researcher focused on observing the types of interactions and discourse employed by the teachers, as well as their utilization of the scientific language register in teaching Agricultural Sciences. This

approach was considered crucial for addressing the research question: "How does the application of the Tshivenda language register shape meaningful learning?" Detailed notes regarding language usage during instruction were recorded throughout the observations. Each teacher from the selected schools was observed for one hour, with 45 minutes dedicated to teaching unit 1 using the Tshivenda scientific register for Agricultural Sciences. The researcher maintained a non-invasive stance during the observations. Following the observation phase, interviews were conducted as the subsequent step.

3.6.7 Interviews

After conducting classroom observations of participants from the three selected schools, interviews were carried out using a semi-structured approach. As stated by Ntseli (2020), semi-structured interviews allow for probing when participants' responses are unclear, encouraging open and comprehensive responses. The interviews, arranged at the schools' convenience, were divided into two sections. The first part comprised biographical inquiries, such as teaching experience duration and qualifications held. The second part consisted of questions regarding the participants' viewpoints on the utilization of the Tshivenda language in teaching Agricultural Sciences. Throughout the interviews, follow-up questions were posed in response to the participants' answers. These follow-up inquiries aimed to delve deeper into their perceptions regarding the use of Tshivenda as the medium of instruction and its impact on Agricultural Sciences teaching and learning. The objective of these follow-up questions was to elucidate responses and gather additional data. All interviews with the participants adhered to this structured format.

Teachers

Following their observation while teaching using both registers, three Agricultural Sciences teachers from three deliberately selected schools were interviewed face-to-face on their respective school premises. The interview consisted of two sections: the first part centered on biographical details, including their tenure in teaching Agricultural Sciences and their qualifications. The second part delved into their perspectives on the use of the scientific register in teaching Agricultural Sciences. These questions, along with follow-up inquiries, were directed to the teachers to elicit responses relevant to the research question: "What were the stakeholders'

perceptions on the use of the register?" The interview process typically lasted 10-15 minutes.

Learners

In this study, focus-group interviews were conducted with a single class of learners, with each group comprising five learners. The researcher presented identical sets of questions to each group and recorded the responses to ensure data preservation. The question posed was: "Do you encounter any challenges in learning Agricultural Sciences in English?" This method was designed to assist the researcher in addressing the research question: "How does the application of the Tshivenda scientific language register for Animal Studies shape meaningful learning?" During the group interviews with learners, the researcher attended to one group at a time, with each interview lasting approximately 10-15 minutes.

Parents (Members of the School Governing Body)

Face-to-face interviews were conducted with five parents from each of the three selected schools, aiding in data management. These interviews focused specifically on language-related issues, including the parents' perceptions of using Tshivenda to teach Agricultural Sciences and their preference regarding the language—Tshivenda or English—that they would prefer their children to use for learning Agricultural Sciences. Prior arrangements were made with the parents regarding the interview location. While the interviews were conducted in English, Tshivenda was utilized to clarify questions when necessary. Each interview session lasted between 10 and 15 minutes. All interviews with the participants from the three selected schools were recorded for accuracy and to prevent data loss. Participants were given the opportunity to review the recorded audio to ensure that their responses were accurately captured. This measure was implemented to maintain the fidelity of the data. Subsequently, the audio-recorded interviews were transcribed to facilitate data analysis.

3.7 Data analysis and Interpretation

Data analysis involves the systematic examination of collected data (Ary, 2010), which is particularly significant in interpretive studies (Maree, 2019). Qualitative data

analysis encompasses various approaches and procedures aimed at extracting explanations, understandings, or interpretations from qualitative data obtained from researched individuals and situations (Maree, 2019). After data collection, the researcher analyzed the data gathered from participant interviews, audio recordings, observations, and diary entries using content analysis. Content analysis is defined as a methodical, replicable technique for condensing textual data into fewer content categories based on explicit coding rules (Stemler, 2001).

In this study, data from audio-taped interviews, observations, and diaries were transcribed, coded, and scrutinized multiple times to comprehend the collected data. Audio-taped interview data were analyzed by listening to them repeatedly, transcribing them into written documents, and re-evaluating the audio recordings to ensure alignment with participants' responses. The same process was applied to video data to ensure accuracy between the captured footage and the researcher's documentation. Participants were also given the opportunity to review the transcribed data, enabling them to offer input and corrections before finalizing the data. Additionally, data from observations, interviews, and diaries were coded and categorized for analysis.

3.8 RIGOUR

Ensuring validity and reliability is crucial in qualitative research as it distinguishes effective studies from ineffective ones and enhances confidence in the credibility and trustworthiness of the findings (Shruti & Priya, 2020). Validity pertains to the appropriateness and accuracy of the research's values, tools, techniques, and processes, including data collection and validation (Mohamad et al., 2015). It also confirms the robustness of the methodology, sampling procedures, data analysis, and study conclusions (Golafshani, 2003). In this study, the researcher prioritized credibility (internal validity), dependability, verisimilitude, and conformability to ensure the reliability and validity of the research.

3.8.1 Credibility (Internal validity)

Credibility, often termed internal validity, denotes the extent of confidence in affirming that any cause-and-effect relationship identified in a study is not influenced by other variables (Bhandari, 2020). As the researcher was directly involved in data

collection, establishing credibility was essential to uphold the trustworthiness and reliability of the conclusions drawn (Bhandari, 2020).

3.8.2 Dependability

Dependability pertains to the researcher's capacity to address the inherent variations within the study (Maree, 2019). In this research, ensuring dependability involved the researcher maintaining transparency concerning the research methodology.

3.8.3 Confirmability

Confirmability, as described by Lincoln and Guba (1985), refers to the extent to which study outcomes are shaped by participants' viewpoints rather than the researcher's biases or preferences. To ensure confirmability in this study, triangulation was utilized. The researcher combined data from interviews, diaries, and classroom observations to achieve this aim.

3.8.4 Verisimilitude

While collecting data from participants, the researcher maintained the authenticity of the research by directly quoting the participants' statements. This approach aimed to eliminate any uncertainty regarding the credibility of the provided data. Additionally, all participant responses were presented in italics to emphasize that these perspectives originated from the participants themselves, rather than the researcher.

3.8.5 Triangulation

Richardson (2000) argues that triangulation depends on a stable point or entity that can be triangulated, typically involving the use of multiple data collection methods (often three) to examine the same phenomenon. This approach serves as a mutual means of measurement and validation of findings (Maree, 2019). Berg (2007) explains that by incorporating various data collection techniques, researchers attain a more comprehensive understanding of reality. In this study, to enhance credibility and accuracy of the data, the researcher employed interviews, observations, and diaries.

3.8.6 Pilot study

Pilot studies typically involve a trial, project, or developmental phase conducted before a larger future endeavor (Eldridge et al., 2016). Pilots are often akin to feasibility studies, aiming to inform the planning of a large-scale investigation (Dorothy et al., 2018). In this study, the pilot phase helped the researcher identify actual issues to address before initiating the full-scale study. By conducting a pilot study, the researcher could assess any loopholes that needed attention before proceeding with the full-scale study, while retaining unchanged aspects that did not require further adjustment.

Before implementing the research instrument on a pilot basis, it was submitted to the supervisor for feedback. The research instrument was then tested with participants who met the criteria of the main study, including:

- All teachers must teach Agricultural Sciences in grade 10.
- Teachers must be proficient in Tshivenda.
- Participants must be willing to take part in the study.
- Parents or guardians of a learner at a selected school.

Several insights were gained during the pilot study:

- Participants' mobile phones were unavailable during the pilot study, with network issues mentioned. Consequently, the researcher realized the need for at least two cellphone numbers and an email address.
- Delays in conducting the pilot were observed due to participants' busy schedules, necessitating better scheduling practices in the main study.
- Participants were unclear about when interviews would be recorded, highlighting the need for clearer explanations regarding the confidentiality of collected data.
- Initially, participants did not fully grasp certain questions, prompting the researcher to repeat and elaborate on them.
- Some participants had difficulty understanding questions in English, prompting the researcher to provide questions in both English and Tshivenda.

The insights gained from this pilot study provided the researcher with valuable considerations before embarking on the main study, improving the researcher's strategy for interacting with participants.

3.9   ETHICAL CONSIDERATIONS

The researcher initiated the research process by securing approval from the Vhembe East District Office and the Luvuvhu Circuit, followed by obtaining consent from the three chosen schools where the study would be conducted. Upon receiving permission, the researcher convened with the participants, including Agricultural Sciences teachers proficient in Tshivenda, Grade 10 Agricultural Sciences students, and parents. The researcher provided a comprehensive overview of the data collection procedures, ensuring that all participants understood the process. Consent forms were distributed, with parents signing on behalf of their children after receiving detailed explanations. Participants were informed of their rights, including the option to decline participation or withdraw at any stage without consequence. Stringent measures were implemented to safeguard the confidentiality and anonymity of collected data, with data collection scheduled outside of regular school hours to minimize disruptions.

3.10   CHAPTER SUMMARY

This chapter provides a detailed account of the research methodology adopted for data collection, covering key elements such as the qualitative approach, case study methodology, research paradigm, research context, and data management practices, as well as rigor considerations aimed at ensuring validity and trustworthiness. Furthermore, the chapter outlines the data collection methods employed, which include interviews, observations, and diaries.

CHAPTER 4: DYNAMICS ABOUT THE SCIENTIFIC LANGUAGE REGISTER

4.1   INTRODUCTION

This chapter presents and discusses the data collected to address the study's objectives, followed by the reporting of findings. The research questions that guided the study are then introduced:

Main question:

● How can the development and the application of the Tshivenda Scientific language register for animal studies be carried out?

Sub-questions:

● What are the challenges identified in developing the Tshivenda Scientific language register for animal studies?

● What are the opportunities in developing the Tshivenda Scientific register for animal studies?

● What are the stakeholders' perceptions in developing the Tshivenda Scientific language register for animal studies?

● How does the application of Tshivenda language register shape meaningful learning?

The researcher utilized a table containing Themes, Categories, and Characteristics to analyze and interpret both the collected data and the findings of this study.

THEME	CATEGORY	CHARACTERISTICS
THE DEVELOPMENT AND APPLICATIONS.	CHALLENGES	To view the challenges encountered in the development of Tshivenda register.
	OPPORTUNITIES	To view the opportunities in the development of Tshivenda register.
	PERCEPTIONS	To understand how different stakeholders perceive the development of Tshivenda register (Teacher, Parents and Learners)
	MEANINGFUL LEARNINGS	To view on how the application of Tshivenda registers shape meaningful learning in class.

4.2 DATA ANALYSIS AND DISCUSSION

4.2.1 Challenges and opportunities

This section delves into the first and second research sub-questions of the study: What challenges were encountered in formulating the Tshivenda Scientific language register for animal studies? Furthermore, it investigates the potential opportunities in crafting the Tshivenda Scientific register for animal studies. Acknowledging Netshivhumbe's (2022) observation that Tshivenda is still evolving due to the dearth of scientific terminology, the researcher underscored the significance of consulting Tshivenda language educators to gather insights into the formulation of the Tshivenda register. Prior to embarking on the creation of the Tshivenda Scientific language register, the researcher convened a meeting with three Tshivenda language educators. During this meeting, the researcher expounded on the study's

objectives, emphasizing the intent to devise a Tshivenda scientific language register tailored for Agricultural Sciences instruction. One teacher conveyed the sentiment that:

"Diverting from English to Tshivenda might be a problem because they are words that we still borrow from other languages like English and Afrikaans, the teacher also made the researcher aware that even when they are teaching learners Tshivenda subject in class, they made learners aware of the words that are borrowed from other languages."

Considering the teacher's comments, the researcher acknowledged the importance of seeking further input from individuals well-versed in the Tshivenda language. While crafting the scientific language register, the researcher acquired contact details for a Tshivenda curriculum implementer from the Vhembe-East district through the teacher. Following this, the researcher reached out to her to seek clarification on the distinctions between male and female animal breeds in Tshivenda terms. The curriculum implementer expressed that*:*

"The names and gender of animals are not properly used, our learners just know cattle as kholomo, goat as mbudzi and sheep as nngu, she indicated that they are specific terms that are used, which she promises to send the following day and eventual did."

While working on developing the Scientific language register, the researcher came across a senior citizen in her village, who turned out to be a retired principal and Tshivenda language teacher from an undisclosed secondary school. The researcher shared her difficulties with terms that were absent in Tshivenda, such as "pelt" and "pale brown." The retired principal mentioned that:

"The word for pelt is not yet developed in Tshivenda but the term can be directly translated from English instead, and also for pale brown he said that we don't have specific term for it in Tshivenda and brown is also borrowed from English."

From the description above, it seems that Tshivenda, akin to other indigenous languages like isiNdebele, is in a state of continual development, with a limited pool of scientific terminology available, as observed in Ntuli's (2022) research. Despite

seeking guidance from various sources, the researcher encountered terms that were still absent in Tshivenda, prompting her to turn to senior citizens in her village for advice.

To address this gap, the researcher visited Tshivenda-speaking seniors in her community to solicit input on relevant terms, particularly those related to combinations of breed colors and their usage. These seniors proposed several words, which the researcher then verified with Tshivenda teachers for accuracy.

Amidst the challenges, the researcher also identified opportunities in the development of the scientific register. Through a Tshivenda teacher, the researcher obtained contact details for a Tshivenda curriculum implementer. Upon explaining the study's focus to the implementer, she promptly supplied specific terms for describing male and female animals, thereby assisting the researcher in selecting appropriate language.

Furthermore, another opportunity arose when the researcher consulted a writer of Tshivenda literature and dramas residing in her village. His response was encouraging, as he expressed support for the researcher's endeavors:

> *"Tshivenda language is not yet fully developed as they are still terms which are not known to them he then gave the researcher a book with English, Afrikaans, Tshivenda and Tsonga translations, the book helped with other terms."*

4.3. CASES

CASE 1: MURI FROM MUSWIRI HIGH SCHOOL

4.3.1 STAKEHOLDERS PERCEPTION
Teacher

In South Africa, Gordon (2019) observes that most parents select English as the Language of Learning and Teaching (LoLT) for grade 4. This preference is frequently influenced by the limited accessibility of educational materials in African languages (Ntuli, 2022). As part of the development of the Tshivenda scientific language

register, the researcher sought to understand teachers' perspectives on parents' decision to switch to English instead of utilizing their native language. Here is Muri, the teacher from Muswiri High School, sharing his thoughts on using Tshivenda for teaching Agricultural Sciences.

"My perception is that it will be good to teach Agricultural Sciences in Tshivenda because learners will understand the lesson clearly." Muri

The teacher's position advocates for the utilization of Tshivenda in teaching Agricultural Sciences, in line with the findings of Probyn (2015), indicating that students experiencing difficulties in comprehending science perform better when provided with opportunities to improve their language proficiency. Muri's perspective echoes Ogunniyi's (2019) remark that conveying scientific concepts in a language other than the learners' native tongue may present challenges. During the interview conducted for this study, Muri, the teacher from Muswiri High School, expanded upon this standpoint:

"If we are teaching in English, they found it difficult hence they would be a negative impact on learning, but if they are taught in Tshivenda it become easy for them to understand what is being taught." Muri

Muri also expressed concerns regarding the impact of the language employed in teaching Agricultural Sciences on learner performance, as evidenced by the following statement from him:

"Yes, it has an impact, if we were using maybe their mother tongue the performance will be best, it will be better than the one we currently have." Muri

Parents

Some parents continue to hold onto the perspective articulated by Mutase (2015), maintaining that English proficiency is essential for their children's success, as they believe that job prospects favor those who are fluent in English. Parent 2 echoed this viewpoint by stating that:

"Zwau funza Agricultural Sciences nga Tshivenda zwingasi shume ngauri habe a tshiswika hangei zwikoloni zwa ṋtha hukhou toḓea tshikhuwa

(Teaching Agricultural Sciences in Tshivenda will never work because in tertiary institution the is a need of English)." P2

Although Muri, the teacher, advocates for instruction in Tshivenda, some other parents view it as a drawback, despite its potential advantages for their children's academic success. This corresponds with the discoveries of Kinyaduka and Kiwara (2013), who observed that both parents and educators recognize the benefits of utilizing the mother tongue in education but still opt for English as the primary mode of instruction. This inclination could be attributed to the incomplete development of many indigenous languages (Netshivhumbe, 2022).

Nonetheless, despite certain parents' hesitations regarding the use of Tshivenda in Agricultural Sciences instruction, others perceive it as a beneficial move, anticipating that it will improve their children's grasp of the subject matter (Francis and Eucharia, 2019). The feedback from Parent 1 endorses the utilization of indigenous languages in Agricultural Sciences instruction:

"Nne ndivhona unga hezwi vhana vhatshi khou fuziwa nga Tshivenda ndi zwone zwavhuḓi ngauri vhaḓo kona u pfesesa na mudededzi (I think it will be best if learners are taught in Tshivenda because they will be able to understand the teacher)." P1

In contrast, Parent 3 supports the use of a learner's native language, echoing the sentiments expressed by Maluleke (2019) that switching to the learner's mother tongue improves academic performance and fosters greater engagement in lessons. This perspective is emphasized by the feedback provided by Parent 3:

"Musi ṅwana a tshikhou funziwa nga Tshivenda uya kona u pfesesa uri ukhou funziwa mini. Ee thiri uvha asa pfesesi a tshi funziwa , vhunzhi ha vhana avha ṱalukanyi maipfi a tshikhuwa. (When our children are taught in Tshivenda, they understand what is being taught, yes majority of our children don't understand most of words in English)." P3

Parent 3 from Muswiri High School promotes the utilization of Tshivenda in both teaching and learning, highlighting the benefits associated with learning in one's native language. According to research conducted by Garcia et al. (2017), parents advocate for the use of two languages by teachers to ensure learners attain a more

profound and lucid understanding of subjects: initially teaching in English and subsequently offering explanations in the learners' mother tongue. This viewpoint is echoed in the feedback provided by Parent 4:

> *"Nṋe ndi vhona ungari ngauri maṅwe maipfi a tshibva kha tshikhuwa a tshiya kha Tshivenda ha pfali, ndi uri arali I Agric a ivhe nga tshetsho tshine ya khou funziwa ngatsho. Arali a mudededzi uḓo to ḓologela samusi hu green manure, mudededzi kha ṱalutshedze nga Tshivenda uri green manure zwikhou amba mini na nga Tshivenda, vha ṱalutshedze kha ipfi ḽine nwana ḽikhou mukonḓela (In my view, I think some words are not easy to translate from English to Tshivenda, if its Agric let it continue like the way it is, teacher will interpret words from English to Tshivenda if learners don't understand, if its green manure teacher will have to explain it to learners in Tshivenda." P4*

The parent's inclination is apparent in their wish for their children to be taught in English initially, with subsequent explanations provided in Tshivenda. This signifies the parent's acknowledgment of the language barrier faced by the learners. They proceed to elaborate on this point:

> *"Nṋe ndipfa unga English I vha I right, mara ṅwana kha fhedze a ṱalutshedziwe nga Tshivenda, ritshikhou amba hu so huna fhethu hune havha hukhou ṱoḓea tshikhuwa fhedzi havha husina wa u ḓologela, mudededzi kha dovhe avhe na tshifhinga tshilapfu na vhana(I think English is right but teacher should interpret to learners in Tshivenda, because if we look for instant we have area where in you are required to only speak in English with no one to interpret in Tshivenda, teacher should have more time with learners)." P4*

Learners

In addition to considering the opinions of teachers and parents, the researcher also considered the perspectives of the learners. Although they voiced challenges in comprehending English, the learners still showed a preference for being taught in that language. This inclination might be influenced by their parents' attitudes at home. Phillipson (1992) supports this notion, emphasizing that English serves as a

language facilitating upward social mobility, and argues that learners' reluctance to use their native language is not inherently natural but rather a consequence of societal influences. The sentiments expressed by learners in group 1 were summarized as follows:

> *"For us in the future if we manage to secure a scholarship to go to other country, even though Tshivenda is easy to understand but we still prefer to be taught in English even though we don't understand it." L1*

The observation aligns with the findings of Mapelo and John (2021), who observed that while learners demonstrate understanding when taught in their mother tongue, there remains a challenge regarding unclear career paths after completing their studies. However, this assertion can be challenged in light of statements made on SABC news on February 22, 2020, by Chief Justice Mogoeng Mogoeng. He dismissed the notion that proficiency in English is indispensable for advancement in the corporate world, citing examples of developed nations like China and Korea, which have achieved progress using their native languages. Learners in Group 3 expressed their endorsement for the use of their mother tongue. Here are their sentiments following instruction with the Tshivenda register:

> *"Zwiṅwe zwa zwithu zwe ravha risongo kona u zwipfesesa nga tshikhuwa musi hutshi vho funziwa nga Tshivenda ro kona uzwi pfesesa (Some of the concept that we fail to understand in English, we manage to understand them in Tshivenda, we manage understand them when we were taught in Tshivenda)" L1*

> *"Tshinwe tshifhinga arali ritshikhou tou ṅwala test ri a misunderstand questions like ngori I kha English, sometimes a ri I pfesesi zwinga ita arali ra ṅwala nga Tshivenda (Sometimes if we are writing a test we misunderstand questions asked in English, it will be better if we write in Tshivenda)." L2*

Learners in Group 3 conveyed that they grasp lessons more effectively when delivered in their mother tongue. Their preference for instruction in Tshivenda originates from their conviction that it enhances their comprehension of concepts they find challenging in English. This perspective is consistent with the conclusions

drawn by Sibongile and Ansuries (2021), who underscored that learners' restricted exposure to their native language hampers efficient teaching and learning. When asked about their performance in Agricultural Sciences, the learners acknowledged experiencing difficulties, attributing their challenges to the language used for instruction. Their responses were recorded as follows:

> *"Ee ri vhona unga zwikhou vhangiwa nga ṅwambo wa luambo lune lwa shumiswa u funza Agricultural Sciences lwa tshikhuwa ari lupfesesi na luthihi lua ri kanganyisa (Yes we would say it's because we don't understand English at all, it confuses us)." L3*

The learners' statements above highlight the difficulties they encounter with English, indicating that it frequently causes confusion for them.

4.3.2   MEANINGFUL LEARNING

In this section, the researcher examined the participants' viewpoints concerning the implementation of the Tshivenda register. This analysis aimed to address one of the research inquiries regarding the impact of using the Tshivenda language register on meaningful learning. Ramothwala et al. (2022) argue that for teaching and learning to be meaningful, learners must actively engage, which is facilitated when instruction takes place in their native language. Carstens (2016) supports this idea by suggesting that learners demonstrate comprehension, confidence, and expressive skills when taught in their mother tongue. Parent 3's favorable response regarding the adoption of the Tshivenda register for teaching Agriculture resonates with this perspective. She agrees that utilizing the Tshivenda register shapes classroom interactions and discussions, enabling learners to effectively engage with their teachers. This interaction fosters meaningful learning and is associated with improved academic outcomes (Adesemowo, 2017).

> *"Musi vhana vha vho riṋe vha tshi khou funziwa nga luambo lwa tshikhuwa avha koni u ṱandavhudza vhuḓipfi havho fhedzi ha arali vhatshi nga kona u funziwa Agric nga Tshivenḓa vhaḓo kona u ṱandavhudza vhuḓipfi havho havha na u amba classin na mudededzi ngauri Tshivenḓa tshi a pfala. (When our learners are   taught in English they fail to express*

their view, but when they can be taught Agriculture in Tshivenda they can
be able to interact with their teacher in classroom)." P3

Muri also affirmed this viewpoint following the implementation of the Tshivenda register, as indicated by his interview response:

"My experience in using the scientific language register was good, because I can see that the learners were participating, and they were happy and they enjoyed the lesson." Muri

The researcher's observations were consistent with the responses obtained during interviews with parents and teachers. When the learners received instruction in Tshivenda, they exhibited engagement by asking questions and showing interest in the lesson. This mirrors the sentiments conveyed by Muri and one of the parents. This consistency is apparent in the interaction between the teacher and learners provided below:

Learner 1: "Ri a wana uḽu ine ra ita ngayo zwiambaro (We get wool to manufacture clothes)."

Teacher: "Yes zwiṅwe? (What else)."

Learner 2: "Ri a wana mafhi. (We get milk)."

Teacher: "Ee mafhi na one awela kha zwiḽiwa. (Milk is also food)."

Learner 3: "Ri a rengisa (We sell)."

From the preceding dialogue, it's apparent that the learners demonstrated a notable level of confidence in responding to the teacher's inquiries, which fostered positive interaction between the teacher and students. The use of Tshivenda facilitated constructive discussions among the learners, especially when the teacher prompted them to generate questions based on the lesson content. The confidence displayed by the learners indicated that meaningful learning had occurred.

Mapelo and John (2021) have emphasized that learners exhibit understanding and comprehension when instructed in their native language. During the researcher's observation of the lesson conducted using the Tshivenda register, learners actively engaged with the teacher and conveyed their comprehension through affirmative

nods. This engagement is exemplified in the interaction between the teacher and learners provided below:

Learner 1: "Ya wool (Its wool)"

Teacher: "Haḓa ya mini? (What else)"

Learner 2: "Ya ṋama na uḽu (Meat and wool)"

Teacher: "Zwino ri khouḓa kha ya mini? (So now we are coming to which one?)."

Learner 3: "Khaya nama (Meat breeds)."

Teacher: "Ee ndi heyo nngu, ya u thoma ipfi mini habe? (Yes that's the one, what is the name of the first sheep?)."

Learner 4: "Dorper."

During the interaction, there was a clear understanding between the teacher and learners as the teacher employed the Tshivenda register. Learners responded effectively to questions, and the discussion expanded beyond the initial inquiries due to the utilization of the learners' native language. The introduction of the Tshivenda scientific language register also enhanced the confidence levels of the learners, a phenomenon supported by Großmann and Wilde (2019), who observed that English as a second language learners in science classrooms typically show improvement when taught by their teachers in their native language. The image below demonstrates how learners displayed confidence and active participation during the lesson, indicating their deep engagement.

Figure 4: Case 1 learners during Tshivenda register lesson observation

Contrary to this, Opic (2016) emphasized that when teachers utilize the native language of learners, it nurtures positive interpersonal connections, fostering mutual understanding between teachers and learners. The accompanying image further supports this claim, depicting learners engaging in dialogue with each other, demonstrating their comprehension.

FIGURE 5: Case 1 learners engaging in dialoque

The researcher also observed the teacher utilizing the English register. According to Kufakunesu (2021), disregarding learners' native language restricts their confidence and interaction. From the researcher's observations during the English lesson, there was minimal engagement between the learners and the teacher, with the learners showing passivity towards the lesson. Additionally, when the teacher asked questions, the learners remained silent, likely due to language barriers impeding

their understanding of the material, resulting in a lack of comprehension of the questions asked.

Learner 1: "Fats."

Teacher: "Nguni, its origin they originate in South Africa and some of its characteristics and special adaptive features are that it is well adapted to local climatic condition, it produce well in a normal local pasture and it is adapted to drought, it also endure tough condition so this are South African beef breeds. We have other breeds which come from other country and what do we call them? (Pointing to learners)."

Learners 2: (Learner kept quite)

Teacher: "We call them exotic breeds, we have Abedeen Angus and?"

During the English lesson, the teacher seemed to take on the role of the main speaker, while learners frequently stayed quiet and seemed disengaged, as illustrated by the interaction outlined above between Muri and his class. The teacher also skillfully utilized code-switching to ensure clarity in explanations for the learners. Alang and Idris (2018) recognize the widespread use of code-switching, especially in South Africa, where English is the predominant medium of instruction in numerous schools. When asked during an interview about his use of code-switching while employing the English register, Muri offered the following response:

"This is because my learners understand Tshivenda better than English."
Muri

Parent 3 holds a similar perspective, confirming that Tshivenda is indeed straightforward to understand. Below is the response from this parent:

"Ngauri ndivhona Tshivenḓa tshi tshi pfesesea ufhira Tshikhuwa (Tshivenḓa is easy to understand as compared to English)" P3

The ensuing interaction was documented during the teacher's lesson, wherein halfway through, the teacher transitioned to Tshivenda. Research conducted by Garcia et al. (2017) promotes the utilization of a different language, asserting that it augments students' depth of understanding.

Learner 1: "Big at the back."

Teacher: "Ndiuri hangei murahu (It means there at the back) their big but when it comes to front their narrow, hence they have got a shape which is sort of block shape, it is like a triangle shape. So, the backline of dairy is seen from the side and forms a straight line from neck to the tail, so it is straight, so the rumen is very much highly productive with very great deal of food and water is necessary to produce milk, the udder is a very important part of the dairy breeds."

The photograph below captures the implementation of the English register. The teacher observed that some learners were asleep, while others were gazing downward during the lesson. Research by Nishanthi (2020) illustrates that when learners are taught in their mother tongue, they exhibit greater engagement with the content and achieve better comprehension. However, during the English instruction, learners were not attentive.
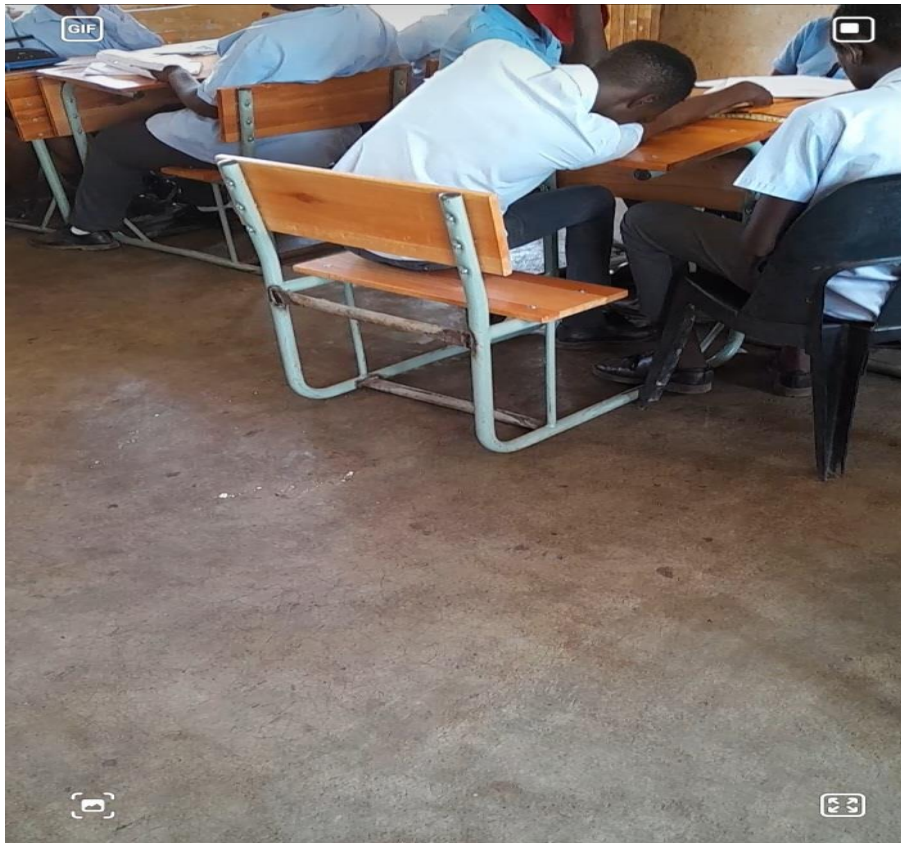

FIGURE 6: Case 1 learners during English lesson observation

4.3.3   FINDINGS

Teacher's perception

In this study, the teacher endorsed the use of Tshivenda for teaching Agricultural Sciences, as indicated by their favorable feedback. Muri commented that utilizing Tshivenda as the medium of instruction boosts learners' confidence in answering questions. Additionally, he observed that if given the option between English and their mother tongues, learners would opt for Tshivenda or their native languages. Muri noticed that whenever he switched to Tshivenda to explain or teach, learners displayed confidence and reacted positively. He also mentioned that as a teacher, he resorts to code-switching when elucidating difficult terms to the learners.

Parents' Perception

Among the five parents interviewed, only two endorsed the use of Tshivenda for teaching Agricultural Sciences, while three were opposed to it. Supporters believe that learners will achieve better understanding when taught in their mother tongue, asserting that this method will improve their children's educational experience. On the other hand, parents advocating for English instruction argue that it should be the preferred language because of its prominence in higher education. Some parents suggested a middle ground, proposing that English be taught alongside the learners' native language, recognizing the difficulties their children encounter in understanding English but still advocating for its use with interpretation provided by teachers.

Learner's perceptions

Different learners display varying attitudes towards the use of Tshivenda in Agricultural Sciences instruction. Some learners prefer English, emphasizing the importance of English proficiency for obtaining scholarships abroad, even though they recognize their difficulties in comprehending English lessons. Conversely, some learners endorse instruction in Tshivenda, highlighting the importance of comprehension. Others advocate for being taught and assessed in their native language, citing difficulties in understanding English questions as their reasoning.

Meaningful Learning findings

When learners actively participate with the teacher, the educational process becomes more significant, as evidenced by their involvement and understanding. In the observed sessions, learners showed comprehension and responsiveness when instruction was conveyed in Tshivenda. They remained attentive to the teacher and followed directions closely, facilitated by the mutual language comprehension between teacher and learners. Conversely, when English was used, the interaction between teacher and learners was limited, resulting in passive involvement from the learners. Some students seemed disengaged, with some even falling asleep during the lesson, prompting the teacher to utilize code-switching strategies. In this context, learners struggled to grasp the questions posed to them and often responded inaccurately or remained silent when prompted. This observation underscores the difficulties encountered by learners when instructed in a non-native language.

CASE 2: MPHO FROM MUNNGO SECONDARY SCHOOL

4.3.4   STAKEHOLDERS PERCEPTIONS
Teacher perceptions

According to Hurst and Mona (2017), despite changes in post-apartheid language policies, teaching approaches in South African classrooms have remained largely stagnant since the colonial era, with minimal integration of learners' mother tongues (Chaka, 2020). In the context of creating the Tshivenda Scientific language register, the researcher aimed to explore teachers' viewpoints on using Tshivenda for Agricultural Sciences instruction. Mpho, a teacher from Munngo Secondary School, shared insights on this topic:

> *"I think it would be good idea to introduce Tshivenda as the language of teaching Agricultural Sciences. The reason for that is that many times when learners have difficult, that is the language they normally switch to so that we can explain terms that are difficult to the learners, and also it is the language that they easily understand in this school." Mpho*

From the preceding statement, it is evident that the teacher supports the use of Tshivenda and believes it will improve learners' understanding. Furthermore, the teacher discussed the language's impact on learners' performance in Agricultural Sciences, as illustrated by Mpho's response:

"Yes the language that is used to teach Agricultural Sciences has an impact. Since it is not the common language that the learners use even outside the classroom or home, it becomes difficult for the learners to understand what they are learning but if we change then the learners is going to improve." Mpho

The teacher's statement is reinforced by the conclusions of Sefotho (2022), who observed that using learners' native languages enhances their understanding of complex concepts.

Parents' perceptions

Parents play a crucial role in influencing their children's attitudes towards learning, especially in language acquisition and literacy development (Lerkkanen, 2019). The teacher's viewpoints resonate with those of the parents, as they also advocate for the use of Tshivenda in teaching Agricultural Sciences, as articulated by Parent 1:

"Vhupfiwa hanga ndi ha uri ṅwana uḓo kona u pfesesa zwine mudededzi a khou amba zwone, zwine mudededzi avha atshikhou mufunza zwone nga luambo lwawe lwa ḓamuni.Reason ndi ya uri musi a tshi khou shumiseliwa tshikhuwa hakoni u pfesesa u fana na luambo lwa we lwa ḓamuni.(My percptions is that learners will understand what is being taught by their teacher if there using their home language, the reason being that when the lesson is in English learners fails to understand, unlike if the lesson is in their own language)" P1

The parents were also asked about their preference regarding the language used for instructing their children, and here was their reply:

"Ndi nga takalela uri a funziwe nga luambo lwawe lwa ḓamuni, ngauri zwoṱhe zwine zwa ḓovha zwikhou funziwa uḓo kona uri a zwipfesese ngauri vhaya kona uri vha ambedzane tshiṅwe na tshinwe tshine vhakhou

mufunza ngatsho, uya kona u vhudzisa vhakona u muṱalutshedza, ndiuri a ambe nga luambo lwawe lwa ḓamuni fhedzi. (I would prefer them to be taught using their home language, as there able to understand what is being taught, and also they are able to interact with their teacher and all that is being taught, also asking questions become easy when learners are using their home language)." P2

Additionally, the parents were asked about the impacts of employing the English language versus Tshivenda in teaching Agricultural Sciences:

"Ee luna masia ndoita asi avhuḓi ngauri zwifhedza zwitshi vho vhangela uri vha fanela u feila vha vhanzhi, mafhungo husi uri vhavha vha sa zwikoni, thaidzo huku pfesesele kwa honolu luambo lune vhakhou funziwa ngalwo. (Yes, it does have an impact, the use of English makes our learners to fail in large numbers, the problem being that they fail to understand the language not the lesson taught)." P2

According to the responses given earlier, parents conveyed numerous favorable opinions regarding the integration of Tshivenda as the instructional language in Agricultural Sciences classes, recognizing its efficacy.

Learners' perceptions

The revelations gathered from interviews with learners revealed their positive attitude towards the use of Tshivenda in teaching Agricultural Sciences. They conveyed that understanding is enhanced when their teacher utilizes Tshivenda, which is consistent with the findings of Barnard and McLellan (2014). Here is a passage showcasing the perspectives of learners in group 1:

"Nṋe ndinga amba uri zwikhwine ngauri vhunzhi ha vhana vhaya balelwa nga u amba English, musi vhatshi khou funziwa nga Tshivenda ndihone vhatshi pfesesa khwine. Ngauri vhana vha fhano vha amba Tshivenda, vhunzhi havho avha dzuleli u amba tshikhuwa. (What I can say is that it will be better, because majority of us are unable to speak in English, and when we are taught in Tshivenda is then that they understand better, because most of us in this school we speak Tshivenda in most cases and not English)." L1

Teachers and learners alike held a shared viewpoint regarding the utilization of Tshivenda for teaching Agricultural Sciences. When asked about any challenges they faced while studying Agricultural Sciences in English during an interview, here are the responses from learners in group 2:

"*Ee ria ṱangana na vhuleme ngauri English ari ngo toi ḓowelesa nga uto ralo, ngauri mahayani vhabebi vhashu vha amba na riṋe nga Tshivenda na fhano tshikoloni sometimes vhadededzi vhaamba na rine nga Tshivenda. (Yes we do experience some challenges because we are not used to speak in English, because at home we use Tshivenda to communicate with our parents, even here at school, our teachers sometimes communicate with us using Tshivenda)." L2*

The learners' responses indicate their endorsement of incorporating Tshivenda in Agricultural Sciences instruction, as they conveyed their unease with speaking English. They were then asked about their choice of language for instruction in Agricultural Sciences, resulting in the following reply:

"Ndi Tshivenda. Hezwi noni ritshi khou funziwa nga Tshivenda thi like ria kona u amba maipfi ane rakona u a vhala nga Tshivenda, hezwi noni nitshi khou amba ḽinwe ipfi nga tshikhuwa na wana uri ani ḽikoni, ende vhathu vhaya ri sea, so Tshivenda ndi tshone tsha khwine u fhirisa English.Ripfesesa khwine.(Its Tshivenda,when we are being taught in Tshivenda, we are able to speak and also read, because when we are using English and you find that you are unable to pronounce some words, others will laugh at you, so the use of Tshivenda is better than English." L3

4.3.5 MEANINGFUL LEARNING

Mpho, a teacher from Munngo Secondary School, expanded on the benefits of integrating Tshivenda into Agricultural Sciences teaching. This corresponds with Sah's (2018) claim that teachers utilize the native language to enhance student understanding, especially for those with limited proficiency in English. Mpho's statements during the interview reiterated his conviction that incorporating Tshivenda would improve learners' understanding:

"Teaching learners in English usually learners are quiet, they are passive and you switch in a language that they understand which is Tshivenda in this case, the learners shows positive interaction and understanding."
Mpho

The parents also expressed their support for employing Tshivenda in Agricultural Sciences instruction:

"Ee arali atshi khou funziwa nga luambo lwawe uḓo kona u pfesesa na zwine mudededzi akhou zwiṱoda khae. Ndi khou ambiswa ngauri musi atshi khou funziwa nga luambo lwawe lwa ḓamuni uya kona u pfesesa than atshi khou funziwa nga English, ya zwiita uri a kone u fhindula mbudziso ngauri vhaḓovha vhatshi khou kona u davhidzana.(Yes if learners are taught in their own language, they understand what the teacher wants from them, I am saying this because if learners are taught in their own language they understand whats being taught than when English is used,it makes them to answer questions, and to interact with their teacher." P2

This is demonstrated by the teacher's session employing the Tshivenda register. Observations from Mpho's classroom show learners actively participating while using the Tshivenda register, supporting the findings of Mavuru and Ramnarain (2020). Their study indicates that utilizing learners' native languages enables them to express their thoughts more clearly, which may not be attainable using the instructional language. An excerpt from the Tshivenda lesson further reinforces this idea:

Learner 1: "Ya Holstein-friesland (Its Holstein-Friesland)."

Teacher: "Ri ivhona nga mavhala mafhio? (what are their characteristics in terms of their colour)."

Learner 2: "Matswu na matshena (Black and White colour)."

Teacher: "I dovha hafhu ya vha yone kholomo ine ya ri bveledzela mafhi manzhisa. Arali ranga vhudzisiwa uri kholomo ine yari bveledzela mafhi manzhisa ndi ifhio? (It also have high milk productions, if the question

would come and wanted us to mention the dairy cattle with high milk productions, which one would be)"

Learner 3: "Ndi Holstein-Friesland (It will be Holstein-Friesland)"

Sah (2014) emphasized that using learners' native language promotes peer interactions, allowing students to articulate their comprehension to both their peers and their teacher, thereby enhancing learning outcomes. The researcher observed these interactions between learners and their teacher during the implementation of Tshivenda, as illustrated in the image below.

FIGURE 7: Case 2 learners during Tshivenda register lesson observation

While observing an English lesson, the teacher would start with English but switch to Tshivenda if there was little response or understanding from the learners. Subsequently, the teacher would return to English.

Learner 1: "We get cheese."

Teacher: "And? Riwana na mini hafhu zwiṅwe (What else do we get)"

Learner 2: "Even butter fats."

Teacher: "So this one has got low butter fats contents (Ina mapfura a butter maṱuku), so now we are done with Holstein-Friesland the second one is the jesey (Writing on the board). Do you understand?"

The inclusion of the native language in this English class aided comprehension among learners. This is supported by Sah's (2018) study, which confirms that using the native language improves understanding, vocabulary comprehension, grammar, and classroom interaction. It indicates that learners are more capable of responding to questions when the native language is employed. The image below depicts the lack of engagement among learners during the English lesson, with some students not paying attention while the teacher was teaching.

FIGURE 8: Case 2 learners during English lesson observation

4.3.6   FINDINGS

Teacher perceptions

Mpho from Munngo Secondary School demonstrated a favorable outlook towards employing the developed scientific language register and recognized the efficacy of using Tshivenda for teaching Agricultural Sciences. He also pointed out challenges when English is used as the medium of instruction for Agricultural Sciences, citing instances where learners encounter difficulties in grasping concepts. To address this, he resorted to code-switching to enhance comprehension, emphasizing the positive influence of integrating Tshivenda. Mpho further observed that learners lack familiarity with English, as it is not spoken at home or extensively used in the school environment, both within and outside the classroom.

Parents' perceptions

The viewpoints of the parents regarding the language used in Agricultural Sciences instruction remained consistent throughout all the interviews conducted by the researcher. They unanimously favored Tshivenda, highlighting improved interaction between teachers and learners as a significant advantage. Moreover, they noted that when English is employed, learners hesitate to ask questions, leading to a lack of clarity. The parents attributed the learners' challenges to the absence of Tshivenda instruction and believed that guiding them in their native language could enhance comprehension and academic performance.

Learners' perceptions

The research also investigated the learners' perceptions regarding the utilization of Tshivenda in Agricultural Sciences education, with learners displaying a positive outlook. They indicated challenges in comprehending English and indicated a preference for Tshivenda instruction, as it matches their linguistic competence and everyday communication. Learners underscored their familiarity with Tshivenda, a language they use both at school and at home, in contrast to their restricted proficiency in English. Furthermore, learners mentioned apprehensions about speaking English confidently and facing ridicule from peers, which underscores their preference for instruction in a language in which they feel at ease communicating.

Meaningful learning

Throughout the application of the Tshivenda scientific language register, learners showcased impressive performance in the lesson, confidently responding to their teachers' inquiries. They actively participated in conversations and demonstrated a strong grasp of the subject matter. The teacher credited this achievement to teaching in the learners' mother tongue. In contrast, when the lesson was conducted in English, learners exhibited diminished confidence and interest, possibly due to the language barrier and their limited comprehension.

CASE 3: THENDO FROM MUSESE SECONDARY SCHOOL

4.3.7 STAKEHOLDERS PERCEPTIONS
Teacher perceptions

Motloung and Mavuru (2021) discovered that the implementation of the South African language policy in rural and township schools lacks inclusivity, disproportionately favoring only a small portion of the population. Similarly, Brock-Ltne and Mercer (2014) emphasize that proficiency in English significantly diminishes when it serves as the Language of Learning and Teaching (LoLT) compared to one's mother tongue. In this investigation, the researcher aimed to examine teachers' perspectives on using Tshivenda for teaching Agricultural Sciences. Acknowledging that teachers closely interact with students and comprehend their requirements, the researcher believed they could offer valuable insights. Thendo, one of the educators, shared his viewpoints:

> *"I think by using Tshivenda we can have good results, the learners can understand better, they can also do things on their own because the only problem is that when they don't understand they won't even do it right. For example if I can give an example like I am teaching Agricultural Sciences in grade 10, so if the learners understand well they can even use the knowledge for themselves in building an interest on how they can do farming. I was just giving an example." Thendo*

The teacher also voiced their endorsement for incorporating Tshivenda in the instruction of Agricultural Sciences. Furthermore, the teacher highlighted the adverse consequences of employing English to teach Agricultural Sciences, associating it with the unsatisfactory academic outcomes of grade 10 Agricultural Sciences learners. Here is the teacher's response:

> *"Yes, it has a very big impact because those learners if we were allowed to teach them in home language it will be very good, so when you ask them questions in English is very much difficult for them." Thendo*

This viewpoint finds support in the study conducted by Sumbalan et al. (2017), which underscores that using indigenous languages as the medium of instruction for all subjects enables learners to exercise their right to be educated in their mother tongue. The teacher recognizes the importance of indigenous languages in the educational journey, as emphasized in the research by Sithole (2021).

Parents' perceptions

During the interviews with parents, some conveyed the belief that the language spoken at home, Tshivenda, should correspond with the language utilized in schools, as articulated by one parent:

> *"Okay thank you very much you are welcomed in terms of your question on my perception about the use of Agriculture, my perception is that it is good, it is right to use Venda to teach Agricultural Sciences. Why because when it comes to learners when the teacher is busy teaching, what we call Agricultural Sciences, learners don't understand the teacher well, even the concepts, the terms they won't understand. Let's say the teacher is busy teaching in the classroom, some of the learners they can't understand the medium of instruction which is English. If the teacher is teaching in Tshivenda it will be better than when English is used." P1*

This parent views the use of indigenous language as ideal for their children, believing that proficiency can be improved when taught in their mother tongue, as supported by studies such as Großmann and Wilde (2019). While some parents advocate for the integration of Tshivenda in Agricultural Sciences instruction, others oppose it, advocating for English instead. The reasoning provided by these parents for favoring English as the instructional language for Agricultural Sciences comprised:

> *"Nṋe ndikhou vhona unga vhana vhakhou tea u funziwa nga holu luambo lwa English uri vhakone u I guda sa izwi na mishumoni vhatshi ambesa yone. Athiri zwino musi vhangei mishumoni vhatshi ṱangana na makhuwa, na dzedzi dzi interview vhatea uvha vhatshi ḓivha luambo lwa tshikhuwa. (I think the learners should continue to learn using English, so that they will know how to communicate in workplace because at workplace when they meet English speakers and during interview, they have to know English)." P2*

The researcher also questioned the parents about the influence of language in classroom interactions between teachers and learners, and the responses from these parents leaned towards Tshivenda, as shown below:

"Zwone zwa Tshivenda zwia thusa ngauri thi vhana vhashu vha vha vhatshi khou kona u amba na vhadededzi nga Tshivenda, vhado thusalea vhana.(The use of Tshivenda helps because our learners are able to speak with their teacher using Tshivenda, the use of Tshivenda will benefit them)." P2

During the interview, the researcher also asked the parents about the impact of language on learning Agricultural Sciences, resulting in the following response:

"Ee hu tshikhuwa zwi ita uri hoyu nwananga asi shume nga ndila yavhudi ngauri musi zwitshi vhudzisiwa zworala manwe maipfi a luisimane aya mupfuka, zwafhiriswa nga musi atshi khou funzwa Agriculture nga Tshivenda ngauri ndi luambo lwa hawe lwa damuni, zwisia atshido pfesesa ipfi linwe na linwe. (Yes when its English learners performance is low, because they fail to understand some of the words in English, so it's better if their taught using their home language as they will understand."P3

Learners' perceptions

The learners were also encouraged to express their opinions on the use of Tshivenda in studying Agricultural Sciences, considering they are the ones undergoing education. Here is the viewpoint articulated by learners in group 1:

"Nṋe ndipfa zwi right ngauri zwine zwa khou ambiwa ndivha ndikhou kona u zwipfa. Musi hu tshikhuwa huvha huna zwiṅwe zwine ndivha ndi sa khou kona u zwipfa na zwine zwi a ita zwitshi balela nyana (I think its ok to use Tshivenda because I will understand what is being said when the lesson is in English, I am unable to understand other words." L1

The learners from the same group further indicated that:

"Arali vhatshi khou funza nga Tshivenda ri a ṱavhanya u pfesesa ngauri huna vhaṅwe vhathu vhano tonga sanṋe vhane vhavha uri English avha tu I pfesesa zwavhuḓi, ngauri hayani avhai ambi na henefha tshikoloni avhai ambi. (When the lesson is in Tshivenda we understand fast,

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because some of us we don't know English, because at home we speak Tshivenda and also at school)." L2

4.3.8 MEANINGFUL LEARNING

According to Trudell's (2016) research, utilizing the mother tongue as the medium of instruction enhances children's cognitive and learning processes, fostering effective learner-centered education and enhancing comprehension. The researcher aimed to determine from the teacher if employing Tshivenda in Agricultural Sciences classes influences interactions and discourse, and the teacher provided the following response:

"Yes, because each and every time the learners learn from each other learners and when they are in classroom, if we are using Tshivenda to teach them it will be simple for them to understand because those learners usually communicate with themselves using Tshivenda, and not English when they are communicating." Thendo

On the contrary, parents also emphasized that meaningful learning can be achieved using the home language:

"Because learners are not using this English at home, so if they continue with this English the is going to be high failure rate, because the learners are not talking this medium of instruction." P1

This viewpoint is supported by the study conducted by Greenhalgh and Shumba (2014), emphasizing that the inability to learn in one's mother tongue contributes to academic underperformance. During the observation, it was clear that learners actively engaged and displayed confidence in responding to questions while the Tshivenda register was being implemented. Below is a glimpse of the observed Tshivenda lesson.

Learners 1: "Simmentailer."

Teacher: "Simmentailer, ndi yeyo fhedzi? (Is this the only one?"

Learners 2: "Hayi (No)"

Teacher: "So inwe ndi ifhio. (What else)"

Learners 3: "Red poll."

Here are the images captured during the implementation of the Tshivenda register, depicting learners engaging with their teacher and responding to questions.

FIGURE 9: Case 3 lerners during Tshivenda register lesson observation

FIGURE 10: Case 3 learners in group during Tshivenda register lesson

According to Ogunniyis (2019), employing a language other than the learner's mother tongue presents challenges. During the Tshivenda lesson, learners grasped the content and actively participated in answering questions, unlike their behavior during the English lesson. In the English session, learners merely nodded in agreement without actively engaging, leading to the teacher assuming the role of the primary speaker, with minimal interaction from the learners.

Teacher: "Yes it has originated in Netherland, so this Holstein is very big and the colour of this Holstein is black and white. So this Holstein produces approximately 4650 kg per year of milk, are we together?"

Learners 4: "Yes"

Teacher: "Okay we don't only have Holstein we have Jesey, number one is a Holstein and number two is jesey, so where does the jesey originate?"

When the researcher observed the English lesson, learners showed reduced interest, and the level of interaction varied compared to when Tshivenda registers were used. The accompanying images were taken during the English lesson.

FIGURE 11: Case 3 learners during English register lesson observation

Dos Santos (2019) also highlighted the challenges encountered by second language learners when instructed in English, especially regarding classroom interaction.
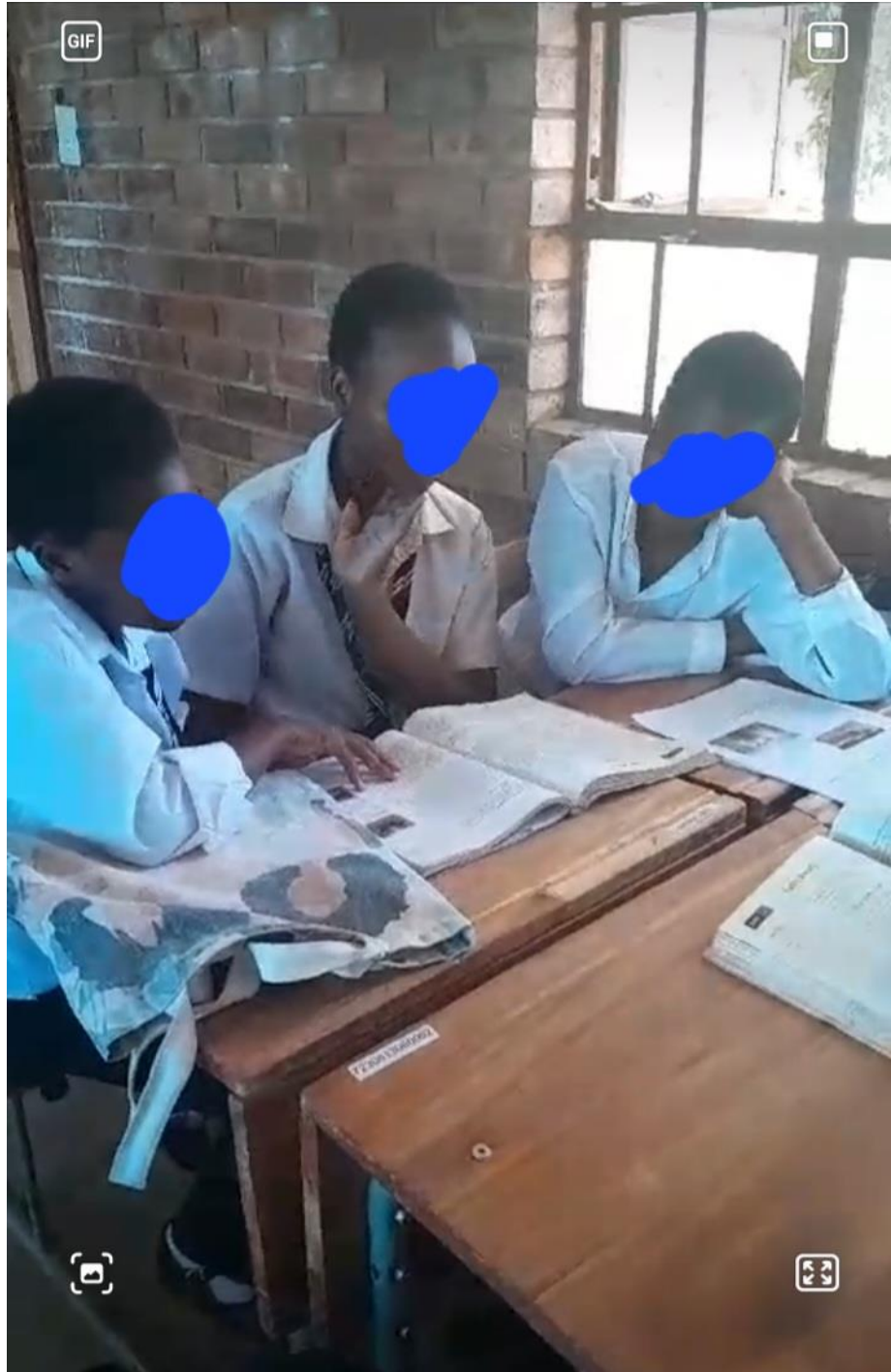
FIGURE 12: Case 3 learners in group during English lesson

4.3.9 FINDINGS

Teacher perceptions

Thendo, a teacher from Musese Secondary School, underscored the potential advantages of utilizing Tshivenda, envisioning favorable outcomes for the subject. He emphasized that instructing in Tshivenda would improve comprehension among

learners, allowing them to grasp the lessons more effectively in their mother tongue. Thendo highlighted that without a strong command of English, learners might encounter difficulties in performing adequately and offering precise responses when questioned in English. Consequently, he advocated for teaching Agricultural Sciences in Tshivenda instead of English.

Parents' perceptions

Not all parents showed enthusiasm for adopting Tshivenda as the instructional medium for Agricultural Sciences. Some parents expressed a preference for sticking with English, citing its perceived benefits in the workplace and during interviews. They believed that English fluency was crucial for securing job opportunities. However, other parents fully embraced the notion of using Tshivenda to teach Agricultural Sciences. They stressed that learners showed better comprehension when instruction was conducted in their native language, Tshivenda, for this study. These parents also noted that their children faced difficulties in understanding certain concepts when taught in English.

Learners' perceptions

The learners expressed positive opinions about the integration of Tshivenda for instruction. They noted their difficulties in understanding certain concepts when taught in English and believed they would have better comprehension if instructed in their mother tongue. Additionally, they mentioned feeling disadvantaged in English lessons, as English was not spoken at home with their parents. They emphasized their ability to understand lessons more easily when taught in Tshivenda. Overall, all the learners held similar positive attitudes toward the use of Tshivenda for teaching and learning Agricultural Sciences.

Meaningful Learning

The researcher noted that when lessons were conducted in Tshivenda, learners actively participated with the teacher, responding to questions, and indicating their understanding by providing accurate answers. Conversely, during English lessons, learners remained silent, with minimal interaction and primarily passive involvement. They displayed less interest and did not derive as much benefit from the lesson.

However, during Tshivenda lessons, learners attentively followed the teacher's instructions, actively engaging with the content.

4.4   CHAPTER SUMMARY

This chapter explores the obstacles and prospects encountered while creating a scientific language register. It extensively explores the viewpoints of participants, including teachers, parents, and learners, and examines how the developed scientific language register impacted meaningful learning. The findings of the study are carefully examined and discussed within each respective context. The following chapter will present the answers to the research questions, outline the contributions of the study, and provide recommendations.

CHAPTER 5: SUMMARY OF FINDINGS AND RECOMMENDATIONS

5.1   INTRODUCTION

In this chapter, responses to the research questions are presented, a summary of findings is outlined, the research contributions are discussed, and recommendations are provided.

5.2   RESEARCH QUESTIONS

The aim of this study was to develop a Tshivenda scientific language register for teaching Agricultural Sciences. The study was guided by the following research questions:

 Main question:

● How can the development and the application of the Tshivenda Scientific language register for animal studies be carried out?

Sub-questions:
● What are the challenges identified in developing the Tshivenda Scientific language register for animal studies?
● What are the opportunities in developing the Tshivenda Scientific register for animal studies?
● What are the stakeholders' perceptions in developing the Tshivenda Scientific language register for animal studies?
● How does the application of Tshivenda language register shape meaningful learning?

Below are the answers for the above research questions.

5.2.1 What are the challenges identified in developing the Tshivenda scientific language register for animal studies?

This study uncovered that Tshivenda, one of South Africa's official languages, lacks comprehensive terminology in Agricultural Sciences, with many terms either absent or borrowed from English and Afrikaans. Elevating Tshivenda to the standard of other official languages, especially for educational purposes, poses a significant

challenge, particularly in Agricultural Sciences, notably in Animal Studies. Although progress in developing Tshivenda's scientific vocabulary is gradual, collaborative efforts are underway, supported by various stakeholders dedicated to this initiative. Engagements with Tshivenda literature authors, curriculum specialists, educators, and community leaders have been pivotal in enhancing the scientific lexicon, particularly in Agricultural Sciences, to make it more suitable for educational settings.

5.2.2 What are the opportunities in developing the Tshivenda Scientific register for animal studies?

The researcher's collaboration with curriculum advisors, educators, authors, and community elders reflects a hopeful outlook for the ongoing advancement of the Tshivenda language, not only as an official language but also as a medium of instruction, particularly in Agricultural Sciences. This partnership holds great promise for integrating Tshivenda into the teaching of this discipline. The active involvement of diverse stakeholders in aiding the researcher in developing the scientific lexicon is a source of significant encouragement. Throughout the process of compiling scientific terminology, the researcher received lists of existing terms, indicating sustained efforts and an optimistic stance toward enriching Tshivenda for educational purposes, especially in Animal Studies.

5.2.3 What are the stakeholders' perceptions in developing the Tshivenda Scientific language register for animal Studies?

CASE 1: MURI FROM MUSWIRI HIGH SCHOOL

This research sheds light on Muri's positive stance toward employing the Tshivenda language in teaching Agricultural Sciences, specifically focusing on animal studies. Muri emphasized that instructing learners in Agricultural Sciences using their mother tongue facilitates comprehension, leading to improved academic outcomes. However, contrasting viewpoints from parents surfaced, with some expressing hesitance due to the absence of Tshivenda as a medium of instruction in higher education, anticipating challenges for learners transitioning to tertiary institutions. Conversely, other parents supported the use of Tshivenda, arguing that it would enhance learners' grasp of the subject matter. Another perspective proposed a bilingual approach, suggesting simultaneous use of English and Tshivenda, though

concerns were raised about the need for continuous translation by teachers. Among the learners, opinions varied, with some favoring Tshivenda instruction due to apprehensions about their prospects in English-speaking countries, despite their limited English proficiency. Conversely, other learners welcomed Tshivenda instruction, believing it would improve their understanding and performance in Agricultural Sciences assessments in the long run.

CASE 2: MPHO FROM MUNNGO SECONDARY SCHOOL

This study illuminated Mpho's affirmative position and advocacy for the incorporation of Tshivenda in teaching Agricultural Sciences, especially concerning animal studies. Mpho is of the opinion that introducing Tshivenda would be advantageous for learners. He observed that whenever students encounter difficulties with certain English terms during Agricultural Sciences lessons, they naturally resort to Tshivenda, the language spoken both at home and at school. All parents participating in the study expressed their endorsement of using Tshivenda in Agricultural Sciences instruction, emphasizing that teaching in their children's native language would facilitate comprehension and foster greater interaction with teachers. They are convinced that instruction in the learners' mother tongue would alleviate academic challenges in Agricultural Sciences. Similarly, the learners' viewpoints echoed this support for incorporating Tshivenda in Agricultural Sciences instruction, citing their proficiency and understanding in Tshivenda, the predominant language spoken at home.

CASE 3: THENDO FROM MUSESE SECONDARY SCHOOL

Thendo, in his role as a teacher, holds a favorable opinion regarding the integration of Tshivenda in teaching Agricultural Sciences, seeing it as a means to improve comprehension for learners, particularly those facing difficulties with English. Thendo emphasized that employing the learners' native language would encourage them to seek clarification when faced with challenges in Agricultural Sciences topics, thus enhancing their confidence. However, parents expressed differing views regarding the use of Tshivenda in Agricultural Sciences instruction. Some expressed reservations, stating that proficiency in English would better equip their children for the workforce and job interviews. Conversely, other parents regarded Tshivenda positively, arguing that it would aid comprehension and consequently enhance

academic performance. They cited instances where learners had misunderstood Agricultural Sciences terms in English, leading to misinterpretation of questions, and believed that using Tshivenda would improve learners' performance in the subject. Similarly, learners themselves voiced support for using their native language, noting that it aided their comprehension, particularly when confronted with complex English statements. They believed that Tshivenda, being their mother tongue, would facilitate their learning process.

5.2.4 How does the application of Tshivenda language register shape meaningful learning?

CASE 1: MURI FROM MUSWIRI HIGH SCHOOL

Multiple stakeholders affirm that employing Tshivenda to teach Agricultural Sciences will facilitate significant learning, allowing learners to express themselves in a language they understand. Muri emphasized that learners exhibit greater engagement with their teachers when instruction is delivered in a comprehensible language. The researcher's observations during various lessons revealed that learners were more active and involved when the instruction was in Tshivenda. They confidently responded to questions, fostering dynamic interactions between learners and teachers. In contrast, English lessons demonstrated limited interaction between learners and teachers, with learners often remaining silent and passive. They showed less inclination to participate in discussions, and some even seemed disengaged, with instances of learners sleeping during English instruction. The researcher observed that meaningful learning appeared to predominantly occur when Tshivenda was used as the medium of instruction, rather than English.

CASE 2: MPHO FROM MUNNGO SECONDARY SCHOOL

The stakeholders involved in this situation align with those previously mentioned. Mpho acknowledges that when learners are taught in Tshivenda, they grasp the subject matter more effectively, leading to increased interaction with the teacher and active engagement in answering questions. He contends that this approach promotes meaningful learning. During observations of Mpho's classes, it became evident that learners were more attentive and participatory when Tshivenda served as the language of instruction. They demonstrated their understanding by providing

accurate responses, indicating their comprehension of the material. Conversely, when instruction was delivered in English, learners exhibited disinterest, displaying decreased activity, and encountering difficulty in responding to questions. They appeared unengaged and demonstrated limited interaction with the teacher.

CASE 3: THENDO FROM MUSESE SECONDARY SCHOOL

The situation observed at Musese Secondary School mirrored similar instances, as stakeholders exhibited optimism and confidence in the effectiveness of utilizing Tshivenda for teaching Agricultural Sciences to improve learner outcomes. Thendo, a teacher at Musese, emphasized the direct link between learners' comprehension and their ability to provide accurate answers. When Tshivenda registers were employed, learners actively participated, eagerly volunteering answers and engaging with both the teacher and their peers. They showed heightened interest in Tshivenda lessons. In contrast, during English lessons, learners appeared notably subdued, displaying minimal participation and reluctance to engage fully. Upon observing lessons that utilized both Tshivenda and English registers, it became evident that the use of Tshivenda language registers indeed facilitated meaningful learning in the classroom.

5.3   CONTRIBUTIONS OF THE STUDY

The objective of this research was to create a specialized Tshivenda scientific language register tailored specifically for teaching Agricultural Sciences. The results emphasize the necessity for ongoing development of scientific terminology in Tshivenda and other scientific language registers to bolster the potential for Tshivenda's utilization as a medium of instruction. Many scientific terms in Tshivenda are still rudimentary, often derived from English or Afrikaans, underscoring the need for resource expansion. Despite the limited availability of terms, there is potential for language enrichment with concerted efforts from relevant stakeholders. Favorable responses were noted when employing Tshivenda registers compared to English registers, suggesting that learners comprehend Tshivenda registers more effectively. Stakeholders exhibited optimism regarding the use of Tshivenda, anticipating benefits for learners. This study focused exclusively on Animal Studies within a

specific subject and grade level across three different schools. Consequently, further research and development of scientific language registers are warranted, encompassing additional topics to ensure comprehensive coverage.

5.4   RECOMMENDATIONS OF THE STUDY

This study proposes the following recommendations:

- Expand the development of scientific language registers beyond Animal Studies to include other topics within Agricultural Sciences.
- Provide teachers with increased time and resources from the Department to facilitate the development of Agricultural Sciences registers.
- Continued significant efforts are necessary until Tshivenda language achieves recognition as a formal medium of instruction.
- Qualified teachers, in collaboration with curriculum implementers proficient in Tshivenda, should take the lead in developing Tshivenda scientific language registers. This initiative should not only focus on Animal Studies but also encompass other topics within Agricultural Sciences.
- Enhance teacher training programs to emphasize the acquisition of skills required for developing Tshivenda registers for Agricultural Sciences.

5.5   LIMITATIONS OF THE STUDY

This study specifically focused on three Grade 10 Agricultural Sciences educators selected from three secondary schools within the Luvuvhu circuit, rather than the entire population. This selective approach was adopted to enable the researcher to manage the collected data efficiently, ensuring clear and precise results, while also minimizing costs. The participants were meticulously selected based on their suitability and alignment with the study's design requirements. The selection process aimed to avoid generalizations, concentrating solely on individuals whose perspectives were essential for addressing the research questions of this study.

5.6   CONCLUSION

The findings of this study indicate that with collaborative efforts from pertinent stakeholders, including teachers, curriculum implementers, and authors, Tshivenda language has the potential to advance and function as the medium of instruction beyond the foundational phase. Key areas that require attention include the enhancement of scientific terminology, as gaps in Tshivenda's scientific lexicon were identified in the study. However, the absence of certain scientific terms should not hinder language development; instead, substantial time and investment are required to bolster the enrichment of scientific vocabulary.

Furthermore, the study findings emphasize the beneficial impact of utilizing Tshivenda scientific language registers on learners' performance and the quality of their learning experiences. Stakeholders noted that the use of Tshivenda language enhances comprehension, fostering increased learner engagement and interaction. These outcomes underscore the urgent need to integrate Tshivenda into educational environments as a language of instruction.

Despite these positive findings, not all stakeholders exhibited favorable attitudes toward using Tshivenda for teaching Agricultural Sciences, some harbored negative perceptions. This highlights the persistent challenges and underscores the necessity for continued efforts to promote the adoption of Tshivenda as a teaching and learning language. To this end, additional scientific language registers should be developed across various languages and subjects, augmenting existing resources and broadening the spectrum of scientific terms available.

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APPENDIX A: PROOF OF REGISTRATION

UNISA | university of south africa

SRMDS01H   2410

                                        Student number : 64013790
MISS O L PHALANDWA   Telephone no. : 0861670411
TSHIKONELO M C P   Fax: (012)429-4150
P O BOX 2978
MALAMULELE   2023-01-05
0982

Dear MISS O L PHALANDWA

I have pleasure in informing you that your application for admission to the studies for the degree of
90063 Master of Education in Natural Science Education
has been approved for the 2023 academic year after reconsideration.

Kindly note that the curriculum comprises a dissertation (master's degree) or a thesis (doctoral degrees).
It is expected of students to complete a research proposal in their first year of study. Guidelines
will be provided by the contact person/supervisor indicated below. Students must note that reregistration
will be subject to the completion of the research proposal in the first year of study.
If you do not register for 2023 you have to apply for admission for 2024 and again submit all supporting
documents.

There is no printed study material for the research component. Please contact the following person
as soon as you have registered:

Supervisor: Dr TG NTULI (supervisor)
Contact detail: entulit@unisa.ac.za / +27782091017
Co-supervisor: Prof AV MUDAU (co-supervisor)
Contact detail: mudauav@unisa.ac.za / +27124296353

All master's and doctoral qualifications are structured over a defined period. Refer to sections 4.12
and 4.13 in the Procedures for studies for Masters and Doctoral degrees.

Yours faithfully

for Registrar
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APPENDIX B: INTERVIEW PROTOCOL (TEACHERS)

Section A. (biographical information)

1. What is your home language?
2. How long have you been teaching grade 10 Agricultural Sciences?
3. What are the teaching qualifications you hold?
4. What are your major subjects?

Section B

Part A (Challenges and Opportunities)

1. Do you experience any challenges using English to teach Agricultural Sciences? If yes, kindly elaborate.
2. Are your learners experiencing problems when taught in English?
3. If yes, what kind of problems? Kindly elaborate.
4. What programmes do you have in place to assist those learners with difficulties in learning with English medium?
5. What is the Language spoken outside the classroom by your learners?
6. What is the language spoken by you and your learners inside the classroom?
7. Do you apply code-switching in your classroom? If yes, why?
8. What language do you normally code switch to and why?
9. What are the challenges you experienced in using the scientific language register?
10. And what are the opportunities did you identify in using the scientific language register?
11. How was your experience in using the scientific language register? And Why?

Part B (Perceptions)

1. What is your perception on the use of Tshivenda to teach Agricultural Sciences?
2. Why is your perception like that?
3. How is the general performance of Agricultural Sciences in your school? (Good or Bad)

4. Do you think the language used to teach Agricultural Sciences has an impact to that performance? And Why?

5. What language do you prefer to use when teaching Agricultural Sciences? And why?

6. What language do you think your learners would prefer to learn Agricultural Sciences? And why?

Part C (Interaction and discourses)

1. Does language influence learner's interactions and discourses in the classroom? If yes please elaborate?

APPENDIX C: INTERVIEW PROTOCOL (LEARNERS)

Semi-structured interview questions for learners

Section B

Part A (Challenges and Opportunities)

1. Do you experience any challenges in learning Agricultural Sciences in English? If yes, elaborate those challenges.
2. What language would you prefer to learn Agricultural Sciences? And why?
3. What is the language do you speak inside the classroom? And why?
4. What language do you speak outside the classroom? And why?
5. What are the challenges you experienced when learning Agricultural Sciences in Tshivenda?
6. What are the opportunities identified in learning Agricultural sciences in Tshivenda?

Part B (Perceptions)

1. What is your perception on the use of Tshivenda to teach Agricultural Sciences?
2. Why is your perception like that?
3. How is the general performance of Agricultural Sciences in your school? (Good or Bad)
4. Do you think the language used to teach Agricultural Sciences has an impact to the performance? If yes, Why?

Part C (Interaction and discourses)

1. Does a language influence your participation in the classroom?
2. If yes why/how, please elaborate

APPENDIX D: INTERVIEW PROTOCOL (PARENTS)

Semi-structured interview questions for SGB (parents)

Section B

Part B (Perceptions)

1. What is your perception on the use of Tshivenda to teach Agricultural Sciences?
2. Why is your perception like that?
3. How is the general performance of Agricultural Sciences in the school where your child attend?
4. Do you think the language used to teach Agricultural Sciences has an impact on the performance? And Why?
5. What language do you prefer your child to use to learn Agricultural Sciences? And why?

Part C (Interaction and discourses)

1. Do you think the language used to teach Agricultural Sciences influences learners' interactions and discourses in the classroom? If yes, how? Please elaborate

APPENDIX E: OBSERVATIONAL TOOL (TEACHERS)

THE TEACHER OBSERVATIONAL TOOL

Lesson observation schedule for Agricultural Science teachers on the use of scientific language register.

School:

_____
___

Date:

_____
_____

Grade:

_____
____

Number of learners in agricultural sciences classroom:

Boys: _____   Girls: _____   Total:

_____

Teacher:

_____
__

Researcher:

_____

Role of Researcher:

_____

Time of observation:

_____

Length of observation:

_____

    A. Challenges and opportunities

1. Did the teacher had any challenge in using the scientific language register

_____
_____
_____
_____
_____
_____
_____

2. Did the teacher used Tshivenda through-out the lesson

_____
_____
_____
_____

3. Lesson properly planed and presented

_____
_____
_____

4. Teachers understanding of concepts and presentation

_____
_____
_____
_____

B. Interaction and discourses

a) Learners' participation

_____
_____
_____
_____

b) Learners interactions and discourses

_____
_____

APPENDIX F: PERMISSION LETTER TO THE DISTRICT MANAGER

LETTER TO THE DISTRICT MANAGER

College of education

Department of science and technology education

Request for permission to conduct research at schools

Title: "Developing of Tshivenda scientific language register for Agricultural Science"
17 October 2023

The District Manager

Vhembe East Department of Education

Dear Sir/ Madam

I, Phalandwa OcktoviaLivhuwani, am doing research under the supervision of Dr T.G Ntuli and Prof A.V Mudau, lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am requesting a written permission to use the schools that will be interested to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Science".

The aim of the study is to develop the scientific language register for Agricultural Sciences in Tshivenda and its application in some classes in the Luvuvhu circuit. The study will also explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom. Your department has been selected because the main objective of the study is to explore perceptions, challenges and opportunities of developing this register and

how it shapes the interactions and discourses in the classroom this objective can only be realised within your department. The study will request consent from Agricultural Sciences teachers, learners and parents of the Luvuvhu circuit to participate in this study, prior to interviews and observations, participants permission will be requested, a recording device will be used. Up on the granted permission from the participants to take park in the study, I will then work with them through-out the research process. In this study three schools will be selected to participate, one teacher from each school will be observed and interviewed, one class from each selected school will be interviewed and 5 parents from each selected school will be interviewed.

The benefits of this study will be for all schools situated in Luvuvhu circuit even the neighbouring ones. There are no known risks associated with this study. Confidentiality will be maintained by not disclosing the names of schools and participants. The data that will be collected from the participants will be kept confidential and will be strictly used for research purpose. Participants will not be reimbursed or receive any incentives for participating in this study. Up on request participants will receive the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Yours sincerely

Phalandwa O.L (Researcher)

APPENDIX G: PERMISSION LETTER TO THE CIRCUIT MANAGER
LETTER TO THE CIRCUIT MANAGER

College of education

Department of science and technology education

Request for permission to conduct research at schools

Title: "Developing of Tshivenda scientific language register for Agricultural Sciences"
17 October 2023

The Circuit Manager

Luvuvhu circuit Department of Education

Dear Sir/ Madam

I, Phalandwa Ocktovia Livhuwani, am doing research under the supervision of Dr T.G Ntuli and Prof A.V Mudau, lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am requesting a written permission to use the schools that will be interested to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Sciences".

The aim of the study is to develop the scientific language register for Agricultural Sciences in Tshivenda and its application in some classes in the Luvuvhu circuit. The study will also explore perceptions, challenges and opportunities of developing

this register and how it shapes the interactions and discourses in the classroom. Your department has been selected because the main objective of the study is to explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom this objective can only be realised within your department. The study will request consent from Agricultural Sciences teachers, learners and parents of the Luvuvhu circuit to participate in this study, prior to interviews and observations, participants permission will be requested, a recording device will be used. Up on the granted permission from the participants to take park in the study, I will then work with them through-out the research process. In this study three schools will be selected to participate, one teacher from each school will be observed and interviewed, one class from each selected school will be interviewed and 5 parents from each selected school will be interviewed.

The benefits of this study will be for all schools situated in Luvuvhu circuit even the neighbouring ones. There are no known risks associated with this study. Confidentiality will be maintained by not disclosing the names of schools and participants. The data that will be collected from the participants will be kept confidential and will be strictly used for research purpose. Participants will not be reimbursed or receive any incentives for participating in this study. Up on request participants will receive the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com, my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Yours sincerely

Phalandwa O.L(Researcher)

APPENDIX H: PERMISSION LETTER TO THE PRINCIPALS

LETTER TO THE PRINCIPALS

![UNISA - university of south africa logo]

College of education

Department of science and technology education

Request for permission to conduct research at schools

Title: "Developing of Tshivenda scientific language register for Agricultural Sciences"
17 October 2023

The Principal

Luvuvhu circuit Department of Education

Dear Sir/ Madam

I, Phalandwa OcktoviaLivhuwani, am doing research under the supervision of Dr T.G Ntuli and Prof A.VMudau, lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am requesting a written permission to use the schools that will be interested to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Sciences".

The aim of the study is to develop the scientific language register for Agricultural Sciences in Tshivenda and its application in some classes in the Luvuvhu circuit. The study will also explore perceptions, challenges and opportunities of developing

this register and how it shapes the interactions and discourses in the classroom. Your department has been selected because the main objective of the study is to explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom this objective can only be realised within your department. The study will request consent from Agricultural Sciences teachers, learners and parents of the Luvuvhu circuit to participate in this study, prior to interviews and observations, participants permission will be requested, a recording device will be used. Up on the granted permission from the participants to take part in the study, I will then work with them through-out the research process. In this study three schools will be selected to participate, one teacher from each school will be observed and interviewed, one class from each selected school will be interviewed and 5 parents from each selected school will be interviewed.

The benefits of this study will be for all schools situated in Luvuvhu circuit even the neighbouring ones. There are no known risks associated with this study. Confidentiality will be maintained by not disclosing the names of schools and participants. The data that will be collected from the participants will be kept confidential and will be strictly used for research purpose. Participants will not be reimbursed or receive any incentives for participating in this study. Up on request participants will receive the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com or my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Yours sincerely

Phalandwa O.L(Researcher)

APPENDIX I: LETTER TO AGRICULTURAL SCIENCES TEACHER

College of education

Department of science and technology education

Title: "Developing of Tshivenda scientific language register for Agricultura lScience."

DEAR PROSPECTIVE PARTICIPANT

I, Phalandwa OcktoviaLivhuwani, am doing research under the supervision of Dr T.G Ntuli, and Prof A.V Mudau, lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am inviting you to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Sciences". The main objective of this study is to explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom. You are requested to participate in this study because you are a suitable candidate as you are teaching Agricultural Sciences in one of the schools situated in Luvuvhu circuit where the study will be undertaken. I do not have your details.

I hereby request your permission to observe you while teaching Agricultural Sciences using the Tshivenda scientific language register in your classroom and use

of audio recording during interviews. The time allocation for every interview will be 10-15 minutes maximum and research will be conducted for a period of one month.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. In this study there are no potential benefits for taking part. There are no negative consequences for any participant if they participate in this study. The information that you provide will not be disclosed to your colleagues or seniors your identity will be kept confidential. Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filling cabinet at the researcher's workplace for future research or academic purposes: electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further research ethics review and proposal. The researcher will destroy the information two years after the completion of study by shredding the hard copies and by permanently deleting the soft copies using software applications. In this study there will be no incentives and no receipt of payment for participation. Up on request participants will be provided with the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com , my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Thank you for taking the time reading this information sheet

Kind regards

_____Phalanda O.L

APPENDIX J: LETTER TO PARENTS

College of education

Department of science and technology education

Title: "Developing of Tshivenda scientific language register for Agricultural Sciences "

DEAR PROSPECTIVE PARTICIPANT

I, Phalandwa Ocktovia Livhuwani, am doing research under the supervision of Dr T.G Ntuli, and Prof A.V Mudau lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am inviting you to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Sciences". The main objective of this study is to explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom. You are requested to participate in this study because you are a suitable candidate as your child is doing grade 10 in one of the selected schools in Luvuvhu circuit where the study will be undertaken. I do not have your details.

I hereby request your permission to interview you. The time allocation for every interview will be 10-15 minutes maximum and research will be conducted for a period of one month.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. In this study there are no potential benefits for taking part. There are no negative consequences for any participant if they participate in this study. The information that you provide will not be disclosed to your colleagues or seniors your identity will be kept confidential. Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filling cabinet at the researcher's workplace for future research or academic purposes: electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further research ethics review and proposal. The researcher will destroy the information two years after the completion of study by shredding the hard copies and by permanently deleting the soft copies using software applications. In this study there will be no incentives and no receipt of payment for participation. Up on request participants will be provided with the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com,my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Thank you for taking the time reading this information sheet

Kind regards

—

Phalandwa O.L _____

APPENDIX K: LETTER TO LEARNERS' PARENTS

College of education

Department of science and technology education

Title: "Developing of Tshivenda scientific language register for Agricultural Sciences "

DEAR PROSPECTIVE PARTICIPANT

I, Phalandwa OcktoviaLivhuwani, am doing research under the supervision of Dr T.G Ntuli, and Prof A.V Mudau lecturers in the Department of Science and Technology Education. I am working towards my Master Degree in education with specialisation in Natural Sciences at the University of South Africa. There is no funding involved in this study. I am inviting you to participate in the study entitled: "Developing of Tshivenda scientific language register for Agricultural Sciences ". The main objective of this study is to explore perceptions, challenges and opportunities of developing this register and how it shapes the interactions and discourses in the classroom. I hereby request your child to participate in the study as she/he is a suitable candidate since she/he is doing grade 10 Agricultural Science in the selected schools around

Luvuvhu circuit where the study will take place. . I do not have your details. I hereby request your permission to interview your child. The time allocation for every interview will be 10-15 minutes maximum and research will be conducted for a period of one month.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. In this study there are no potential benefits for taking part. There are no negative consequences for any participant if they participate in this study. The information that you provide will not be disclosed to your colleagues or seniors your identity will be kept confidential. Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filling cabinet at the researcher's workplace for future research or academic purposes: electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further research ethics review and proposal. The researcher will destroy the information two years after the completion of study by shredding the hard copies and by permanently deleting the soft copies using software applications. In this study there will be no incentives and no receipt of payment for participation. Up on request participants will be provided with the summary of the research findings.

For more information regarding the study, please contact me on: 0722143363 or email: livhuwaniocktovia@gmail.com my supervisor Dr T.G. Ntuli can be reached at: 012 429 6353 or email: entulit@unisa.ac.za

Thank you for taking the time reading this information sheet

Kind regards

._____

Phalandwa Ocktovia Livhuwani

APPENDIX L: CONSENT FORM FOR TEACHERS

CONSENT FORM FOR AGRICULTURAL SCIENCES TEACHERS

I,

_____

_(participant name), confirm that the researcher asking for my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconveniences of participation.

I have read and (or had explained to me) and understand the study as explained in the information sheet.

I have had sufficient opportunities to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to be recorded in the interviews and observations

_____
___

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print)

_____

APPENDIX M: CONSENT FORM FOR PARENTS (SGB)

CONSENT FORM FOR PARENTS (SGB)

I,

_____

_(participant name), confirm that the researcher asking for my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconveniences of participation.

I have read and (or had explained to me) and understand the study as explained in the information sheet.

I have had sufficient opportunities to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into research report, journal publications and/or conference proceedings, butt that my participation will be kept confidential unless otherwise specified.

I agree to be recorded in the interviews.

_____

___

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print)

_____

APPENDIX N: CONSENT FORM FOR LEARNERS (PARENTS)

CONSENT FORM FOR LEARNERS (PARENTS)

I,

_____

_(participant name), confirm that the researcher asking for my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconveniences of participation.

I have read and (or had explained to me) and understand the study as explained in the information sheet.

I have had sufficient opportunities to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into research report, journal publications and/or conference proceedings, butt that my participation will be kept confidential unless otherwise specified.

I agree that my child be recorded in the interviews.

_____
___

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print)

APPENDIX O: AGRICULTURAL SCIENCES SAINTHIFIKI RIGISTARA YA LUAMBO YA AGRICULTURAL SCIENCES IN TSHIVENḒA

MUDZUDZANYI: Ms OCKTOVIA LIVHUWANI PHALANDWA

Rina kholomo dzo fhambananaho, dzine dza fuwelwa u bveledza ṋama, mafhi na dzine dza bveledza zwothe mafhi na ṋama.

1. KHOLOMO DZA ṆAMA

Idzi ndi kholomo dzine dza fuwelwa u ḽiwa ṋama.

MBONALELO DZINE DZA LAVHELESWA NGA VHO RABULASI KHA KHOLOMO DZINE DZA KHETHELWA U FUWELWA ṆAMA.

Mboho ivha khulwane ya dovha hafhu ya lemela musi ritshi I vhambedza na kholomo ya khulukadzi.

Naho kholomo ya khulukadzi itshivha na ḓamu na ṱhungu nṋa fhedzi ḓamu la kholomo dza ṋama ḽivha ḽituku kha kholomo dza mafhi.

Dzivha na misipha na ṋama nnzhi muvhilini.

Mafhi dzi kona fhedzi u bveledza ane a kona u tshidza tshiṋamana.

Kholomo idzi dzi shumisa mannḓa manzhi kha u bveledza misipha, ine ya thusa kha u bveledza ṋama ya vhudi.

Dzi vha na mapfura o rambalalaho muvhili woṱhe

Dzi a kona u konḓelela mufhiso na u vha na milenzhe yo khwaṱhelaho ine ya kona u tshimbila tshikhala tshilapfu.

Dzi a kona ubveledza tshileme musi dzo wana zwiḽiwa zwoteaho.

1.1. KHOLOMO DZA ṆAMA DZIBVAHO AFURIKA TSHIPEMBE, MBONALELO NA HUNE DZA KONA U TSHILA HONE KHWIṆE.

Afrikaner

Iyi ndi kholomo ibvaho fhano khaḽa Afurika Tshipembe.

Kholomo iyi I kona utshila khwine kha mutsho wa fhano Afurika Tshipembe une wavha wa u fhisa.

Iya kona u konḓelela malwadze othe a fhano hayani.

Ivha na mukumba une zwisi leluwe uri u momelwe nga mbadzhane

I kona ubveledza ṇama nnzhi yo nakaho

Bonsmara

Iyi ndi kholomo yo bveledzwaho nga murahu ha u ṱanganyiswa Afrikaner, Hereford na Shorthorn nga vho ra saintsi fhano Afrika Tshipembe.

Bonsmara yo bveledzwa nga muhulisei Vho- Phurofesa Bonsma ngei Mara.

Ina mbonalelo dzine dza I konisa u tshila kha mutsho u fhio na u fhio.

U kona u konḓelela malwadze a fhano Afurika uya nga u fhambana ha o na mufhiso.

Kholomo iyi iya hula yavha na ṋama yavhudi.

Drakensberger

Kholomo I konaho u konḓelela mbanzhane na malwadze o fhambananaho.

Kholomo ine ya hula nga u ṱavhanya yavha na ṋama nnzhi.

Iya kona u tshila kha mutsho wo fhambanaho.

Nguni

Kholomo ine ya kona u tshila na kha Gomelelo.

Kuhulele kwayo kwo ṱukufhala ri tshi ku vhambedza na dzinwe kholomo dza ṋama

Iya kona u konḓelela mutsho wa fhano hayani Afurika Tshipembe

Khulukadzi ya Nguni na tshiṋamana tshayo

Khulukadzi ya ulu lushala lwa Nguni I ya kona u t̯hogomela tshin̯amana zwine zwa fhungudza ufa ha zwin̯amana zwitshitobva u dzwaliwa.

1.2. KHOLOMO DZA N̯AMA DZINE DZABVA KHA MANWE MADZHANGO A VHUKOVHELA NA MBONALELO YAHONE

Hereford

Ndi kholomo ibvaho kha l̯a England.

Iya kona utshila kha mutsho wo fhambananaho, zwitshi katela na mutsho u fhisaho wa fhano Afrika Tshipembe.

I kona ubveledza n̯ama yavhudi ire na mbonalelo ya khwine kha makete.

Ndi kholomo yo khwat̯helaho ine ya kona u tshila tshifhinga tshilapfu.

Sussex

Iyi ndi kholomo ibvaho kha ḽa England.

Iya kona u shuma khwine kha gomelelo.

Kadzhi Ivha na muvhala mutswuku na mutshila mutshena.

Iya kona u tshimbila tshikhala tshilapfu, na miledzhe yo khwaṱhelaho.

A I koni u konḓelela mbadzhane na malwadze a fhano hayani kha ḽa Afrika Tshipembe.

Ndi kholomo yo dzikaho ya dovha ya linganela.

Charolais

Iyi ndi kholomo inobva kha ḽa France.

I ya kona u tshila kha mutsho wo fhambananaho.

Iya kona u bveledza ṋama yavhuḓi.

Ivha na muvhala mutshena, uya kha mutshena wo rombaho.

Iya kona uvha na tshileme tshino lingana 1000 uya kha 1650 nga kiḽogireme kha mboho, na 700 uya kha 1200 nga kiḽogireme kha khulukadzi

Khulukadzi iya kona u ṱhogomela tshiṋamana khwine

Aberdeen Angus

Iyi ndi kholomo ibvaho kha ḽa Scotland.

Iya kona u tshila khwine na kha mufhiso wo kalulaho.

Iya kona ubveledza ṋama yavhuḓi.

Ingavha na muvhala mutswu kana mutswuku.

Khulukadzi ya ulu lushaka ikona u onḓa tshinamana khwine.

Iya kona utshila tshifhinga tshilapfu.

Brahman

Ndi kholomo ibvaho kha ḽa America.

Iya kona u tshila kha mutsho wo fhambananaho.

Ivha na mivhala yo fhambananaho, sa muvhala wa museṱha, mutswuku na mutswu.

I a kona u fula nga yone iṋe ḓakani.

Iya kona u konḓelela malwadze a fhano Afurika Tshipembe.

Iya kona u tshila lwa tshifhinga tshilapfu.

Khulukadzi iya kona u dzwala tshiṋamana naho yono fhirisa miṅwaha ya fumi ṱhanu.

MBONALELO DZA KHOLOMO DZA MAFHI DZIRE KHA TSHIFANYISO

Ḓamu ḽi vha ḽihulwane na ṱhungu nṋa dzo dzingindelaho.

Kholomo ya mafhi itea uvha ire na mukumba wavhudi, musekene usa hwasiho.

Naho kholomo ya mafhi isa huli ufana naya ṋama, fhedzi mbonalelo ya mboho ivha khulwane I lemelaho ritshi vhambedza na kholomo ya mafhi ya tsadzi.

Sa izwi kholomo ya mboho isa koni ubveledza mafhi, yone I a ṱhavhiwa ya ḽiwa ṋama.

Kholomo ya tsadzi ya mafhi inga lemela 550-650 kg nga kiḽogireme.

Itea uvha kholomo ine ya kona u bveledza mafhi manzhi musi yowana zwiḽiwa zwoteaho

Mannḓa na ṋungo dzothe dzia shumisa kha u bveledza mafhi

Kholomo idzi dzikona u bveledza mafhi musi dzothoma dza dzwala tshiṋamana, huno tshiṋamana tsha vhetshelwa dubo dzone dza hamiwa mafhi lwa miṅwedzi ya fumi dza awedzwa miṅwedzi mivhili.

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Vhunzhi ha kholomo dza mafhi dzia konḓelwa kha mufhiso wo kalulaho.

TSHAKA DZA KHOLOMO DZA MAFHI, MBONALELO NA HUNE DZA KONA U TSHILA HONE KHWIṊE.

Holstein-friesiana

Iyi ndi kholomo ibvaho mashangoni a nnḓa kha ḽa Netherlands.

Ivhonala nga u vha na mavhala matswu na matshena.

Ivha kholomo khulwane ritshi ivhambedza na kholomo dziṅwe dza mafhi.

Iya kona ubveledza tshikalo tsha mafhi tshino lingana 4650 kg nga ṅwaha.

Zwo leluwa vhukuma musi itshi hamiwa.

Jersey

Iyi ndi kholomo ibvaho mashangoni a nnḓa khaḽa Island.

Muvhala wayo u vha buraweni yo rombaho.

Ivha na tshileme tshiṱuku kha tsha Holstein-friesiana tshine tsha nga lingana 380 uya kha 450 kg.

Ivha na ḓamu ḽihulwane.

Ndikholomo yo dzikaho naho mboho ya hone itshi ḓivhelwa u ita itshi kelema.

Iya kona u swikisa 3200 khilogireme ya mafhi nga nwaha.

Guernsey

Ndi kholomo I bvaho Islands.

Ivhonala nga mavhala matshena na buraweni yo dzikaho.

I vha khulwane kha Jersey ya vha ṱhukhu kha Holstein-friesiana.

Kholomo iyi ibveledza mapfura a batha manzhi ritshi vhambedza na dzinwe kholomo.

Zwoleluwa u hama iyi kholomo.

Ayrshire

Iyi ndi kholomo I bvaho ngei kha ḽa Scotland

Ivha na muvhala mutswuku woyaho kha buraweni na muvhala mutshena

Inga lemela 450 uya kha 500 nga kiḽogireme.

Ibveledza mafhi matshena na mapfura a batha manzhi.

Zwibveledzwa zwa kha kholomo dza mafhi.

Mafhi

Tshizi

Mapfura

Nama, na zwinwe zwinzhi zwibveledzwa zwino shumiselwa mafhi musi zwitshi bveledzwa.
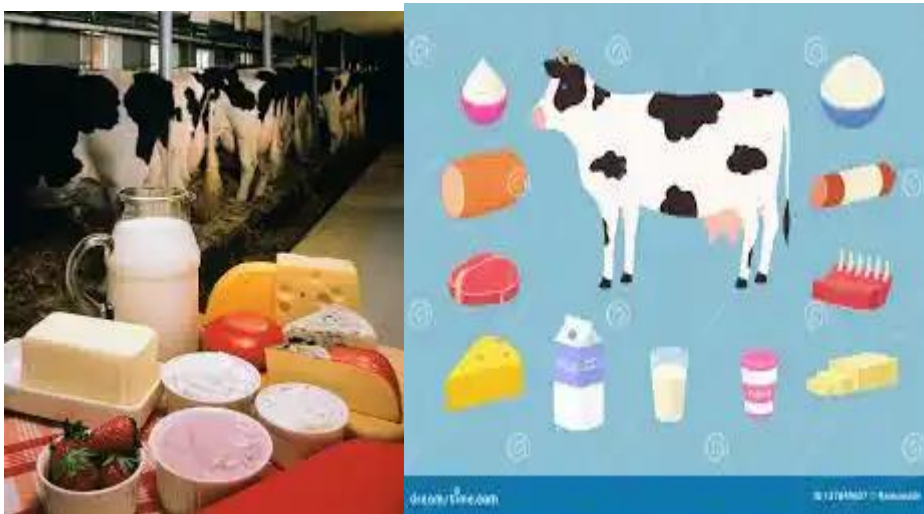
1.3. RIDOVHA HAFHU RAVHA NA KHOLOMO DZA ṊAMA NA MAFHI.

Idzi ndi kholomo dzine vho rabulasi vha dzi fuwela nga huvhili mafhi na ṋama.

Dzikona u bveledza ṋama ya vhudi dza dovha hafhu dza kona u bveledza mafhi ane akona uya na kha makete.

MBONALELO YA DZINWE DZA KHOLOMO DZINE DZA KONA U BVELEDZA MAFHI NA ṊAMA

Simmentaler

Yo bveledzwa nga murahu ha u ṱanganyiswa kholomo ya German na inwe ya ngei khaḽa Switzerlang.

Ndi kholomo ine ya kona u tshila kha nyimele dzo fhambananaho.

Ivha na muvhala mutswuku na mutshena.

Ndi kholomo ina misipha na ṋama ya vhudi.

Khulukadzi iya kona u lemela 700 u ya kha 900 nga kiḽogireme, ngeno mboho I tshi nga kha ḓi swikisa 1300 kilogireme.

Iya kona u bveledza mafhi a vhudi o khetheaho.

Red Poll breed

Iyi ndi kholomo ibvaho ngei England.

Ivha na muvhala mutswuku wo dombelelaho.

Iya kona ubveledza ṋama ya khwine kha kholomo dza mafhi.

Pinzgauer breed

Iyi ndi kholomo I bvaho ngei Austria.

Ivha na mavhala matswu na matswuku.

Ndi kholomo ine ya konḓisa vhukuma, isa lengi u sinyuwa.

Uya kona u ṱhogomela tshiṋamana.

Iya kona u konḓelela mutsho u fhisaho na mutsho u rotholaho.

Iya kona u konḓelela malwadze.

Ngannḓa ha ṋama na mafhi, kha kholomo ri a dovha hafhu ra thusalea nga mukumba une wa kona u bveledza zwienda, zwipatshi, zwiambaro minwadzi na zwinwe zwinzhi.

Zwibveledzwa zwa kha mukumba wa kholomo

2. NNGU

Kha nngu ri a kona u bveledza uḽu, ṋama na peḽithi.

Nngu ya thutha I ya kona uvha khulwane kha ya tsadzi.

Nngu ya thutha ivha na misipha na muvhili wo khwaṱhelaho.

Nngu ya thutha ire na mbonalelo isi ya vhudi isa ṱoḓei iya rengiswa isaathu pfukisela iyo mbonalelo kha lushaka ludaho.

2.1. NNGU DZA UḼU

Merino

Nngu ine ya bveledza uḽu ya khwine ndi Merino

Iyi ndi nngu ibvaho kha ḽa Spain.

I vha na muvhala mutshena.

Merino i vha na ṋama ya vhudi.

I kona u tshila khwine fhethu hure na mvula ṱhukhu na mahatsi maṱuku.

Ivha na mukumba muhulwane wo tandedzwaho nga uḽu.

Ivha na miledzhe ya vhudi ine ya kona u I tshimbidza na kha maḓaka o ṱangananaho.

Iya kona u ṱhogomela ngwana ya yo.

Uḽu iyi ya merino ndi tshinwe tsha zwibveledzwa zwine zwa thusa ikhonomi ya fhano Afurika Tshipembe musi itshi rengisela manwe mashango.

2.2. NNGU DZA ṊAMA NA UḼU

Ridovha hafhu ravha na nngu dzine dza kona u bveledza ṋama khathihi na uḽu.

Idzi nngu dzivha na mbonalelo ya nngu dza uḽu khathihi na mbonalelo ya nngu dza ṋama,

MBONALELO YA NNGU DZINE DZA KONA U BVELEDZA NAMA NA ULU.

Dorset Horn

Nngu khulwane ine ya kona u bveledza uḽu ya vhuḓi na ṋama ya vhuḓi.

Ndi nngu ine yabva kha ḽa England.

Dohne Merino.

Nngu khulwane ine ya kona u bveledza ṋama na uḽu ya vhudi.

Ibveledza u ḽu tshena ya vhudi.

Zwibveledzwa zwinobva kha nngu dza uḽu, zwikatela dzidzhesi dza uḽu, nguvho, minwadzi, masogisi na zwinwe zwinzhi.

Uḽu inwe iya kona u rengiselwa na kha manwe mashango.

2.3. MBONALELO YA NNGU YA ṈAMA

I kona ubveledza ṋama ya vhudi.

I kona u hula u ṱavhanya.

Iya kona u tshila khwine kha mutsho wo fhambananaho.

Iya kona u konḓelela malwadze o fhambananaho.

I vha na misipha muvhili wothe na miledzhe yo khwaṱhelaho ine ya I konisa u tshimbila tshikhala tshilapfu.

MBONALELO YA DZINWE DZA NNGU DZINE DZA FUWELWA ṊAMA

Dorper

Ndi nngu ibvaho kha ḽa Afurika Tshipembe.

Ibveledza ṋama yavhuḓi kha makete.

U kona u konḓelela mutsho wa mvula na murotholo.

I vha na mivhala yo fhambananaho, zwitshikatela mutshena na mutswu.

Zwia leluwa u ṱhogomela iyi nngu sa izwi isa dini.

Dormer

Ndi nngu ibvaho fhano Afurika Tshipembe.

Iya kona u tshila khwine kha mutsho wa fhano hayani.

Nngu ya tsadzi ya u lu lushaka I kona u bveledza ngwana ya dovha hafhu ya kona u I ṱhogomela khwine.

I kona u hula nga u ṱavhanya.

Damara

Ndi nngu inobva fhano Afurika Tshipembe.

I kona u bveledza ṋama ya vhudi ino difha.

Iya kona u tshila na kha mutsho usi wa vhudi, uno fhisa kana una mvula.

Mukumba wayo wo khwaṱhaho u kona u I tsireledza na kha mutsho u rotholaho wa vhuria.

Iya kona u tshila khwine na kha pfulo I si ya vhudi.

2.4. NNGU YA KARAKUL

Ndi nngu ibvaho kha shango la German.

I fuwelwa u bveledza peḽithi kha ngwana.

Ndi nngu yo khwaṱhelaho ine ya kona u tshila na kha mutsho u konḓaho.

Mukumba wa ngwana ina maduvha mararu ndi wone une wa shumiswa kha u bveledza pheḽithi.

Kadzhi ngwana ivha na muvhala mutswu.

Pheḽithi yakha iyi nngu, I kona u bveledza mukumba une wa shumiswa kha u bveledza zwiambaro zwi ḓuraho zwa maimo a nṱha.

Nngu idzi dzi a kona u shumiswa na kha u bveledza ṋama.

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ENGLISH AGRICULTURAL SCIENCES REGISTER

Chapter 2: Cattle breeds

Unit 1: Differences between African and European cattle breeds

1.1 Bos indicus (African cattle breeds)

The taxonomic names of cattle are divided into mainly two types: the African breeds, *Bos indicus* (zebu types from South Asia), and the European breeds, *Bos taurus*. *Bos indicus* are adapted to hot African and tropical climates, and are resistant to ticks and certain diseases. For example, the *Bos indicus* survived the massive rinderpest outbreak of 1898 that killed thousands of cattle in southern Africa.

They are also sometimes described as respiratory types because they have large areas of loose thin skin with small amounts of fur and large functional chests. The Brahman breed is an example of *Bos indicus*.

1.2 Bos taurus (European cattle breeds)

The European breeds have evolved to cope with heavy snow in winter and hot summers. They are adapted to the cooler conditions of Europe. An example is the Hereford breed.

There are large differences between the two breeds with respect to stamina, build, growth and calving percentage. Table 5.4 lists some of these differences.

Table 5.4 Comparison of indigenous and European cattle breeds

Feature	Indigenous breeds	European breeds
Skin types	Thin, smooth and loose skin that covers their bodies to protect them and provide a larger area for cooling.	Thick and hairy skin that covers their bodies to protect them against extreme weather patterns.
Height	Tall animals to insulate them from the heat and protect them from tall grasses (normally large framed).	Shorter in height and normally small framed.
Body mass	A huge body mass.	A smaller body mass.
Examples	Bonsmara, Tuli, Nguni, Brahman and Afrikaner	Hereford, Aberdeen Angus, Beef shorthorn and Charolais

1.3 Choosing the correct breed

Farmers need to consider many factors when choosing which cattle to breed for a livestock farm. The following are some of the most important factors to consider:

* The size of the farm and useable pasture fields
* Climate
* Financial resources available
* Amount of labour available
* Distance from the market.

Chapter 2:
Key questions
1. What are the general characteristics of beef and dairy cattle?
2. Why do we produce beef and dairy cattle?
3. What are the dual purposes of different breeds, based on their history and basic descriptions?

Unit 2: Beef cattle breeds

2.1 Beef cattle breeds

Beef cattle breeds are kept for meat production and therefore have muscular bodies. Figure 5.21 shows a typical beef cattle breed.
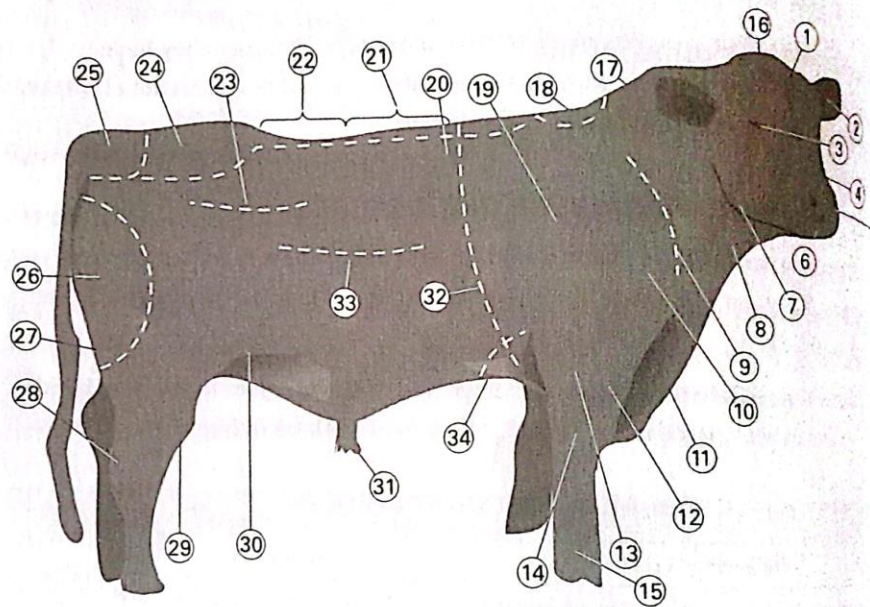
eef animal

- Forehead
- Ear
- Eye
- Face
- Nostril
- Muzzle
- Jaw
- Throat
- Shoulder vein
0. Shoulder point
1. Dewlap
2. Brisket
3. Forearm
4. Knee
5. Shank
6. Poll
7. Neck
8. Top of shoulder
9. Shoulder
0. Crops
1. Back
2. Loin
3. Loin edge
4. Rump
5. Tail head
6. Round or thigh
7. Twist
8. Hock
9. Cod
30. Hind flank
31. Sheath
32. Chest or heart girth
33. Ribs
34. Fore flank

Figure 5.21 A typical beef cattle breed

Beef cattle breeds have the following characteristics:
- **Build or shape of body:** A beef breed has a block-shaped body, and they are a normal size for its breed. However, they are wide and deep from the back to the front. The best quality meat is found at the back of the animal. The rump should be broad and muscular.
- **Head and neck:** Beef breeds have a short, broad face, with a well-developed mouth and large nostrils. The neck is heavy and well developed, and the shoulders are broad and muscular. Normally, the head and the body of the animals are in proportion.
- **Stomach:** The stomach is large to allow the animals to eat the large volumes of food that they require for their large muscle mass. This is called the function of the structure of the animal.
- **Udder:** The females of the beef breeds have well-developed udders with four well-developed teats. However, the udders are much smaller than those of dairy breeds as they are only required to supply milk to their calves.

Back-line: From the head to the tail, beef breeds have a broad but very straight top line.

Legs and feet: The legs are usually wide apart to accommodate their wide chests and well-developed hindquarters. The legs have to be strong enough to carry the heavy mass of the animal, but should also be of good quality, ending with strong, well-shaped hooves.

Tail: The tail should fit at the back without disturbing the back-line, but be long enough with a good switch, which is used to keep away pests such as flies.

The hindquarters: The hindquarters should be wide, bulging out on the sides and muscular. The legs should be thickly covered with meat. The hindquarters are the parts where most of the beef is stored.

General appearance: The bodies of beef breeds should be well balanced. They should be wide and deep, allowing them to carry a large mass. They should also be evenly covered with a layer of fat. The hip bones should be well covered and less prominent than most dairy breeds.

Hair and skin: The hair and skin of an animal give an indication of its quality. Fine, soft hair indicates a better animal than one that has coarse, thick hair.

2 General characteristics of male and female beef animals

Generally, male beef cattle are bigger than their female counterparts. They are also heavier and larger, particularly around the head and neck, and their hair is either straight or curly. This is in addition to the normal sexual differences. So, females also have udders and female genitals, while males have big humps and male genitals.

Activity 6: Identify the different parts of a beef animal

Do this activity on your own.

1. Read the information about beef cattle breeds and study the diagram in Figure 5.22.
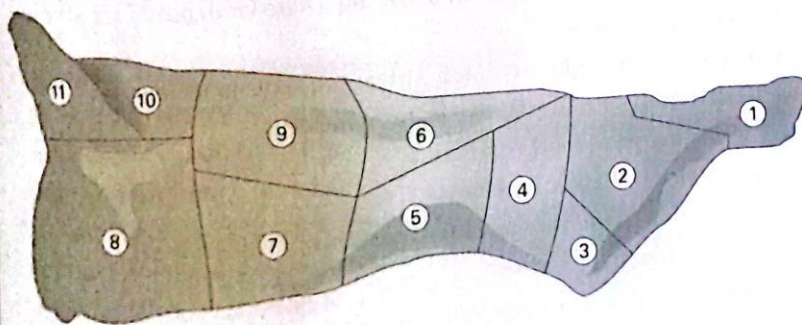
Figure 5.22 A beef cattle carcass (10)

2. Identify the parts labelled 1 to 10. (5)

3. Describe five general characteristics of beef breeds. Total marks: [15]

2.3 Comparison of beef breeds

Most beef cattle are farmed under extensive conditions with indigenous breeds or cross-bred animals being very popular. Indigenous cattle are found in drier regions of South Africa in north eastern Natal, north west Cape and north west Free State. The cattle have a large structure and can survive harsh conditions such as high temperatures and intense radiation from the sun. Some examples of indigenous breeds include the Afrikaner, Bonsmara and Drakensberger. The bullet points below summarise the unique characteristics of some of the indigenous breeds, and their special adaptation features.

Figure 5.23 The Afrikaner breed

- Afrikaner: Its country of origin was South Africa, and some of its unique characteristics and special adaptive features include:
  - adapted to local conditions as they are one of the oldest indigenous breeds in the country
  - resistance to local extreme climatic conditions
  - resistance to local parasites
  - high quality and softer beef
  - the cow has very good maternal characteristics.

Figure 5.24 The Bonsmara breed

- Bonsmara: Its country of origin was South Africa, and some of its unique characteristics and special adaptive features include:
  - developed based on scientific research
  - developed by crossing an Afrikaner, Hereford and Shorthorn
  - adapted to a variety of local climatic conditions and resistant to heat
  - resistance against diseases
  - exceptional milk production by cows
  - good body growth rate with high-quality meat
  - very few calving problems.

Figure 5.25 The Drakensberger breed

- Drakensberger: Its country of origin was South Africa, and some of its unique characteristics and special adaptive features include:
  - resistance to ticks
  - resistance to diseases
  - very high growth rate
  - very high feed conversion ratio
  - very lean meat with very little **fat marbling** where fat deposits are visible between muscle tissue

Figure 5.26 The Nguni breed

- Nguni: Its country of origin was South Africa, and some of its unique characteristics and special adaptive features include:
  - very well adapted to local conditions
  - adapted to local climatic conditions
  - produce very well for normal natural pastures (grass-fed beef)
  - adapted to drought conditions
  - small in structure to endure tough conditions
  - has a small growth rate, does not give a very good food conversion ratio and receives a lower price compared to other breeds.

Exotic breeds did not originate in South Africa but were brought here from Europe and adapted to South African climatic and environmental conditions. These exotic breeds are found mainly in coastal regions of the eastern province and also

coastal regions of KwaZulu-Natal. The bullets below summarise the unique characteristics of some of the exotic breeds, and their special adaptation features.

Hereford: Its place of origin was Herefordshire in England, and some of its unique characteristics and special adaptive features include:

- very fertile breed
- adapt easily to new environments
- convert native grasses to beef, and do it at a profit
- deliver calves that are bigger when weaned
- due to very low pigmentation on the head and around the eye, this breed develops eye problems.

Figure 5.27 The Hereford breed

Sussex: Its place of origin was in the pasture land of Sussex and Kent in the southern part of England, and some of its unique characteristics and special adaptive features include:

- originally had long, strong horns and are heavy-boned, large-shouldered draught animals
- rich red-brown pigmented skin with a creamy white switch to the tail
- has a thin summer coat and many sweat glands, and grows a thick coat in winter, which makes them suited for both hot summers and cold winters
- is a medium-sized, long-bodied animal
- traditionally had white horns but polled strains have now been developed
- a placid temperament but can be very stubborn
- strong legs allowing them to walk long distances over difficult terrain
- easy calving and regular breeders, which makes them very fertile
- early maturing with a high percentage of saleable meat
- efficient foragers so can maintain their condition even on poor quality feed.

Figure 5.28 The Sussex breed

Charolais: Its place of origin was the Bresse-Plateau Region in the Jura Mountains of eastern France and from the plateau of Bresse, the breed spread to the fertile Charolles area. Some of its unique characteristics and special adaptive features include:

- a solid white cattle breed with very little pigmentation
- highly efficient, well-adapted, lean meat producers with tremendous growth potential
- outstanding daily live weight gains resulting in unbeatable weight for age results
- excellent progeny conformation and muscling
- quiet temperament
- susceptible to skin cancer in the high radiation and sunny climate of Africa
- highly adaptable.

Figure 5.29 The Charolais breed

Aberdeen Angus: Its place of origin was the north east of Scotland in the counties of Aberdeen, Kincardine and Forfar. Some of its unique characteristics and special adaptive features include:

- a black or red smooth fur and polled head
- easy to handle, which means easier management
- easy to calve
- great longevity
- cheap to keep and can eat grass
- superior meat qualities
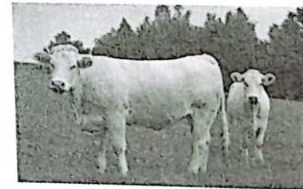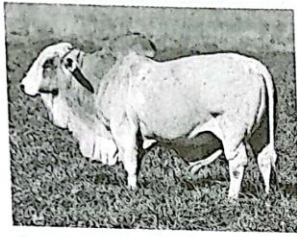

Figure 5.30 The Aberdeen Angus breed

Figure 5.31 The Brahman breed

– a good carcass balance, which is very important when selling to the best markets.

- Brahman: Its country of origin was the United States. The American Brahman Cattle Breed originated from a nucleus of approximately 266 bulls and 22 females of several *Bos indicus* (cattle of South Asia) imported into the United States in 1854. Some of its unique characteristics and special adaptive features include:
  – well adapted to extensive farming conditions and are hardy
  – easy to calve and has a high weaning mass of calves
  – good maternal instincts by the cow
  – resistance to diseases
  – longevity
  – efficient beef production.

Activity 7: Make a poster of the differences between the varieties of beef cattle

Do this activity in pairs.

1. Read the information about the different beef cattle breeds.
2. Draw a poster that outlines the differences between the different beef cattle breeds. Your poster will be assessed for completeness, correctness, outlay, variety, use of colour and neatness. (15)
3. Describe three characteristics that differ between the breeds. (3)
4. Name four characteristics that the beef breeds have in common. (4)
5. List four visible differences between beef bulls and cows. (4)
6. Name four characteristics of indigenous breeds that make them more productive in local conditions compared to exotic breeds. (4)

Total marks: [30]

Unit 3: Dairy cattle breeds

3.1 Dairy cattle breeds

Dairy cattle are kept to supply milk and cream. Therefore, they generally have big udders and well-developed teats so that can give as much milk as possible. Dairy cattle are generally farmed under intensive conditions in order to maximise milk production at the lowest possible cost. The females (cows) produce milk and are kept from their offspring. Male animals are sold and raised for meat while the best males are kept and raised for breeding purposes.

The following are some of the general characteristics of dairy breeds:

Build or shape of the body: Seen from above, dairy cows are broad at the back and narrow towards the front; they are wedge shaped. Seen from the side, dairy cows (with their large udders and stomachs) are deep at the back and higher above the ground towards the front.

Back line: The back line of a dairy cow, seen from the side, forms a straight line from the neck to the tail.

The rumen: Dairy cows have to be highly productive. A great deal of food and water is necessary to produce milk. The largest proportion of a cow's feed consists of grass and other roughage, which is stored in large quantities in the rumen. A highly productive cow must therefore have a large rumen, which will protrude at its sides and hang fairly low.

The udder: The udders of dairy cows are important for milk production and therefore should be well-developed. They should be large and stretch forward and high up between the hind legs. Well-developed milk veins lead to the front part of the udder and the udder must be square with four well-developed quarters, each with a well-formed teat.

Head and neck: Dairy cows should have a strong head with a well-developed mouth for grazing. The eyes should be well placed and alert, and the neck is slim, and together with the head, forms a straight line with the back.

Legs and feet: They should have fine quality leg bones that are not thick and coarse. The legs should be placed well apart and should function well. The hooves should be of good quality.

The tail: Dairy cows should have a long, thin tail with a large switch hanging over the hocks.

General appearance: The various sections of a dairy cow's body must be in proportion. It should look typical of its breed, while at the same time have the characteristics of a dairy cow.
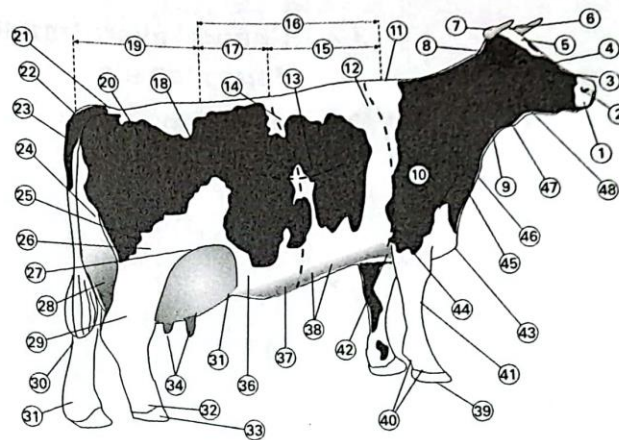

Figure 5.32 A typical dairy cattle breed

Dairy cow

1. Muzzle	26. Stifle
2. Nostril	27. Rear flank
3. Face	28. Rear udder
4. Bridge of nose	29. Hock
5. Forehead	30. Switch
6. Poll	31. Dewclaw
7. Horns	32. Pastern
8. Ear	33. Hoof
9. Neck	34. Teats
10. Heart girth	35. Fore udder
11. Withers	36. Fore udder
12. Crops	attachment
13. Ribs	37. Mammary
14. Barrel	veins
15. Chine	38. Milk wells
16. Back	39. Sole
17. Loin	40. Heel
18. Hip	41. Knee
19. Rump	42. Chest floor
20. Thurl	43. Brisket
21. Tail head	44. Point of elbow
22. Pin bones	45. Dewlap
23. Tail	46. Point of
24. Rear udder	shoulder
attachment	47. Throat
25. Thigh	48. Jaw

- Hair and skin: A good dairy cow has a healthy, thin skin covered by soft, silky, good-quality hair. It should not be coarse as this indicates poor quality.

3.2 General characteristics of male and female dairy animals

Males and females are assessed differently because of the differences between them and because of their functionality.
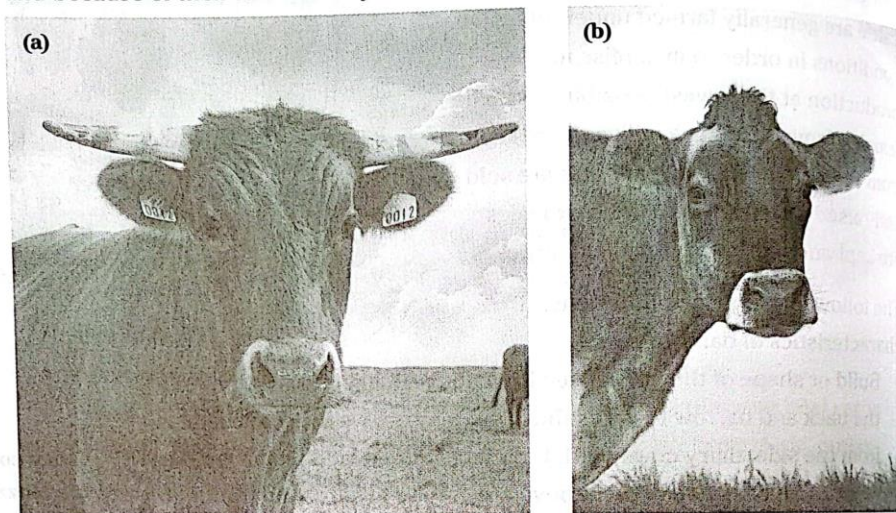
Figure 5.33 (a) A Jersey bull and (b) a dairy cow

Generally the bulls are heavier than cows, as they are bigger, particularly around the head and neck, and their hair is either straight or curly. The mass of a mature cow varies from 550–650 kg, while the bulls often exceed 1 000 kg. This is in addition to male and female sexual characteristics.

Males generally have a wilder temperament than females and show more aggressive behaviour, especially during the mating season.

3.3 Comparison of dairy breeds

Dairy cattle are raised throughout South Africa, with most farms in the eastern and northern Free State, the North West, the KwaZulu-Natal Midlands, the Eastern and Western Cape, Gauteng and the southern parts of Mpumalanga. Dairy cattle differ greatly in terms of body size and milk production, and therefore it is difficult to compare one breed with another. A farmer's decision as to which breed to farm will depend on the end product that the farmer wants, for example, Friesland for large quantities of milk and Jersey for butterfat. The climate, as well as the site of the farm, plays a role in determining which breed to choose, as does the distance from town. The Holstein-Friesland is one of the most popular dairy breeds found in South Africa, followed by the Jersey, Ayrshire and Guernsey. All other breeds comprise less than 1% of the total dairy herd.

The bullets below summarise the unique characteristics of some the dairy breeds and their special adaptation features.

Holstein-Friesland: Its country of origin was the northern parts of the Netherlands. Over the years, a number of distinctive strains have evolved within the breed, including the Holstein that was developed in the United States of America, the British Friesian and the Dutch type. Some of its unique characteristics and special adaptive features include:

- originally they were either black and white, or red and white
- large-framed body compared to other dairy breeds, and produces the largest volumes of milk (average 4 650 kg of milk per year) with relatively low butterfat content

Figure 5.34 The Holstein-Friesland breed

- easy to milk, with a good temperament
- some lines, especially in the Holstein types, have poor leg conformation, which could have a detrimental effect on the productive life of the cow
- poor udder conformation also affects the productive life of cows
- milk is mainly used fresh, and in some cases processed to yoghurt or other similar dairy products.
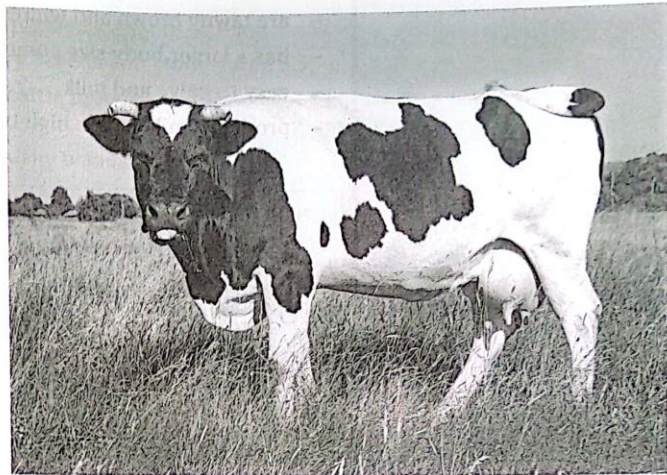
Jersey: Its country of origin was the Channel Island of Jersey, and some of its unique characteristics and special adaptive features include:

- they are tawny to tawny-brown in colour
- are the smallest of the local dairy breeds, with mature cows having a mass of between 380 kg and 450 kg
- extremely lean with a well-formed udder. They may have hollow backs
- an extremely good pelvic shape, which contributes to the very low incidence of calving problems
- lack of size and muscling, as well as a tendency for the carcass fat to be yellow, making this breed unsuitable for meat
- milk has a slight yellow colour (3 200 kg of milk per year) with a high butterfat content and is processed to make cheese, butter, cream and fresh milk. In some cases it is processed to yoghurt or other similar dairy products
- famous for their good temperament, but the bulls have been known to be very aggressive.
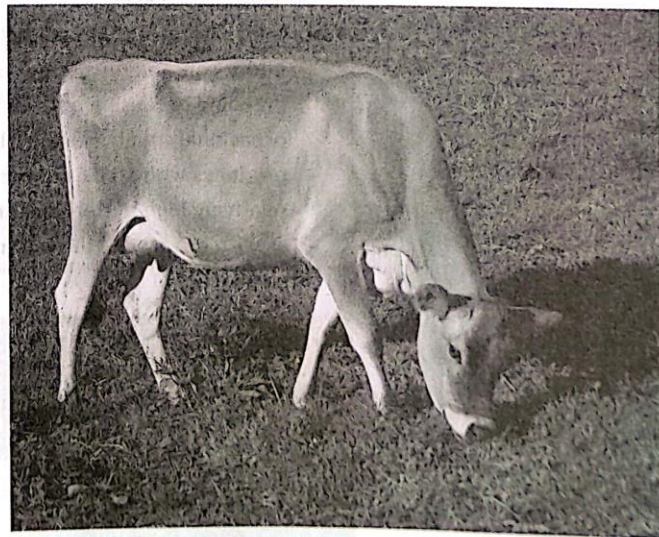

Figure 5.35 The Jersey breed

- Guernsey: Its country of origin was the Channel Islands of Guernsey, and some of its unique characteristics and special adaptive features include:
  - are tawny brown and white with a white switch
  - has a larger body size compared to the Jersey (average 450 kg)
  - easy to calve and milk
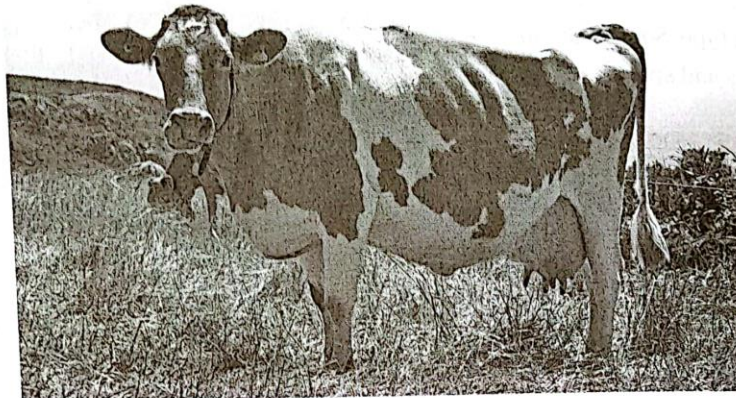 - produces milk with a high butterfat content.

Figure 5.36 The Guernsey breed

- Ayrshire: Its place of origin was the county of Ayr in the south-western part of Scotland, and some of its unique characteristics and special adaptive features include:
  - is speckled red-brown and white but was originally predominantly black
  - is a medium-sized dairy breed, and mature cows have a mass of between 450 kg and 500 kg
  - the conformation is generally considered ideal, with exceptionally sound udder conformation (an example of what can be achieved by selective breeding because Ayrshires used to be criticised for having poor udders – the occasional small, meaty udder is a legacy of that period)
  - produces white milk, similar to that of the Holstein-Friesland, but it has a relatively high butterfat content
  - as with the case of the Guernsey, there is a small population, which limits the availability of bulls.

Figure 5.37 The Ayrshire breed

Activity 8: Compare characteristics of dairy cattle breeds

Do this activity on your own.

1. Read the information about the different dairy breeds and study Table 5.5, which compares some of the different dairy cattle breeds.

Table 5.5 Comparison of various characteristics of dairy breeds

Breed	Fraction of total dairy herd (cows) (%)	Annual milk production (kg)	Butterfat content (%)	Protein content (%)	Average inter-calving period, (days)
Holstein-Friesland	75	6 426	3,48	3,15	406
Jersey	19	4 468	4,43	3,73	400
Ayrshire	3	5 260	3,66	3,34	419
Guernsey	2	4 965	4,31	3,54	439
Crossbreeds	1	4 839	3,69	3,30	388

2. What is the most popular dairy breed in South Africa? (2)

3. Name four characteristics that make the breed you named in question 2 such a popular breed. (4)

4. Which two breeds would be most suited to the following production types? Explain your answer.

   4.1 Butter (2)

   4.2 Cheese (2)

   4.3 Fresh milk (2)

5. Draw a bar graph to compare the popularity and annual milk production of the dairy breeds in Table 5.5. (5)

6. What are the colour patterns of the following dairy cattle?

   6.1 Friesland (1)

   6.2 Jersey (1)

   6.3 Ayrshire (1)

Total marks: [20]

Unit 4: Dual purpose cattle breeds

4.1 General characteristics of dual purpose breeds

Dual purpose breeds are kept for both beef and milk production, which means that they share the characteristics of both dairy cattle and beef cattle. In terms of body size and mass, dual purpose breeds are not as big as beef breeds, but they do have sufficient meat. Their udders are well-developed for milk production but they do not produce as much milk as dairy cattle. They can be farmed under both extensive and intensive conditions. Many dual purpose breeds are used in crossbreeding to produce offspring that have certain stronger characteristics, such as increasing milk production in pure beef animals.

In these breeds, the two characteristics are inversely proportional, for example, if the meat side is emphasised, then its milk production will be reduced accordingly.

4.2 Comparison of dual purpose breeds

The most common dual purpose breeds are the Red Poll, Simentaler, Pinzgauer, Brown Swiss, Dairy Shorthorn and South Devon.
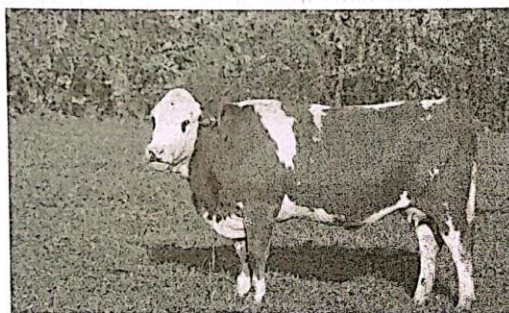

Figure 5.38 The Simmentaler breed

- Simmentaler: It originates back to the Middle Ages. Simmental cattle are the result of a cross between large German cattle and a smaller breed indigenous to Switzerland. The name Simmental is derived from the name of the area where the cattle were first bred: the Simme Valley. Some of its unique characteristics and special adaptive features include:
    - the colour varies from gold-red with white, and may be evenly distributed or clearly defined in patches on a white background
    - the majority have pigment around the eyes, helping to reduce eye problems that result from bright sunlight
    - are horned or polled; if horned, the horns are turned up
    - have a heavy dewlap
    - a large frame with good muscling
    - the cows are approximately 135–150 cm tall and the bulls are 150–160 cm tall
    - the cows have a mass of between 700 kg and 900 kg, and bulls of approximately 1 300 kg
    - generations of selective breeding to maximise milk and beef production at minimum cost have created a breed that is highly adaptable, heavily muscled, fine lined, and well conformed
    - good mothering traits.

Figure 5.39 The Red Poll breed

Figure 5.40 A Pinzgauer breed

- Red Poll: Its place of origin was the eastern middle coastal area of England in the Norfolk and Suffolk counties. It resulted from crossing cattle from both areas. Some of its unique characteristics and special adaptive features include:
  - a deep to dark red colour and no horns (polled)
  - more angular and longer-legged than medium-sized beef animal
  - has more flesh than a dairy animal
  - responds well to good handling practices
  - converts feed better and creates more tender meat than dairy breeds
  - is naturally fertile and breeds again quickly after calving
  - good maternal instincts, and milk producers with good udders
  - renowned for tender beef and high-yielding carcasses with well-marbled beef.
- Pinzgauer: Its region of origin was the Alps. The Alpine herdsmen, who ran their cattle on small, widely scattered rocky pastures, had begun to develop a breed of red and white cattle from the native red Bavarian cattle. The Pinzgauer breed was then developed in the Pinzgau district in the province of Salzburg in Austria. Some of its unique characteristics and special adaptive features include:
  - a fertile aggressive breeder
  - well-attached udders with good teat formation
  - good feed efficiency
  - excellent ranging abilities and resistant to hoof rot
  - are profitable because they are 'practical'
  - smooth hair, and pliable and pigmented skin play an important role in adaptability, allowing this breed to thrive in hot or cold climates.

Activity 9: Draw a table to compare dual purpose cattle breeds

Do this activity on your own.
1. Read the information about the different dual purpose breeds.
2. Draw a table to compare the origin and unique characteristics of the following breeds.
   2.1 Simmentaler
   2.2 Red Poll
   2.3 Pinzgauer
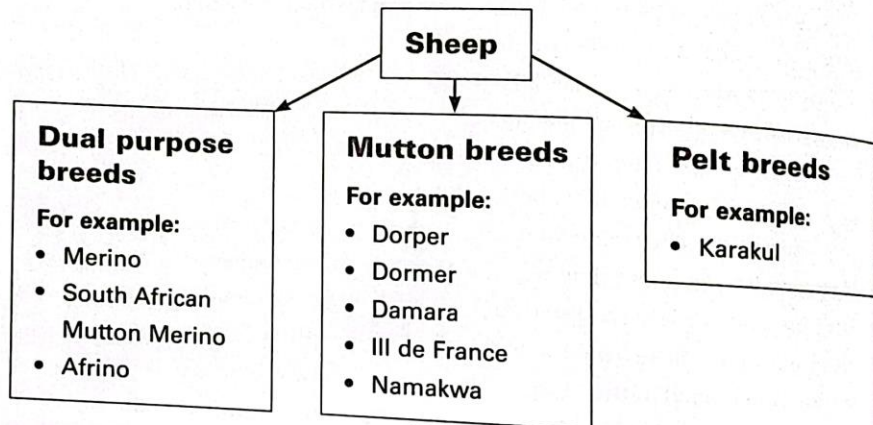
Total marks: [20]

Chapter 3: Sheep breeds

Unit 1: Classification and general characteristics of sheep

1.1 Classification of sheep based on their purpose

We can divide sheep into three categories based on their purpose: dual purpose, mutton and pelt.

- Dual purpose breeds are mainly kept for wool, meat or both. Their hides are also used.
- Mutton breeds are mainly kept for meat (mutton). However, their hair (kemp) and hides are also used.
- Pelt breeds are mainly kept for the pelts of the young lambs, but their meat, wool/hair and hides are also used.

Sheep

Dual purpose breeds	Mutton breeds	Pelt breeds
For example:	For example:	For example:
• Merino	• Dorper	• Karakul
• South African Mutton Merino	• Dormer	
• Afrino	• Damara	
	• Ill de France	
	• Namakwa	

1.2 General characteristics of rams and ewes

The bullets below describe some of the characteristics of rams and ewes.

- Rams have a huge impact as the breeding mate of a flock of sheep with a large number of ewes. A breeding ram provides 50% of his genetic characteristics to all the lambs he sires. Therefore, a farmer will want a breeding ram to have economically important characteristics, such as growth rate and fertility, as these are some of the characteristics that a farmer will want to improve in his flock. Rams with any negative characteristics, such as teeth that do not fit onto gums properly, are sold immediately. Rams must have a masculine build and a strong body. Masculinity in rams is an important characteristic that contributes to a better carcass and meat quality. The ram must have a male appearance, and the scrotum should be long and the testicles equal in size. The circumference of the scrotum in a sitting position should be around 34 cm. The hind legs of the ram play an important part in mating and should be strong.

Ewes should be able to lamb easily and therefore should have a medium-sized body with hip bones positioned to allow the foetus to pass down the birth canal. Ewes should have well-developed udders and teats with healthy reproduction organs. Femininity in ewes is important, and is especially noticeable in the head. Ewes are slightly smaller than rams.

Figure 5.41 A ewe with its lamb

Activity 10: Identify features and characteristics of a sheep

Do this activity on your own.

Figure 5.42 A sheep
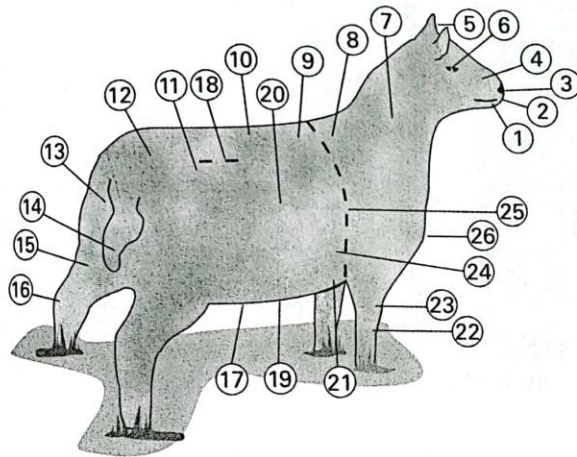
Sheep	
1. Mouth	14. Leg or thigh
2. Muzzle	15. Twist
3. Nostril	16. Hock
4. Face	17. Rear flank
5. Ear	18. Loin edge
6. Eye	19. Underline belly
7. Neck	20. Ribs
8. Top of shoulder	21. Fore flank
9. Back	22. Knee
10. Loin	23. Forearm
11. Hip	24. Chest
12. Rump	25. Heart girth
13. Dock	26. Brisket

1. Read the information about the different breeds of sheep and study Figure 5.42.
2. Name the part(s) of the sheep that you would associate with each of the following. Explain your answer.
   2.1 Mating   (2)
   2.2 Wool production   (2)
   2.3 Movement   (2)
   2.4 Grazing and digesting food   (2)
   2.5 Blow-fly attacks on wet areas of skin   (2)
3. Name five contrasting characteristics of rams and ewes that would be assessed during a sale.   (10)
4. Why will a ram have a greater effect on the offspring in a flock of sheep than the ewe?   (5)

Total marks: [25]

Unit 2: Dual purpose sheep breeds

Dual purpose sheep breeds are kept for both mutton and wool production. These two characteristics are in competition with each other for nutrients. In some breeds, there is a clear balance between wool and mutton production, but in others, the emphasis is on wool production or mutton production. We group dual purpose breeds according to whether their production emphasis is on wool (the Merino) or mutton (the Dohne Merino, German Merino, South African Mutton Merino and Afrino).

2.1 Merino

In 1789, South Africa was the first country outside Europe to own Merinos, when the Dutch Government donated two Spanish Merino Rams and four Spanish Merino Ewes to Colonel Jacob Gordon, the military commander at the Cape at that time, on an experimental basis. By 1830, wool sheep farming in the western and south west Cape was already fairly well established.
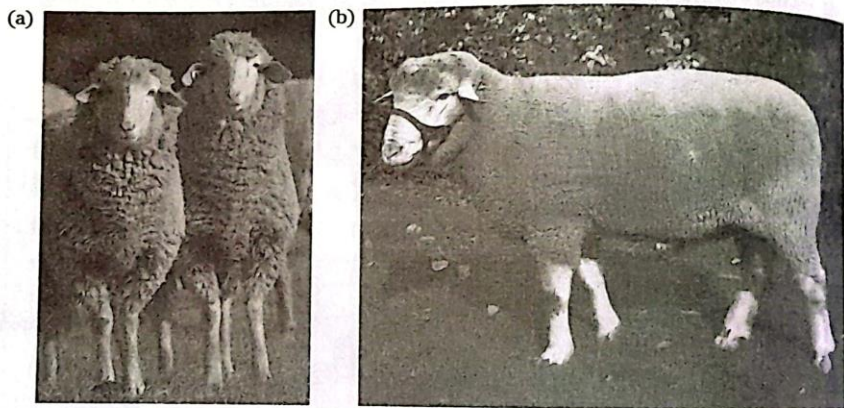
(a)

(b)

Figure 5.43 (a) German Merino and (b) South African Mutton Merino

For many years, Merino sheep were bred for the quality and the quantity of the wool they produced. The bullets below describe some of their characteristics.

- They have a large area of skin on their bodies that contains many wool follicles, which are openings in the skin where the wool grows from.
- The skin area is often pleated on the body and chest to accommodate the large skin area.
- The length of the body means that there is more skin, but also more mutton, which is the secondary product.
- The wool that grows should be of a good quality.
- They have good legs so they are able to move well in areas with sparse vegetation to collect food.
- They have good maternal characteristics, which include a functional udder.
- They have herding instincts and have been used as parents to develop several other new breeds.

There are great numbers of South African Merino sheep in South Africa, and they are adapted to low rainfall areas of between 250 ml and 500 ml. The breed is usually

found in the Karoo of the Western Cape as well as in certain parts of the Eastern and Northern Cape. The vegetation in these areas is very short and close to the ground, and so it does not get caught in the coats of the sheep and spoil the wool. The vegetation in these areas consists of shrubs and grasses that provide the high protein content needed for producing wool of high quality. As vegetation in the Karoo is sparse, the Merino sheep is very strong and has well-developed hooves for walking long distances. It has thick skin to help it survive the harsh conditions of the Karoo. Wool is one of our highest earners of foreign currency, which makes the Merino sheep important for the economy.

2.2 Dohne Merino

The Dohne Merino is a dual purpose sheep breed developed by the South African Department of Agriculture using Peppin-type Merino ewes and German Mutton Merino rams.

The bullets below describe some of their characteristics.
- The ewes are very fertile and so they produce many lambs.
- The ewes normally have well-developed udders and high milk production to help the lambs grow quickly.
- The sheep have a good feed conversion ratio.
- They have a high growth rate.
- They produce fine wool under commercial pastoral conditions.
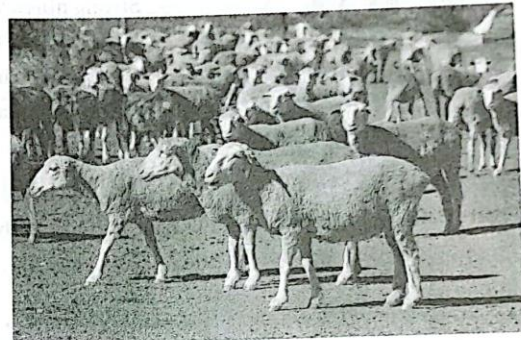

Figure 5.44 Dohne Merino

The Dohne Merino is a naturally polled and plain-bodied breed that produces fine to medium wool. It is a highly productive dual purpose sheep. It has been bred to produce prime meat and fine, white wool. The flock is self-replacing, fertile, hardy and easy to care for.

2.3 South African Mutton (Meat) Merino

South African Mutton (Meat) Merino were imported into South Africa by the Department of Agriculture in 1936 from Germany, where the Deutsche Fliesch Merino is a common meat sheep. In South Africa, the name was translated as Duitse Vleis Merino and then into English as German Mutton Merino.

The South African Mutton Merino is bred specifically to produce a slaughter lamb at an early age. It is also able to produce good volumes of medium to strong wool.

Figure 5.45 The Afrino breed

The Afrino breeding project was initiated at the Carnarvon Experimental Station in the north west Karoo in 1969. A cross consisting of 25% Merino, 25% Ronderib Afrikaner and 50% South African Mutton Merino best fulfilled the requirements set for this new breed.

The bullets below describe some of its characteristics.
- It is a white-wool mutton sheep.
- It combines the quality wool of the Merino with the reproductive performance and mutton producing abilities of the mutton breeds.

2.4 General characteristics of wool breeds and wool produced

The bullets below describe some of the general characteristics of wool breeds and the wool that they produce.

- They have strong legs so that they can walk long distances for the food they need in the sparse vegetation of the Karoo.
- They are covered with wool and have pleated skin areas at the collar and on the body line.
- The wool has the following unique fibre characteristics:
  - Evenly waved fibres with a good spinning ability
  - Strong fibres with good elasticity to produce strong strings
  - Fire-resistant fibres that are safer than synthetic fibres
  - Have a covering of scales that increases the spinning ability
  - Provide insulation against the cold.
- Wool sheep breeds are normally docked to prevent faeces and urine from collecting in these areas as the wool becomes long.

Figure 5.46 Wool fibres

The more follicles that a sheep has, the more wool it will produce. These follicles develop during differential tissue growth in the skin area of the foetus.

Activity 11: Identify characteristics of sheep and wool
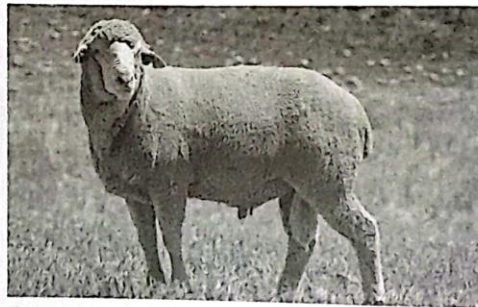
Do this activity on your own.

Figure 5.47 A breed of sheep

1. Read the information about different types of wool breeds and the wool that they produce, and study Figure 5.47.
2. What wool breed is shown in Figure 5.47? (1)
3. Name three characteristics of this sheep breed. (3)
4. What is the main product that this breed of sheep produces? (2)
5. Is the animal in Figure 5.47 male or female? Explain your answer, giving two reasons. (2)
6. Compare the Merino and Afrino sheep breeds with regard to:
   6.1 origin and development (4)
   6.2 unique characteristics. (4)
7. Name four characteristics of wool fibres that make it useful as a textile product. (4)

Total marks: [20]

Unit 3: Mutton sheep breeds

3.1 Comparison of mutton sheep breeds

Mutton sheep breeds are kept for meat production and therefore they should grow as fast and as big as possible. They have been bred to produce as much muscle and body tissue as possible, with no emphasis having been placed on fibre formation such as wool or hair.

Mutton sheep breeds are divided into the following broad groups.

• Non-wool breeds: the Dorper
• Woolled breeds: the Dormer, Ill de France and Afrino
• Fat-tailed breeds: the Namakwa and Round ribbed Afrikaner
• Fat-rumped breeds: the Black-faced Persian and Van Rooy

The bullets below describe some of the unique characteristics and adaptive features of these breeds.

• Dorper: It was first developed in the 1930s by the Department of Agriculture of South Africa by crossing a Dorset Horn ram and Black-faced Persian ewe. In 1946, the breed project was finalised at Grootfontein College of Agriculture in South Africa. Some of its unique characteristics and special adaptive features include:
  - satisfactory lambing ability in the autumn
  - reasonably acceptable meat carcass
  - a good slaughter lamb on veld conditions at 4–5 months
  - resistance against cold wind, rain, extremely high summer temperatures and radiation
  - a versatile sheep that can feed on tough grass and shrub veld
  - satisfactory reproductive fitness
  - easy to care for and without lamb shearing problems
  - fair amount of colour and pigmentation.

Figure 5.48 The Dorper breed

3.2 General characteristics of mutton breeds

Mutton breeds have the following general characteristics.

- They have a good build in that they have a good body with strong legs.
- They are hardy and can survive in areas where the average annual rainfall is less than 250 ml.
- They have a high growth rate.
- They are generally very fertile.
- They have good motherly characteristics, such as high milk production (well-developed udders).
- They are hardy and disease-resistant.
- They have a high meat conversion ratio (faster growth).
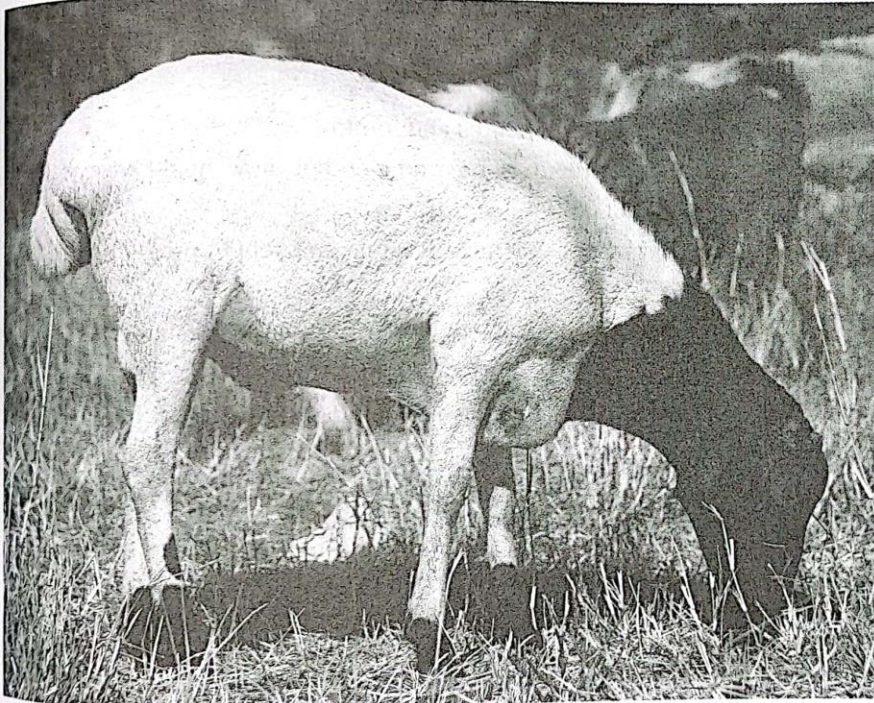- They have a high level of adaptability and suitability.

Figure 5.51 A Black-faced Persian

Activity 12: Draw a mind map of mutton sheep breeds

Do this activity on your own.

1. Read the information about the different mutton sheep breeds.
2. Draw a mind map of the different mutton sheep breeds. Indicate on the map the origin and characteristics of each breed. (16)
3. Compare indigenous and exotic sheep breeds by describing two differences between these sheep breeds with regards to their important characteristics. (4)

Total marks: [20]

Unit 4: Pelt sheep breeds

4.1 The Karakul sheep

Karakul or Qaraqul (named after Qorako'l, a city in Bukhara Province in Uzbekistan) is the oldest breed of domestic sheep that originated in central Asia. There is archaeological evidence that suggests that Karakul sheep have been raised there since 1400 BC.

Karakul sheep are renowned for their ability to forage and thrive under extremely harsh living conditions. Karakuls are also raised in large numbers in Namibia, having first been brought there by German colonists in the early 20th century. As well as being very hardy and adaptable, the ewes are released of their lambs within three days of being born. This takes the strain of caring for the young away from the ewes, which increases their chances of surviving very harsh and extreme drought conditions. The bullets below describe some of the characteristics of the Karakul sheep.

- They are resistant to internal parasites and foot rot.
- Karakuls can withstand extremes of hot and cold but they should have access to dry cover and be kept out of marshy pastures.
- Karakuls breed out of season, making it possible for them to produce three lamb crops in two years.
- The ewes are very protective and attentive mothers, which results in a high lamb survival rate.
- The Karakuls possess a strong flocking instinct and can be run either on an open range or in fenced pastures.
- Karakuls do not herd well – they are likely to scatter or fight a dog trying to herd them.
- Fat is stored in their large tails as a source of nourishment, similar in function to a camel's hump.

Karakul sheep are a multi-purpose breed, kept for milk, meat, pelts and wool. As a fat-tailed breed, they have a distinctive meat flavour. Many adult Karakul are double-coated and the coarse guard hair is usually separated from the undercoat. The Karakul's relatively coarse fiber is used for outer garments, carpets and for felting.

The newborn lambs have tightly curled hair. The lambs must be under three days old when they are killed, or they will lose their black colour and soft, tightly woven coils of fur. Dark colours are dominant and lambs often darken in colour as they age.

Figure 5.52 The Karakul breed

Activity 13: Describe the adaptability of Karakul sheep

Do this activity on your own.
1. Read the information about Karakul sheep.
2. List and explain five characteristics of the Karakul that allow it to survive harsh conditions and extreme droughts. (10)
3. Name five products produced from Karakul. Briefly explain the economic value of each of these products. (10)

Total marks: [20]

APPENDIX Q : DATA ANALYSIS SCHEME (DAS)

THEME	CATEGORY	CHARACTERISTICS
THE DEVELOPMENT AND APPLICATIONS.	CHALLENGES	To view the challenges encountered in the development of Tshivenda register.
	OPPORTUNITIES	To view the opportunities in the development of Tshivenda register.
	PERCEPTIONS	To understand how different stakeholders perceive the development of Tshivenda register (Teacher, Parents and Learners)
	MEANINGFUL LEARNINGS	To view on how the application of Tshivenda registers shape meaningful learning in class.

APPENDIX R: CODED ENGLISH OBSERVATION TRANSCRIPT:

19	Learners: Netherland
20	Teacher: Yes the Northern part of Netherland and it has black and white and
21	sometimes red and white colour. It is easy to milk with good tempement, what is
22	tempement it is good moods, they are not moody. Moody is some body that become
23	angry easily. The milk of this cow it is usually used as fresh milk; it is used in processed
24	yoghurt and other similar dairy produce. It is not good in cheese making this one. Then
25	we have got Jersey, which is developed or originate from Island, so it is tine brown. Are
26	the smallest of dairy cow, ndiyone thukhusa. This is the smallest cow; it can weigh
27	between 380 to 450 kg. Extremely lean with very formed udder, they have got hollow
28	back and extremely hood pelvic shape which contribute to their very low incident of
29	calving problems so they can give birth easily because they have got a pelvic shape, so
30	you know what is a pelvic (Pointing to learners)
31	Learner: No
32	Teacher: A pelvic is where your leg meet, with your body, ndi hune milenzhe na

Comment [I1]: Passive learning

170

8	Learners: Ri a wana ṋama.(We get meat)
9	Teacher: Ṋama I wela kha zwiḽiwa, zwiṅwe zwine ra zwiwana ndi zwifhio? (Meat is also
10	food, what else?)
11	Learners: Ri a wana zwa u ita zwiambaro. (We also get materials for clothing)
12	Teacher: Khari ambe nga muthihi nga muthihi, nifhindule musi ro ni sumba. (Let avoid
13	speaking in group, and raise your hand before you answer)
14	Learners: Ri a wana uḽu ine ra ita ngayo zwiambaro. (We also get wool for clothing)
15	Teacher: Yes zwiṅwe? (Yes what else)
16	Learners: Ri a wana mafhi. (We get milk)
17	Teacher: Ee mafhi na one awela kha zwiḽiwa. (Yes milk also falls under food)
18	Learner: Ri a rengisa (We can sell)
19	Teacher: Ee na u rengisa ri a kona u rengisa zwifuwo zwashu ra kona u wana tshelede,
20	zwikhou pfala thi? Zwi amba uri zwifuwo zwiḓoḓi dzula zwizwa important (Yes we can
21	also sell our animal for money, do you understand? This means that our animals will
22	always be important

Comment [I2]: Interactions

APPENDIX T: CODED INTERVIEW TRANSCRIPT

48	Teacher: Challenges of using the scientific language register, there was no many
49	challenges except that there are still some words or statement which have not yet
50	been fully transcribed to the learners home language, those words still pose
51	challenges.
52	Researcher: What are the opportunities did you identify in using the scientific language
53	register?
54	Teacher: The opportunity that I have identified is that the is the is a need for
55	developing the scientific language register that explain even the most difficult words
56	and break it down in to simple language that the learners will be able to understand.
57	Researcher: How was your experience in using the scientific language register?
58	Teacher: I had a positive experience
59	Researcher: Why?
60	Teacher: The reason for this was that the learners shows the level of confidence in
61	answering the question.
62	Researcher: What is your perception on the use of Tshivenda to teach Agricultural
63	Sciences?
64	Teacher: I think it would be good idea to introduce Tshivenda as the language of
65	teaching Agricultural Sciences
66	Researcher: Why?
67	Teacher: The reason for that is that many times when learners have difficult, that is
68	the language they normally switch to so that we can explain terms that are difficult
69	to the learners, and also it is the language that they easily understand in this school.
70	Researcher: How is the general performance of Agricultural Sciences in your school is it

Comment [I3]: Perception

APPENDIX U: CODED DIARY

Dates		Action
13/10/2023	1	Before the researcher start to develop the Tshivenda
	2	scientific language register she had a meeting with three
	3	Tshivenda language teacher and the researcher explain the
	4	reason of the study, and also indicated the topic of the study
	5	which is to develop of Tshivenda scientific language register
	6	for teaching Agricultural Sciences, she explain it to the
	7	teacher. One of the teachers indicated that diverting from
	8	English to Tshivenda might be a problem because there words
	9	that we still borrow from other languages like English and
	10	Afrikaans, the teachers also made the researcher aware that
	11	even when they are teaching learners Tshivenda in class, they
	12	made learners aware of the words that are borrowed from
	13	other languages

Comment [I4]: Challenges

APPENDIX V: ETHICAL CLEARANCE CERTIFICATE

UNISA | university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2023/09/06

Ref: **2023/09/06/64013790/22/AM**
Name: Ms OL PHALANDWA
Student No.:64013790

Dear Ms OL PHALANDWA

Decision: Ethics Approval from
2023/09/06 to 2026/09/06

Researcher(s): Name: Ms OL PHALANDWA
E-mail address: 64013790@mylife.unisa.ac.za
Telephone: 0722143363

Supervisor(s): Name: DR T.G NTULI
E-mail address: entulit@unisa.ac.za
Telephone: 0782091017

Name: PROF A. V Mudau
E-mail address: mudauav@unisa.ac.za
Telephone: 0727062710

Title of research:

**DEVELOPING OF TSHIVENDA SCIENTIFIC LANGUAGE REGISTER FOR
AGRICULTURAL SCIENCES FOCUSING ON ANIMAL STUDIES**

Qualification: MEd Natural Science Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2023/09/06 to 2026/09/06.

The **medium risk** application was reviewed by the Ethics Review Committee on 2023/09/06 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.

4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.

6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

8. No field work activities may continue after the expiry date **2026/09/06**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2023/09/06/64013790/22/AM** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof Mpine Makoe
EXECUTIVE DEAN
qakisme@unisa.ac.za

Approved - decision template – updated 16 Feb 2017

APPENDIX W: TURNITIN

Developing of Tshivenda scientific language register for teaching Agricultural Sciences

APPENDIX X: EDITORS CERTIFICATE

Shiraz 16

50 Quail Avenue

Thatchfield Close

Centurion, Pretoria

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To whom it may concern

This letter confirms that the dissertation entitled: **DEVELOPING OF TSHIVENDA SCIENTIFIC LANGUAGE REGISTER FOR TEACHING AGRICULTURAL SCIENCES** written by **PHALANDWA OCKTOVIA LIVHUWANI** has been edited by Sam Ramaila.

Sincerely,

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