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Exploring Indigenous Knowledge as Curriculum Knowledge for the Life Sciences Curriculum and Assessment Policy Statements: What Rural Communities Can Offer in South Africa

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Exploring Indigenous Knowledge as Curriculum Knowledge for the Life Sciences CAPS: What Rural Communities Can Offer in South Africa

Submitted by
Neo Lefora

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A research report submitted to the Faculty of Humanities, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Education

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Co-supervisor: Dr Paul Hendricks



Declaration

I, Neo Lefora (student number 2622451), declare that this research report is my own unaided work. It is being submitted for the Degree of Master of Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree, part degree or examination at this or any other university.

Signature:



Dedication

I would like to dedicate this Research Report to my aunt, Nobantu Hombakazi Portia Qezu-Siphango, whose untimely death left me with more questions than answers. It never occurred to me that I had limited time with her on the earth, death certainly did not suit her. An adaptation of SEK Mqhayi's words is most accurate in describing the dialogue between my mind and heart:

Ndiswel'imilom'okokuxolisa kwintlungu'engaphakathi
Ndiswel'izandla zokuzosul'iinyembezi zomphefumlo
Ndisweli'isipho sokukwenz'uxol'ulibale

Thank you for your words, wisdom and fierce character. Most importantly, thank you for sharing your life with us *Momkhulu, ndiyabulela Dlangamandla.*

Acknowledgements

I would like to acknowledge the selfless support, guidance and mentorship of Dr Alfred Masinire, thank you for believing in a village boy who mostly found himself lost in a big city. To Dr Paul Hendricks for his timely guidance in this Research Report, thank you sir. I would also like to thank Prof Thabisile Nkambule, Dr Emure Kadenge, Dr Sarah Blessed-Sayah and Lynne 'Slo' Slonimsky for supporting me on my quest to becoming an academic.

I would also like to acknowledge the love, compassion and sensitivity that my friends showed me in 2023. Specifically, Boitumelo Madimabe, Dr Dale Langsford, and Phumzile Mathibela, without whose friendship Wits would have been a lonely place for me. In the same breath I would like to thank my brothers and sister, Yamkela Ndaba, Phakamile Qayi, Gift Kano Lesirela and Lindokuhle Bulelwa Pili, thank you for the fellowship of the Spirit!

Lastly, to my family: Mme Tshwanie, Ausi Tshwanelo, Seithati, Hadio and Padiso and all my nieces for providing me with warmth when I needed it the most. To my precious Reneilwe, I love you baby, and I hope this will be a constant reminder that you can achieve anything you set your mind to. Most importantly, to the love my life, Muhle Mkeme, there is so much to thank you for so I will summarise it by saying *ubomi buswel'incasa nxawungekho, ndikuthandile mntan'omntu!*

And to the community members of Tlokweng who participated in this study, I thank you all. The Xhosa people to whom I owe my being, *nditsho kuni mampondomise, nali ilinge lam lokunikhonza.* I hope this Research Reportis a testimony to how far your influence stretches. A huge thanks to Tamolo Chali, Angus Burnsand Thabathani Tshaka for the pictures of the research site.

Abstract

The study focused on collecting, documenting, and describing Indigenous Knowledge which could be relevant to teaching and learning grade 12 Life Sciences CAPS in a rural South African community. The aim of the study was to create a database of Life Science-related Indigenous Knowledge and propose how it may be integrated with the current grade 12 Life Sciences curriculum. The methodology involved a qualitative indigenous research paradigm centred on Ubuntu approach. Data was collected from 10 community elders through interviews while 6 participated further in focus group discussion. Through thematic analysis, three themes emerged from the data: the knowledge of traditional plants and herbs, knowledge regarding sustainability processes for the traditional plants and herbs, and the knowledge of traditional and cultural practices.

The findings show that the Indigenous Knowledge which is used for health and cultural-spiritual purposes is relevant to the grade 12 Life Sciences CAPS. This includes the community's understanding and use of Artemesia Afra and the African Potato for flu symptoms and diabetes, respectively, which can be explained scientifically. However, some of this knowledge exceeds the scope of Western scientific understanding. The making of Umqombothi as a traditional type of prayer and the burning of Helichrysum Odoratissimum as a way of inviting the presence of the ancestors demonstrates the relational ontology of the community members. The study argues for an intersecting approach to integration in which Indigenous Knowledge is integrated with the grade 12 Life Sciences content at the point of factual and procedural knowledge. This implies integrating Indigenous Knowledge along with associated values and beliefs without compromising the science in the curriculum. In this way, the curriculum is decolonised by adopting a Pluriversal approach to knowledge.

Key Words: Indigenous Knowledge, Integration, Curriculum Knowledge, Decolonisation, Life Science CAPS

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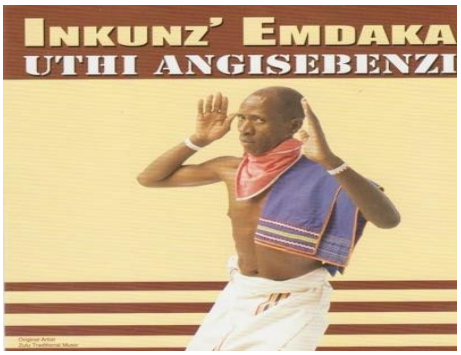
Chapter 1: Introduction

"Imfazwe isuk'eziko"



Imfazwe isuk'eziko is a Xhosa idiom that means conflict can arise from small matters. This theme has been chosen for the chapter because it alerts one to the dangers of ignoring social matters that may lead to conflict, such as the marginalization of Indigenous Knowledge from the curriculum.

The song selected for this chapter is Ingwe by Inkunz'emdaka. It is a call for men to capture a deadly tiger which is ravaging the community. Figuratively, this call is similar to the one mad regarding the marginalisation of Indigenous Knowledge in the curriculum. I identify with the young men in the picture above as capable of dealing with these problems which are ravaging our communities.



https://www.youtube.com/watch?v=sV_Wj2OVTHA

1. Introduction of the study

1.1 Background and context

Historically, formal colonial education, and even post-colonial education, have overlooked or undermined Indigenous Knowledge as a valuable source of curriculum knowledge in Africa (Hountondji, 1997; Odora-Hoppers, 2002, De Beer & Mothwa, 2016).Western epistemology has always taken centre stage as constituting real knowledge while Indigenous Knowledge was discouraged and undermined (Akena, 2012, Le Grange, 2016). Due to the western modelling of universities in the African colonial context, western knowledge enjoyed superiority over Indigenous Knowledge even in knowledge production, thus diminishing the value of Indigenous Knowledge since it was sidelined in research activities (Le Grange, 2016). The push of Indigenous Knowledge to the margins, therefore, was a direct result of colonisation (Hereniko, 2000; Ndofirepi & Ndofirepi, 2012). Consequently, the formal study and development of Indigenous Knowledge Systems was severely undermined by colonial forces and was reinforced by Knowledge Apartheid in the South African school curriculum. Odora-Hoppers (2002) defines knowledge apartheid as the systematic exclusion of Indigenous Knowledge from the formal curriculum. Knowledge-apartheid undermined not only the epistemological affordances of

Indigenous Knowledge, but the ontology from which it is derived. Furthermore, it excluded the

cultural resources which Indigenous Knowledge bring into the modern educational experience (Le Grange, 2007; Jacobs, 2015).

Contrary to Western historical and current perceptions and depictions of Indigenous Knowledge Systems, African scholars have appreciated the value of Indigenous Knowledge systems and its prospects for decolonisation (Hontoundji, 1997; Odora-Hoppers, 2004, Le Grange, 2016). The value placed on Indigenous Knowledge represents a shift from the idolization of Western Knowledge and ways of knowing to the appreciation of Indigenous Knowledge as a source of solutions to context-specific problems in Africa, much of which the West cannot solve (Hountondji, 1997; Odora-Hoppers, 2002, Latullipe & Klinke, 2019). In accordance with the focus of this study, one of the most prominent context-specific problems is the decolonisation of the curriculum. This is particularly relevant in the South African context where the curriculum is arguably Eurocentric (Maluleka, 2021; Heleta, 2016). In this case, Indigenous Knowledge represents Africa's knowledge identity and agency as it is not only a combination of myths and traditions, but a proven source of practical knowledge (Hountondji, 1997, Cameron & Taylor, 2016).

At the current policy level, the Department of Education (2011) in the Curriculum and Assessment Policy Statements (CAPS), notes that Indigenous Knowledge is valuable to Life Sciences because of its potential to promote constitutional values as well as connect science with everyday knowledge. This is a recognition in policy that the integration of Indigenous Knowledge with the Life Science curriculum is fundamental to an educational experience located in the South African context, particularly amidintensifying calls for the decolonisation and contextualization of the curriculum (De Beer & Petersen, 2016; De Beer & Mothwa, 2016). However, there is yet another aspect of Indigenous Knowledge which the CAPS do not adequately define, that is its position as curriculum content knowledge (Khupe, 2014; Jacobs, 2015). Specifically, Indigenous Knowledge integration in thegrade 12 Life Sciences CAPS is only suggested through unspecified policy requirementsconsisting of vague overarching aims and principles (Cameron & Taylor, 2016; Seehawer, 2018).This leads to the marginal integration of Indigenous Knowledge as a classroom pedagogic resource whose content is left to the discretion of the teacher (De Beer & Mothwa, 2016).

In practice, and beyond the vague suggestions of CAPS regarding Indigenous Knowledge integration within Life Sciences classrooms, teachers have not been able to implement meaningful integration. According to De Beer (2016), meaningful integration is undermined by the lack teacher's pedagogical content knowledge in relation to the teaching of Indigenous Knowledge. In this case, teacher hold

retrogressive views of Indigenous Knowledge which equate it with myth and every day, non-scientific knowledge (De Beer & Mothwa, 2016). Therefore, a gap exists between the policy principles of integration in the Life Sciences CAPS, and the integration of Indigenous Knowledge in practice beyond its use for example purposes. In this study, this marginal pedagogic integration of Indigenous Knowledge is interpreted as maintaining the dominant colonial status of Western knowledge in the curriculum. As such, the purpose of this study is to explore Indigenous Knowledge as curriculum knowledge for the Grade12 Life Sciences CAPS. Whereas the pedagogical integration of Indigenous Knowledge and theGrade 12 Life Sciences CAPS has previously been studied, this study seeks to contribute to the discussion by studying integration at the level of the prescribed curriculum knowledge.

1.2 Problem Statement

The previous curricula of post-apartheid South Africa noted the importance of Indigenous Knowledge as a means of creating a transformative curriculum. This is noted in Learning Outcome 3 of C2005 which stated that "the learner [should be] able to demonstrate an understanding of the nature of science, the influence of ethics and biases in the Life Sciences, and the interrelationship of science, technology, Indigenous Knowledge, the environment and society" (Department of Education, 2003, p. 12). Although Indigenous Knowledge was mentioned, the specific content was not prescribed in the curriculum but was left to the discretion of the teacher in the classroom or publishers in textbooks (Suliman 2010, Devie, 2010). The major difference between the revised version of C2005 (which are RNCS and NCS) and CAPS is largely seen in the learning outcomes and very minimally in the content itself (Jacobs, 2015). As such, the problem of the lack of curriculum specification of the indigenous content knowledge to be integrated was carried over to CAPS.

Currently, the Life Sciences CAPS acknowledge the importance of Indigenous Knowledge as noted in two important statements of the policy. First, the curriculum is premised on the principle of "valuing IKS, acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the constitution" (Department of Education, 2011, p. 5). Secondly, the value of Indigenous Knowledge is translated into Specific Aim 3 of the curriculum and it "relates to understanding the applications of Life Sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between Indigenous Knowledge and science" (Department of Education, p. 13). Despite mention of the principle and specific aim, the integration of Indigenous Knowledge in the Grade 12 Life Sciences CAPS is limited to examples which are left to the teacher's discretion as part of a constructivist

pedagogy and, therefore, integration is not articulated in the way of curriculum knowledge (De Beer & Mothwa, 2016; Khupe, 2014).

There is a gap which exists, therefore, between the principles and aims of the Grade 12 Life Sciences CAPS, and the specific curriculum content of the Indigenous Knowledge to be taught in the classroom. Similar to previous policies, the integration of Indigenous Knowledge is only described through overarching foundational principles which neglect the specific details of the Indigenous Knowledge content as part of the curriculum (Jacobs, 2015; Gumbo, 2016). The problem which this study seeks to address is the lack of specificity regarding the Indigenous Knowledge which may be integrated with the Grade 12 Life Sciences CAPS. With the recognition

of rural community members as custodians of Indigenous Knowledge, this study seeks to address this problem by creating an Indigenous Knowledge database which might be used to inform the integration of Indigenous Knowledge with the grade 12 Life Science CAPS as curriculum knowledge. In the current debates about decolonising the South African school curriculum, the created Indigenous Knowledge database could be used as a curriculum resource.

1.3 Rationale for the study

Indigenous Knowledge has been identified as a central component in the decolonization of the curriculum (Odora-Hoppers, 2004; Mapara, 2009; Le Grange, 2016). The call for the integration of Indigenous Knowledge to the Life Science CAPS, therefore, is a proposition which recognizes, and seeks to dismantle, the hegemony of western epistemologies in South African curricula and its systematic 'othering' of the ontologies and epistemologies of indigenous people in schools and universities (Heleta, 2016; Khupe, 2014). Although the integration of Indigenous Knowledge with the Life Sciences content is noted in CAPS, its marginalization in the form of suggestions for use as an example, and a general lack of detail of the indigenous content knowledge to be integrated, cannot be ignored (Khupe, 2014; Gumbo, 2016; De Beer, 2016).

The lack of specificity of policy regarding the content of Indigenous Knowledge which is relevant to the Grade 12 Life Sciences CAPS has undermined its integration in the classroom. According to Gumbo (2016), policy terms such as 'where applicable' in reference to the integration of Indigenous Knowledge in the classroom suggest a lack of urgency. As such, teachers' decisions to ignore the integration of Indigenous Knowledge in Life Sciences as noted by De Beer (2016), can be understood to be a result of the lack of direct and detailed prescription of Indigenous content knowledge. Furthermore, the lack of prescription of Indigenous Knowledge in the Grade 12 Life Sciences CAPS burdens teachers with the selection of appropriate Indigenous Knowledge and strains their pedagogical content knowledge (De Beer & Mothwa, 2016).

This study, therefore, is a response to the possibility of curriculum decolonisation which is realized at the integration of Indigenous Knowledge with the Grade 12 Life Sciences CAPS, and this starts at the documentation of the relevant Indigenous Knowledge (Mutasa, 2015). As a function of decolonisation, learner-identity, preservation of African epistemology, culture, and languages are some of the areas which benefit from the integration of Indigenous Knowledge with the curriculum (Le Grange, 2007). The reason for this study, therefore, is the contribution of an Indigenous Knowledge resource base from a rural South African community, and its description as curriculum knowledge in pursuit of a decolonised grade 12 Life Sciences curriculum. This study seeks to replenish existing literature on the available Indigenous

Knowledge database. The latter serves to inform Indigenous Knowledge integration with the Life Science CAPS. In this way, the description of Indigenous Knowledge that originates from a specific community will contribute an answer to the question: *which indigenous knowledge should be integrated into the Grade 12 Life Sciences CAPS*? (Stanfield & Browne, 2013; Cronje, et al., 2015; Reddy, et al.,2017; Reddy, 2019).

1.4 Research Aims and Objectives

- To describe Life Sciences-related Indigenous Knowledge of a local community.
- To examine which Indigenous Knowledge would be relevant to the grade 12 Life Sciences CAPS.

1.5 Research Questions

In order to address the research objectives, the following questions guide this study:

i. What Indigenous Knowledge is available in the local community that would be relevant to the grade 12 Life Science Curriculum and Assessment Policy Statements?

ii. How would this Indigenous Knowledge be integrated into the grade 12 Life Sciences curriculum?

1.6 Significance of the study

This study makes a case for integrating Indigenous Knowledge with the grade 12 Life Sciences CAPS to decolonise the curriculum in South Africa. This contribution possesses theoretical, educational,policy and pedagogical significance. The knowledge base which is created through this research will contribute to existing knowledge and research regarding Indigenous Knowledge.This means that it will contribute to a pool of knowledge which informs existing theories of Indigenous Knowledge Integration, thus constituting a theoretical significance for the study. In terms of the educational significance, teachers will be aided to access the kind of Indigenous Knowledge which is relevant to the Life Science CAPS. This will help alleviate previous teacher concerns about the selection of relevant Indigenous Knowledge for Life Science classrooms. At a policy level, policymakers and subject advisors will also have access to this knowledge and be able to conduct training workshops that not only train teachers to integrate Indigenous Knowledge with the Life Sciences but describe the database of Indigenous Knowledge which is available and accessible to teachers. As a result of the contributions noted above, learners will benefit from a science educational experience which is not disconnected from their cultural identities and indigenous backgrounds (Le Grange, 2007). This means that learners

in rural schools (and elsewhere) would benefit from a curriculum and pedagogy that acknowledges their indigenous background while introducing them to Life Sciences content.

1.8 Outline of the Research Report

Cultural wisdom is contained in idioms and songs within rural African communities. In reflecting this reality for indigenous communities, each chapter has been assigned a Xhosa idiom that resembles the essence of the chapter. Although songs and images are typically known for entertainment, this study adopts them as cultural resources, and to immerse the reader in the context of the study, both physically and culturally.

This research report consists of five chapters:

Chapter 1 introduced the study, beginning with the historical exclusion and marginalization of Indigenous Knowledge in Africa and South Africa more specifically. The study was contextualized through the identification of a lack of specificity with regards to the indigenous content knowledge to be integrated with the grade 12 Life Sciences CAPS. This informed the rationale of the study which is to create a database of Indigenous Knowledge which can be used to decolonise the grade 12 Life Sciences CAPS.

Chapter 2 provides a literature review which is aimed at situating the study in literature and defining the gap which it fills in the literature. In this chapter, various conceptions of Indigenous Knowledge as well as applications of Indigenous Knowledge and approaches to integration are discussed, thus clarifying the position of the study. In addition, various empirical studies are reviewed to understand the methods and findings of similar studies. Lastly, a conceptual framework which guided the researcher in answering the research questions is discussed.

Chapter 3 is a description of the methodological position and processes of the study. This study employs a decolonial methodology which is sensitive to the indigenous knowledge which it seeks to describe in relation to the grade 12 Life Sciences CAPS. As such, the Indigenous Research Paradigm, Indigenous Research Approach, and Indigenous Research Methods are discussed. Although some conventional methodological processes are discussed, the aim is using them in a decolonial way that does not ignore the epistemology, ontology, beliefs, and values of the indigenous community members who formed part of this study.

Chapter 4 is the presentation of findings. The findings are categorised according to the three themes which emerged from the data and constitute Indigenous Knowledge which is relevant to the Life Sciences CAPS. These are: the Indigenous Knowledge of traditional medicinal plants

and herbs; Issues of sustainability for traditional medicinal plants and herbs; and knowledge of cultural practices and beliefs.

Chapter 5 is the discussion of findings and conclusions. In this chapter, the indigenous knowledge described in the findings is discussed in terms of literature: divergences and convergences between indigenous and western knowledge are noted. Subsequently, an integration of Indigenous Knowledge with the grade 12 Life Sciences CAPS is discussed. Limitations and suggestions for further research are also noted.

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Chapter 2: Literature Review

"Isiziba siviwa ngodondolo"



Isiziba siviwa ngodondolo is a Xhosa expression which alerts one to measure the depth of the water using a stick before crossing a river. This practice is done to ascertain the potential danger of the flooded river and one's ability to cross without danger. This resembles the essence of this chapter which is toascertain the gaps in literature in order to situate the study, and it also articulates the significance of navigating the state of the research field. The theme song chosen for this chapter is gxum'uqalaze by Makhalenkonxeni.



https://www.youtube.com/watch?v=xSn3wf6ZkPQ

The song communicates the essence of the chapter because it describes an event in which people's strengths and weaknesses are evaluated, with the latter fleeing the scene. This resembles the review process which is applied in this chapter.

2. Literature Review

2.1 Introduction

The integration of Indigenous Knowledge with the school curriculum is a contested idea because of the former's alleged incommensurability with the scientific knowledge which dominates the school curriculum. This is despite the fact that Indigenous knowledge has some similar contents with scientific knowledge (Ogunniyi, 2004; Bohensky & Maru, 2011). It appears, therefore, that the marginalisation of Indigenous Knowledge from the school curriculum is sustained through colonial conceptions which view it as an inferior form of knowledge (Sonkqayi, 2023) or, in some instances, no knowledge at all (Horsthemke, 2004). In both instances, Indigenous Knowledge is examined under the light of universalist ideas of knowledge, thus availing no opportunity for Indigenous Knowledge to be appreciated outside the confines of Western/Eurocentric narratives.

The result, and the critical discussion in this chapter, is the exclusion of Indigenous Knowledge in the colonial and apartheid; the continued marginalisation of Indigenous Knowledge despite its application in various policies and areas of life in different countries; and marginal and colonising approaches to the integration of Indigenous Knowledge with sciences. These ideas will be discussed in an attempt to simultaneously define the gap which is filled by this study and to situate the study within broader literature. Empirical studies are also reviewed to understand the strengths

and weaknesses of similar studies, i.e., their methods and findings. In this way, the methodological position of the study is articulated. Lastly, this chapter includes a discussion of the study's conceptual framework which demonstrates the relationship between various concepts.

2.2 Conceptions of Indigenous Knowledge

Despite a lack of consensus in the definition of Indigenous Knowledge, there is a multiplicity of conceptions found in literature and these can be organized in terms of narrow definitions (Du Toit, 2019; Morris, 2010, Grenier, 1998) and broad definitions (Odora-Hoppers, 2005; Manyike & Shava, 2018; Latulippe & Klenk, 2020). Narrow definitions, such as one offered by Du Toit (2019), state that Indigenous Knowledge is a local form of knowledge which is specific to community or location. Similarly, Morris (2010) states that Indigenous Knowledge is "the knowledge that ordinary people have of their local environment" (p.1). In addition, Grenier (1998) defines Indigenous Knowledge as knowledge (including skills) which is used for the survival of a people in a specific environment. This, and other similar definitions are limited to a knower/known conception of Indigenous Knowledge where the indigenous people are the knowers, and their environment is the known (Manyike & Shava, 2018). Although it can be concluded from narrow conceptions that Indigenous Knowledge is derived, generated, and obtained from day-to-day interactions of and by indigenous people with their natural environment, these definitions limit the nature and value of Indigenous Knowledge to community members.

Narrow conceptions of Indigenous Knowledge allow for a comparison which sees western scientific knowledge as superior to Indigenous Knowledge. For example, the idea that Indigenous Knowledge is the knowledge which ordinary people have, implies that Indigenous Knowledge does not have specialist knowledge and, therefore, knowers. By implication, Indigenous Knowledge could be misunderstood as the everyday knowledge of indigenous people in a local community. It is apparent, therefore, that narrow conceptions of Indigenous Knowledge lack detail in terms of the systematic nature of Indigenous Knowledge in relation to systematic nature, application, and transmission. As a result, they do not encompass they study's position on the nature of Indigenous Knowledge as being different from everyday knowledge. Specifically, they do not align with the purpose of the study which is to describe Indigenous Knowledge that is relevant to the Grade 12 Life Sciences CAPS from a holistic and broader conception that values the knowledge as well as the ontology of the indigenous people. Adopting this conception implies a marginal integration of Indigenous Knowledge with the Grade 12 Life Sciences CAPS, the very basis against which the study is premised. Rather, the conception of Indigenous Knowledge which

aligns with this study sees it as more than information and skills.

In more detail, on the other hand, Odora-Hoppers (2005) states that Indigenous Knowledge is "a total of knowledge and practices, whether explicit or implicit, used in the management of socio-economic, ecological and spiritual facet of life stored in the collective memory and communicated orally among the members of the community and to the future generations [through songs, stories, myths songs, etc]" (p. 2). This conception of Indigenous Knowledge aligns with this study because it accounts for the totality of the knowledge, its point of application in the daily lives of the indigenous people, and the modes of transmission to future generations beyond everyday knowledge. Since the purpose of this study is to describe Indigenous Knowledge, which is related to the Grade 12 Life Sciences CAPS, this conception allows a view of Indigenous Knowledge which is systematic, diverse, and multifaceted in its application. Furthermore, it widens the scope of the knowledge which the researcher seeks to describe from the local community.

Another definition which is aligns with this study is presented by Bruchac (2014) and defines Indigenous Knowledge, or what she refers to as Traditional Indigenous Knowledge, as "a network of knowledges, beliefs, and traditions intended to preserve, communicate, and contextualize Indigenous relationships with culture and landscape over time" (p. 3184). This definition implies Indigenous Knowledge to be more than just a systematic collection of facts or information. Latulippe and Klenk (2020) agree with this complex view of Indigenous Knowledge and assert that Indigenous Knowledge is more that epistemology. Rather, it can be understood as the knowledge in which "diverse Indigenous peoples share relational cosmologies or worldviews whereby ontology (being), epistemology (knowing), methodology (doing), and axiology (accounting; ethics) are both interrelated and operate or exist through relationships" (Latulippe & Klenk, 2020, p.4). This idea captures the complexity of Indigenous Knowledge as a body of knowledge and locates it within a specific local community with its own culture, identity, and practices. As such, it is a conception which is adopted in this study as it enables the researcher to describe Indigenous Knowledge at a level deeper than a collection of facts on the knowledge and skills of ordinary people within the community.

There are various other characteristics of Indigenous Knowledge which are highlighted in literature. For example, that it is largely accessible to ordinary members of the communities since it is obtained by the indigenous people through their interaction with the environment (Agrawal, 2002; Odora-Hoppers, 2005). However, it may sometimes be specialised according to gender and participation in specified cultural activities within the community such as initiation schools

(Hontoundji, 1997; Morris, 2010, Bruchac, 2014). This idea clearly separates the Indigenous Knowledge found in a community from its everyday knowledge. Elaborating on this point, Bruchac (2014) asserts that although some knowledge is common among ordinary members of the community, specialised forms of knowledge also exist, and they are preserved by knowledge keepers such as tribal leaders or medicinal healers. In the South African context, iGqirha or iSangoma (Xhosa and Zulu term for traditional healer) is known to mediate between the living and their ancestors, thus making them special custodians of traditional medicinal plants as well as cultural practices of the indigenous people (Wreford, 2005, Makgoba, 2014) Furthermore, Indigenous Knowledge differs according to geographical context and other environmental factors such as climate (Seleka, 2018; Du Toit, 2019). This shows the differentiated character of Indigenous Knowledge within the community since members of the same community may differ in degrees of knowledge, and outside the community since members of different communities do not possess the same Indigenous Knowledge.

In addition to the characteristics which are highlighted within these definitions, Indigenous Knowledge has more features which differentiate it from other forms of knowledge. Since it is largely unique only to a group of people within a specific area, it is local knowledge and not universal (Brush & Stabinsky, 1996). Furthermore, Indigenous Knowledge is based on everyday experiences and interactions with the natural environment (Briggs, 2005), as such it is not taught through formal school, although it can be taught formally through oral indigenous practices (Bruchac, 2014). As a result of its empiricist nature, it is informal and not codified (Morris, 2010). In addition, Indigenous Knowledge is dynamic, cumulative, and adaptive given the changing circumstances that determine its origin as well as its oral transmission (Battiste, 2005, Manyike & Shava, 2018; Du Toit, 2019). This makes Indigenous Knowledge distinct from traditional knowledge which is understood as static and unchanging (Morris, 2010; Bruchac, 2014). This idea can also be seen in Khupe's (2014) assertion that "Indigenous Knowledge systems abides in the hearts and minds of Elders and specialist knowledge keepers…" (p. 12).

An important contribution by Manyike and Shava (2018) to the dynamic conception of Indigenous Knowledge is its identification as mobile knowledge which is carried by the indigen who may or may not be located in their indigenous community. From this idea arises the 'urban indigen' who maintains the knowledge, practices, culture, and identity of the indigenous people while maintaining a geographic distance. Therefore, Indigenous Knowledge, although originating in specific environments is portable to various other contexts (Bruchac, 2014). The characteristics described herein are of note because they capture the essence of Indigenous

Knowledge in accordance with this study, that is, as a body of knowledge which has significant epistemological and cultural potential for curriculum development. Thus, calls for integration are justified in that the product would be a decolonized Life Sciences curriculum which is composed of two forms knowledge, thus offering broader knowledge to the learner while dismantling Eurocentric hegemony from the curriculum.

It is important to note that in this study, Indigenous Knowledge is positioned as an alternative to Western Scientific Knowledge, and the two are different bodies of knowledge operating on different rules. According to Horsthemke (2008), Scientific knowledge must necessarily "involve reference to laws or regularities, observation, description, explanation, prediction and testable hypothesis" (p. 341). Indigenous Knowledge is, therefore, subject to critique as a valid body of knowledge because it does not necessarily involve testable hypothesis. For example, the ancestors' participation in the lives of indigenous people cannot be observed and, therefore, cannot be scientifically described, explained, predicted and/or tested. The Euro-American universalist argument then, is that Indigenous Knowledge is a mere collection of cultural beliefs, values and myths which offer no epistemological bearing. As such, the totality of Indigenous Knowledge is described as unobservable and untestable beliefs and cultural values and practices which are only 'true' in specific cultural contexts (Horsthemke, 2004; Horsthemke, 2008).

In addition, Horsthemke (2008) argues that there is a science which can be located within Indigenous Knowledge, thus introducing the concept of indigenous scientific knowledge. In order to achieve the scientific status, Indigenous Knowledge has to consist of "the requisite criteria: belief, evidential adequacy and truth" (Horsthemke, 2008, p. 343). In this case, Indigenous Knowledge is scientific when it is proven by scientific criteria of testable hypothesis and subject to generalizable laws. This idea has been used to disqualify the existence of an 'indigenous' body of knowledge since it would in fact be universally generalisable scientific knowledge. As a result, the conception of an indigenous scientific knowledge is not in accordance with the totality of Indigenous Knowledge adopted in this study. The position of study, instead, is such that Indigenous Knowledge is taken to include the knowledge which cannot be scientifically tested since it arises from a worldview which is significantly different from the Western/Eurocentric universal worldview. As such, this study adopts the conception of an Indigenous Knowledge which is valid even if it exceeds the scope of, or contradicts the worldview informing, western scientific knowledge.

2.3 Indigenous Knowledge: Pre-colonial to post-apartheid South Africa

Indigenous Knowledge has long been used as an important source of survival in various communities around the globe (Odora-Hoppers, 2004; Du Toit, 2019). However, its integration and application in the South African educational sphere has been continuously undermined with the advent of colonialism and apartheid (Jansen, 1990; Soudien, 2010). In this section, I will discuss the state of Indigenous Knowledge in the curriculum and trace it through the pre-colonial and colonial era, as well as the apartheid and post-apartheid periods of South African history. In doing so, I will show that the systematic exclusion and marginalization of Indigenous Knowledge from the curriculum was not a natural phenomenon but was intended to undermine indigenous epistemologies, ontologies and associated beliefs, values, and cultures.

2.3.1 Indigenous Knowledge in Pre-colonial African Communities

Given the broader conceptions of Indigenous Knowledge discussed in the previous section, traditional African education in the pre-colonial era was defined by Indigenous traditions, beliefs, methods, and knowledge (Adeyemi & Adeyinka, 2002). Ndofirepi and Ndofirepi (2012) assert that pre-colonial African education was a means through which important traditional knowledge, skills, values, and attitudes were transmitted to younger children for their survival as well as socialization into the broader community. As such, the totality of Indigenous Knowledge as conceptualized by Odora-Hoppers (2004) made up the entirety of the informal curriculum of African communities.

The (informal) curriculum in various communities of pre-colonial Africa was founded on the philosophy of Ubuntu (Ndofirepi & Ndofirepi, 2012). Ubuntu is a way of life for many African communities, and it can also be described as a worldview in which a person is continually becoming human through their actions and interactions with others (Murove, 2014). Whereas the Enlightenment era conceptualized a rational being best understood in the phrase *I think therefore I am* (Descartes, 1984), the conception of a person in the philosophy of Ubuntu achieves their human status through a dialectical relationship with other people in the community (Ndofirepi & Ndofirepi, 2012; Le Grange, 2016). In recent years, Le Grange (2016), Le Grange (2019), and Hlatshwayo (2022) *inter alia* have conceptualized a curriculum founded on the philosophy of Ubuntu as Ubuntu-Currere. Ubuntu-Currere signifies an openness towards the active force of the curriculum as well as our interactions with and continuous process of *becoming human* in the world. This study is oriented towards this form of a curriculum at the integration of Indigenous Knowledge with the Grade 12 Life Sciences CAPS.

Indigenous Knowledge is described as informal and uncoded (Horsthemke, 2004; Morris, 2010, Du Toit, 2019), however, its transmission in pre-colonial and present-day African communities is

both formal and informal (Ndofirepi & Ndofirepi, 2012; Bruchac, 2014). In terms of the formal transmission, Indigenous Knowledge along with associated values, skills and attitudes is transmitted to men and women through initiation ceremonies so as to socialize them into the community as knowledgeable and productive members (Ndofirepi & Ndofirepi, 2012). Furthermore, it can also be transmitted informally through activities aimed at teaching "…different kinds of games, inc1uding wrestling and running, training for healthy living, cooking, dressing, hunting, farming, carpentry, training to become a smith, drumming, dancing, marriage counselling and critical thinking" (Adeyemi & Adeyinka, 2002, p. 229). The informality of the transmission of Indigenous Knowledge in this case is in the fact that the activities are the vehicle of the transmission of the knowledge. It is clear, therefore, that education, along with its curriculum in precolonial Africa, was based on Indigenous Knowledge and philosophy. This is an important consideration for this study because Indigenous Knowledge has, evidently, been an important aspect of African communities. As a result, the purpose of studying the integration of Indigenous Knowledge as curriculum knowledge in the Grade 12 Life Sciences CAPS represents a restoration of an important aspect of African community life, culture, and worldview.

2.3.2 Curriculum knowledge in the colonial era

Ndofirepi and Ndofirepi (2012, p.15) make a case for the misinformed colonial logic of the lack of an African education and curriculum in pre-colonial era by noting the following statements from European thinkers. Hume argued the non-existence of African civilization as follows: "I am apt to suspect the Negroes, and in general all other species of men (for there are four or five different kinds), to be naturally inferior to whites. There never was a civilised nation of any complexion than white" (Hume, 1996, p. 228, as cited in Ndofirepi & Ndofirepi, 2012, p.15). Elsewhere, Kant argued the inferiority of African intellectual abilities: "so fundamental is the difference between two races of men, and it appears to be as great to mental capacities as in colour" (Kant, 1997, n.a, as cited in Ndofirepi & Ndofirepi, 2012, p.15). The statement of the inferiority of African mental and intellectual capabilities can be read to mean a lack of epistemology, thought and civilisation. This is affirmed in Hegel's statement: "Africa is no historical part of the world; it has no movement or development to exhibit" (Hegel, 1956, p. 99).

By denying the existence of African intellectual abilities in the period before the imposition of a colonial curriculum, no systematic epistemology, philosophy, and knowledge was ascribed to the African people. It is against such colonial attitudes that settlers decided to civilize African through a curriculum created out of European ideology, knowledge, and culture (Soudien, 2010). The introduction of formal education occurred at the establishment of a slave school in 1658 at the Cape of Good Hope, a school which employed rote learning to teach slave children how to read

the bible (Soudien, 2010). The school was founded as an institution through which Dutch settlers could separate the child from their parents, culture, and local languages, and transmit the European religious order (Jansen, 1990). This manifested through the primacy of the Christian bible and renaming of slaves to European Christian names (Jansen, 1990; Soudien, 2010).

The conceptualization, design, and practice of education overall, and the curriculum specifically, was a tool for the subjugation of 'other' knowledges, that is, knowledges not conforming to the standard of the Dutch church and state (Jansen, 1990). More elaborately, Soudien (2010) asserts that "Education, as an ontological and epistemological question, was and still is, in the context of the evolving colonial landscape, a violent process involving the fundamental displacement of local knowledges and local identities" (p. 22). Therefore, by imposing Christians names on slave children, and instituting formal schooling which comprised of a curriculum informed by oppressive European ideology, the local knowledges and local identities were fundamentally displaced. This period in the education history of South Africa is important for this study because it demonstrates the systematic displacement of the knowledge of the colonised people. As opposed to naturalistic ideas in which Indigenous Knowledge is thought to be inferior and, thus, not forming a major part of the curriculum knowledge of the Grade 12 Life Sciences CAPS, this discussion shows that Indigenous Knowledge was excluded for the purposes of advancing the colonial agenda. Given this colonial history, the marginalisation of Indigenous Knowledge in the Grade 12 Life Sciences CAPS remains questionable, especially since African communities still rely on their Indigenous Knowledge and worldviews. This informs the purpose of the study, which is to describe Indigenous Knowledge which exists in, and is generated from, a local African community and explore it as curriculum knowledge for the Grade 12 Life Sciences CAPS.

2.3.3 Curriculum Knowledge in the Apartheid era

Although the curriculum was a political phenomenon in the colonial period, this was more formalised during the apartheid era. The conception of the curriculum in the apartheid era is that of "a curriculum that both in its content and in its mediation [is] a curriculum of subordination – the rote learning of the script of inferiority" (Soudien, 2010, p. 38). This can be interpreted in terms of what Maldonaldo-Torres (2016) refers to as the *coloniality of being,* a process through which the colonised are used for social reproduction while being simultaneously dislocated from their indigenous traditions, beliefs, and knowledges. Whereas slave education was previously a responsibility of the church, education in the apartheid era was a government project aimed at controlling black subjects through state-centred mass education.

At the recommendation of the Eiselen Commission on Native Education, a state commission which operated from 1949 – 1951, a separate curriculum for black and white schools was instituted through the establishment of the Bantu Education Act (Jansen, 1990). This act provided the legal framework for the exclusion of black South Africans from an intellectually driven curriculum, and their subjugation to an overall inferior form of education. Given that one of the aims of the Bantu Education Act, at least on paper, was to civilise black people (Thobejane, 2013), the exclusion of Indigenous Knowledge from the curriculum was already foregrounded in this period since civilisation was defined in terms of dislocating black people from their backward cultures and beliefs.

Since the *modus operandi* of the apartheid government was a hierarchical racial classification which esteemed white people and oppressed black people, the curriculum knowledge for white schools was scientific whereas the curriculum knowledge under Bantu education was rather technical. Specifically, the curriculum for black learners featured practical skills such as "hygiene, handwork, gardening, agriculture, housecraft, and needlework" (Jansen, 1990, p. 199), while curriculum content such as mathematics was offered to white learners. This was a curriculum selection which would subject the social identity of black people to "hewers of wood and drawers of water" (Soudien, 2010, p. 36). In terms of the coloniality of being, as manifested through the systematic exclusion of indigenous and other forms of knowledge in the curriculum, black South African learners continued to be exiled from their ontologies, epistemologies, cultures, languages, and identities (Hlatshwayo et al., 2022). Thus, similar to the colonial era, Indigenous Knowledge was denied space in the Bantu Education curriculum since the apartheid government was more interested in creating subjects for labour rather than being engaged in epistemic and cognitive justice. The role of education policy in the exclusion of Indigenous Knowledge is clear in this period. As a result, the continuation of the exclusion, or in the case of the Grade 12 Life Sciences CAPS, the marginalisation of Indigenous Knowledge represents a postcolonial and post-apartheid form of knowledge apartheid.

2.3.4 Political contestations for curriculum knowledge in the post-apartheid era

In recognition of the injustice of the Bantu Education Act and how it oppressed black people through forcing them to accept their inferior social statuses, political movements such as the African National Congress (ANC) and the Azanian People's Organisation (AZAPO), *inter alia,* advocated for alternative and emancipatory systems of education and curriculum. Since the Bantu Education Act established a curriculum that trained black people for menial labour, the ANC proposed a curriculum that was made up of western science (Thobejane, 2013). This idea was a means to introduce previously marginalised black people to mainstream scientific knowledge so

they can participate in the development of their country. However, as discussed in Cross et al (1998), the education policy and curriculum proposed by the ANC was largely oriented to western curricular designs and associated knowledge. It is against this western orientation that the Grade 12 Life Sciences CAPS can be described as having no space for Indigenous Knowledge today.

On the other hand, AZAPO proposed an alternative curriculum which was geared towards to the preservation of Indigenous Knowledge. According to Thobejane (2013), AZAPO's proposition was a result of the concern that the educational policy proposed by the ANC "might take away the cultural identity of South Africans and do harm to the indigenous ways of learning" (p. 5). Therefore, AZAPO emphasised the following pan African ideas to their educational and curriculum policy proposition:

> The curriculum should reflect the positive cultural values of every social group through the inclusion of a traditional culture in the form of songs, dances and theatre; education should emphasise meaningful self-image and the correction of historical faults such as black-white relationships; the infusion of science projects with a political and cultural dimension. (Cross et al, 1998, p. 7)

The curriculum, as proposed by AZAPO had made space for Indigenous Knowledge. However, the party which would prevail at the democratic birth of the nation in 1994 was the ANC and this led to the adoption of curriculum policies and objectives oriented towards the West. As Webster and Adler (1999) state, the democracy of South Africa was an achievement of compromise. Specifically, the negotiated settlement between the ANC and the Apartheid government meant that the educational, economic, and other policies of the newly democratic South Africa were constructs of political and ideological compromise. Christie (2006) contributes to this assertion by stating that the ANC-led liberation movement did not seize power and overthrow the government of the day, rather, it entered into "power- sharing arrangements…" (p. 376). It can be concluded, therefore, that the power-sharing arrangements gave way to the systematic marginalisation of Indigenous Knowledge from the curriculum. This is demonstrated in the conformity of post-apartheid educational policies to western-oriented educational frameworks which ultimately resulted in the formation of C2005, RNCS and NCS, and the current CAPS.

In accordance with the western orientation of the post-apartheid South African curriculum, Christie (2006) asserts that the ANC was on a mission of proving capable to run a modern state, thus resulting in the adoption of globally prevailing neo-liberal policies (Christie, 2006). Consequently, fields such as education and economics would be dominated by Western imperatives as a way to show the ANC's willingness and ability to participate in global discourses. It is the position of this study that decolonisation cannot occur without key

consideration of the possibilities and potential of Indigenous Knowledge in key areas of policy, no less in the curriculum. This position finds ground in Ramoupi's (2014) assertion that "the epistemology and theoretical underpinnings of the content and curriculum of our education in basic and higher education remained unchanged and unquestioned [in the transition from Apartheid to post-Apartheid South Africa]" (p. 270). This defines the crack through which the Pan-African ambitions of Indigenous Knowledge in the curriculum fell. Furthermore, it demonstrates the gap which this study seeks to fill through a contribution of Indigenous Knowledge which can be used to fundamentally change the Life Sciences curriculum from its current state.

2.3.5 Post-apartheid Curriculum Policies

Curriculum 2005 (C2005) was the first curriculum to be formally established in the post-apartheid South Africa. The formation of C2005 was on the basis that "the curriculum be restructured to reflect the values and principles of our new democratic society'' (Department of Education, 1997, p.1). However, as noted by Breidlid (2009), this statement is too broad and vague to account for the numerous values, worldviews and epistemologies which are found in South Africa. This and similar statements in the post-apartheid curriculum policy were described by Jansen (2002) as political symbolism used to ascertain South Africa's shift to a democratic era without it bearing any real meaning. Noting the dislocation of C2005 from the South African epistemological context, Breidlid (2009) maintains that "C2005 is modelled on a Western discourse, depending heavily on different international contexts, especially from New Zealand and Australia" (p. 144). This can be read as a prediction of the marginal integration of Indigenous Knowledge at the implementation, i.e., pedagogical level in South African classrooms.

From this foundation, the integration of Indigenous Knowledge with the Life Sciences curriculum is implied in C2005 but not mapped in detail (Jacobs, 2015). Specifically, Learning Outcome 3 of the Life Sciences curriculum states that "the learner [should be] able to demonstrate an understanding of the nature of science, the influence of ethics and biases in the Life Sciences, and the interrelationship of science, technology, Indigenous Knowledge, the environment and society" (Department of Education, 2003, p. 12). A key problem related to the integration of IK and Life Science, however, was that it occurred in the classroom and not at the prescription of the curriculum content knowledge (Jacobs, 2015). Specifically, Jacobs (2015) states that the failure of the integration in C2005 was largely because of the teachers' lack of knowledge and inability to reconcile the different knowledges in their pedagogy.

Following the recommendations of a ministerial task team, C2005 was revised and termed the Revised National Curriculum Statements (grade R to 9) and National Curriculum Statements (grade 10 to 12). The revised curriculum had marginal changes, most of which had to do with the learning outcomes and less to do with the content (Jacobs, 2015). Describing the Indigenous Knowledge and science integration issues carried over from the prior version of the curriculum, Breidlid (2009) states that "So far the revised curriculum is, even though paying lip service to Indigenous Knowledge systems, firmly grounded in a modern, Western epistemology" (p.145). On the other hand, Devie (2010) asserts that the curriculum does not offer direction in terms of the Indigenous Knowledge to be integrated in the classroom. Specifically, Devie (2010) states that "while the Sciences Curricula Statements promote the inclusion of IKS in Learning Outcome three and assessment standards, it is lacking in providing IKS exemplars leaving this to [textbook] publishers" (p, 17). Given that there only marginal changes between NCS and CAPS, there is an apparent continuation of the marginalisation of Indigenous Knowledge from the former to the present curriculum.

Indigenous Knowledge marginalisation, therefore, is a similar issue in CAPS where the fundamental change in the curriculum policy in terms of Indigenous Knowledge and Life Sciences integration is Specific Aim 3 which was formerly Learning Outcome 3. Specific Aim 3, according to the Department of Education (2011), is an aim "which relates to understanding the applications of Life Sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between Indigenous Knowledge and science" (p.13). Indigenous Knowledge in this case, is viewed, and is to be studied, in light of the existing knowledge of science rather than as an independent object of study. Its integration in the curriculum is implied in the following statement "the examples of Indigenous Knowledge that are selected for study should, as far as possible, reflect different South African cultural groups (Department of Education, 2011, p. 17). The use of Indigenous Knowledge as a classroom example which gives legitimacy to prescribed scientific knowledge is a particular concern which this study seeks to address by positioning Indigenous Knowledge as curriculum knowledge rather than pedagogic aid. Specifically, it is against this idea presented in the Grade 12 Life Sciences CAPS that this study seeks to describe and explore Indigenous Knowledge as curriculum knowledge rather than its current limited use as a suggestion for pedagogical examples in Life Sciences classrooms.

Beyond vague principles and aims related to the integration of Indigenous Knowledge with the Life Sciences CAPS, the specified indigenous knowledge in grade 10 and 11 demonstrates further marginalization. The indigenous curriculum knowledge which is prescribed by the grade 10 Life Sciences CAPS is seen in the topic of "application of Indigenous Knowledge and Biotechnology"

(Department of Education, 2011, p. 28). In this topic, Indigenous Knowledge is described in terms of alternative or complementary medicines which come from 'indigenous plants'. The problem which exists here is that the knowledge is not appropriately framed as emerging from a particular socio-spiritual context. The socio-spiritual decontextualization of this knowledge leads to a sidelining of the indigenous knowledge of medicinal plants on the basis that they are not scientifically proven and, therefore, acceptable.

In grade 11, on the other hand, Indigenous Knowledge is prescribed under the topic of "Indigenous Knowledge Systems and the sustainable use of the environment" (Department of Education, 2011, p. 52). The Life Sciences curriculum in this case provides examples of economically valuable indigenous plants that need to be harvested sustainably. These plants include Fynbos, Rooibos, Devil's Claw and African Potato. The main problem in this case is that the 'indigenous' knowledge specified in the curriculum prioritises economic value as key criteria for which plants are selected for study. Similar to the grade 10 curriculum, and as a result of economic value being key determinant for selection, this topic does not adequately capture the socio-spiritual context (and importance) of sustainability practices for the indigenous people. In both grades, the knowledge is not integrated in a manner that captures the social conditions of its production, transmission and function. In this case, it can be said that the integration occurs as a modest form of political symbolism.

The extent to which Western Knowledge has hegemony over Indigenous Knowledges in different regions of the world seems consistent, regardless of the population of settler- descendants over the Indigenous peoples. Bradley et al. (2007) note that the indigenous people of Australia (the Aboriginals and Torres Strait peoples) are educationally disadvantaged, partly because of the limited representation of indigenous culture and identity in the curriculum. Furthermore, they note that the geographic isolation of the indigenous people, as a result of their economic marginalisation during the colonial period, has been sustained in the postcolonial era and is source for lack of resource access. The same can be said for South Africa since the wars of dispossession, land acts and the homeland system, all apartheid structures, and instruments, were the root of economic marginalisation in South Africa. Therefore, the economic and geographic marginalisation of indigenous people in apartheid South Africa produced educational inequalities which persists to the present day. Hlalele (2019) states that the lack of educational resources is a result of the apartheid era and the ideological (epistemological) and economic structures that sustained it. Unlike the Australian context in which the indigenous people are a minority, the South African indigenous people are the majority. However, a striking similarity between the two countries is that Western culture, language and identity appears to dominate in various forms of

the content of the curriculum (Casinader, 2016; Le Grange, 2016).

It is apparent, therefore, that the value of Indigenous Knowledge in South Africa has been severely undermined since the arrival of Dutch settlers. Although Indigenous Knowledge is integrated in the current Grade 12 Life Sciences CAPS, it is not holistic or meaningful. In recognition of the prevailing injustice of the marginalisation of Indigenous Knowledge and associate cultures, identities, and ways of being, this study seeks to contribute to a body of literature which theorises the meaningful integration of Indigenous Knowledge to the curriculum as decolonial praxis. Furthermore, the description of Indigenous Knowledge from a local community is understood to enable a ground-up expression of the identities and cultures which were previously marginalised from the educational space. In other words, this study provides the researcher an opportunity to interact with local community members in order to gain insight into their ways of knowing and being. As such, the study will allow for a theorisation of a meaningful integration which recognises and restores the indigenous identities, cultures, and ways of knowing and being into the curriculum.

2.4 The application of Indigenous Knowledge

Indigenous people in the world, and global South specifically, have knowledge which is unique to them as a result of their interaction with the environment. The United Nations Declaration on the Rights of Indigenous People provides an international legislative framework for the practice of Indigenous Knowledge (Redvers & Blondin, 2020). This can be interpreted as an attempt to resolve the epistemological contestations which exist in the modern world and often leading to the marginalization of the indigenous people. Various countries, therefore, define Indigenous Knowledge according to the people who lived in an area prior to their contact with colonial forces. IP Australia (2023), for example, defines Indigenous Knowledge as "the traditional knowledge and traditional cultural expressions of Aboriginal and Torres Strait Islander peoples" (p.1). In this instance, the Aboriginal and Torres Strait Islander people are custodians and stewards of Indigenous Knowledge in Australia. Although this definition of what constitutes 'indigenous' is rather narrow, and not in line with the conception of Indigenous Knowledge adopted in this study, it is useful for understanding how other countries define the term in relation to their policies.

The Australian National Science Curriculum which was introduced in 2011 mandated the teaching of Australian indigenous knowledge as a form of deepening learner's cultural understanding of Australia (Baynes & Austin, 2012). The National Science curriculum contained Aboriginal and Torres Strait Islander Histories and Cultures Cross-Curriculum

Priority (CCP) and Intercultural Understanding General Capability, two policies which mandated the integration of indigenous content in the curriculum (Baynes, 2016). In this case, the integration of indigenous serves epistemological as well as social justice purposes since this knowledge, along with its custodians, were previously oppressed. Although the integration of the Indigenous Knowledge of the Aboriginal and Torres Strait Islander people was important in the new curriculum, schoolteachers faced difficulties in practice. Specifically, teachers had difficulty reconciling the different forms of knowledge in one classroom (Austin & Hickey, 2011).

There has also been some success in integrating Indigenous Knowledge into the curriculum in New Zealand. McKinley and Stewart (2012) state that the integration of indigenous knowledge into the science curriculum was there "to display the diversity of knowledge in science and hence to celebrate all peoples' knowledges, and to increase motivation and self-esteem of the indigenous students in the class" (p. 548). Furthermore, McKinley and Stewart (2012) show that integration of indigenous content included hāngi (earth oven), kōwhaiwhai and tāniko patterns (decorative patterns for buildings, clothing, etc.), Papatūānuku (personifi ed Earth mother deity), rongoā (Māori medicine), and the use of Māori names for native plants and the planets and constellations. In this way, the knowledge of the Maori people, as influenced by their worldviews, was reflected in the science curriculum and classroom.

Beyond the education context, Wohling (2009) acknowledges a critical use of Aboriginal Indigenous Knowledge in New Resource Management as the Aboriginals have occupied lands sustainably in Northern Australia for many years, thus highlighting the benefit of an empirical formation of knowledge owing to the Aboriginals' longstanding interaction with the Australian environment. Furthermore, climatologists have had to acknowledge Indigenous Knowledge of the Aboriginal people as a source of knowledge for fire management and water management (Cahir et al., 2018). The Indigenous Knowledge of water management is also visible in communities in various countries such as Indonesia, Canada, and the Himalayas as a result of circumstances of water shortage and the need for conservation (David & Ploeger, 2014; Rawat & Sah, 2009; Cheserek, 2005). This means that the practical knowledge which has been formed in these geographical areas provides new approaches to these critical areas of human life. In this way, Indigenous Knowledge can be seen as beneficial at a national scale rather than to the indigenous communities specifically.

Given the plight of HIV/AIDS in Zambia, Chinsembu (2015) notes traditional plant medicineas forming part of valuable knowledge in Zambian communities. In other words, Indigenous Knowledge in this case includes knowledge of various plants and herbs, and how they alleviate

symptoms of HIV/AIDS. Traditional medicinal plants also form a large part of the Indigenous Knowledge and way of life in various communities of South Africa, India, and Ethiopia (Mathibela et al., 2015; Shil et al., 2014; Yirga, 2010). Furthermore, the plants characterise much of the benefit of Indigenous Knowledge to impoverished communities that do not have access to formal healthcare (Suliman, 2010). As a result, there have been calls to study the pharmacological properties of traditional medicines to ensure their efficacy (Mahmood et al., 2013; Novotna et al., 2020; Du Toit & Van der Kooy, 2019).

Contributing to these calls, Novotna et al. (2020) note that the traditional plants found in the African context have not been studied sufficiently for their pharmacological properties, and these include *Alvesia rosmarinifolia, Diplorhynchus condylocarpon, Eriosema affine, Paropsia brazzaeana, Rhus squalida, Sclerocroton cornutus or Xylopia tomentosa*. An example of traditional plants used in various part of the African continent is the Strychnos spinosa which is used for the prevention of miscarriages and the treatment of tuberculosis in Angola whereas it is used to treat malaria in Ghana and gonorrhoea in Tanzania (Novotna et al., 2020).

It is important to note, however, that the use of the traditional medicinal plants has been discouraged in various regions by the scientific community. For example, the *Felicia muricata* which is used for the treatment of headaches in South Africa may lead to a significant increase in white blood cells and cause infections and inflammations to the body (Ashafa et al., 2009). In other instances, some traditional plants have been studied and found to not possess any medicinal properties at all. A prevalent example was seen when people used *Artemisia Afra* (uMhlonyane in Xhosa and Zulu) as a cure for COVID despite it having no medicinal properties to cure COVID (Bangani, 2021). In addition, the sale of Artemisia Afra as a cure for malaria infectionswas banned because there was no scientific evidence for its efficacy other than alleviating symptons of flu (du Toit & van der Kooy, 2019). Suliman et al. (2010 as cited in Taaka, 2016) states that "the Artemisia Afra also exhibits potent pharmacological activities inclusive of antimicrobial, antioxidant, Central Nervous System-effects (sedative, antidepressant), cardiovascular, and spasmolytic activity which has been well documented and reviewed" (p. 5).As such, there is scientific evidence that that the plant can be used for medicinal purposes, but its potency does not extend to the realm of malaria and COVID.

Although medicinal plants are only regarded for their biological properties in western discourse, indigenous communities value them for both the biological properties and their spiritual functions (Redvers & Blondin, 2020). As such, their use is sometimes a means of connecting the sick with their ancestor so that the latter can administer health, blessing or protection to the former

(Wreford, 2005, Makgoba, 2014). The ancestors who are connected by to the living through the use of traditional medicinal plants are defined as "...the 'living-dead', compassionate spirits who are blood-related to the people who believe in them" (Makgoba, 2014,
p. 26). The spirituality of traditional medicine within indigenous contexts differentiates it from the concept of medicine in the western concept (Mainguy et al., 2013). As such, whereas the doctor administers medicine with biological and chemical properties in western contexts, traditional healers administer health from the ancestors using traditional medicinal plants. Furthermore, since communication with the ancestors is done through the slaughtering of animals and/or the brewing of beer, ordinary members of the community can also communicate with their ancestors in the comfort of their own home (Gumede, 1990; Makgoba, 2014).

It is evident from literature that Indigenous Knowledge has valuable contributions to various societies across the globe. This is apparent from the contribution of knowledge about traditional medicinal plants to fire and water management policy and practice. However, a central issue related to this study is that the integration of the Indigenous Knowledge with the Grade 12 Life Sciences CAPS remains marginal. In other words, as previously noted, Indigenous Knowledge is integrated in a manner that leaves the details of the indigenous content knowledge to publishers, and through policy terms which reduce integration of Indigenous Knowledge to examples in a constructivist pedagogy rather than explicit content knowledge (Taylor & Cameron, 2016; Jacobs, 2015). This remains a problematic issue especially since Indigenous Knowledge is acknowledged and purposefully integrated in various areas of policy across the globe. It is acknowledged in this study that the major reason for the marginalisation of Indigenous Knowledge from the curriculum is the lack of Indigenous Knowledge documentation (Fortuin, 2017). As a result of the lack of documentation, Indigenous Knowledge remains enigmatic, thus allowing western scientific knowledge to take centre stage in the curriculum. This study, therefore, seeks to make available a body of Indigenous Knowledge which is specific to, and relevant in, the South African context of the Grade 12 Life Sciences CAPS. This will address the issue of a lack of documentation of Indigenous Knowledge which implicitly contributes to the hegemony of western knowledge in the curriculum.

2.5 Indigenous Knowledge, Science Integration and Decolonisation

The marginalisation of Indigenous Knowledge in the education landscape generally and the curriculum specifically, was a direct result of the introduction of Western Science as a superior form of knowledge (Ogunniyi, 2004). The colonial perception of inferior Indigenous Knowledge implied that "the history, language, culture, customs as well as belief systems of the white

colonizers were to be considered as universal and normative…[and] they were considered superior to the knowledge systems of the colonised which are treated as the inferior other" (Mapara, 2009, p. 141). The persistent hegemony of western knowledge over former colonies is also described as the colonial matrix of power and knowledge (Quijano, 2007; Quijano & Ennis, 2000; Hlatshwayo et al., (2022); Ndlovu-Gatsheni (2014). The coloniality of power as conceptualized by Quijano (2007) is "based upon racial social classification of the world population under Eurocentred world power" (p.171). In this way, Europe exerts power onto formerly colonized contexts through various systems such as international economic policy which seeks to advance neo-colonial influence.

The coloniality of knowledge on the other hand is the colonization of epistemology in attempt to advance Euro-american worldviews and interests (Ndlovu- Gatsheni, 2014). In describing this phenomenon, Quijano and Ennis (2000) explainthat colonialism fundamentally affected, not only the economic structures of colonised nations (coloniality of power),but also the focus and purpose of the production of knowledge (coloniality of knowledge). The matrix, therefore, is such that the coloniality of knowledge is reflected in, and perpetuates, the coloniality of power. The outcome of these forces is the subjugation of African epistemologies, cultures and values while Eurocentric worldviews and other interests are elevated in the conquest of global coloniality (Ndlovu-Gatsheni, 2014).

The exclusion of Indigenous Knowledge in university curricula is a form of colonial and apartheid legacy which still remains in South African institutions, including schools. Furthermore, the exclusion of Indigenous Knowledge production in research activities further contributes to the marginalisation of local knowledges in university spaces (Le Grange, 2016). Therefore, this study of Indigenous Knowledge from a local community is a decolonial act which engages Indigenous Knowledge production at a higher education level in order to inform existing data bases from which curriculum integration may be theorised. From this higher education level, the study can potentially reinforce the identity of Indigenous Knowledge which was stripped by colonialists along with the identity of colonized people in formal schooling. To this end, the purpose of this study which is the description of Indigenous Knowledge from a local community and the proposition of its meaningful integration with the Life Sciences curriculum is fundamentally an act of decolonisation. This is because the study challenges the epistemological and cultural notions of the superiority, centrality, and universality of Western of knowledge, with the aim of proposing Indigenous Knowledge as a viable and sustainable alternative for the current Life Sciences curriculum knowledge.

It can be said, therefore, that decolonisation can be achieved, at least in part, by a reconsideration of the merits of Indigenous Knowledge outside colonial narratives and imperatives (Ogunniyi, 2004). As such, the conception of Indigenous Knowledge in this study is that it is, in its own right, capable of use as curriculum knowledge even in the modern era. In suggesting integration of Indigenous and Scientific knowledge, Bohensky, and Maru (2011) view the two forms of knowledge as having a continuous relationship as opposed to being discrete. From a similar position, Ogunniyi (2004) asserts that "there has been a greater awareness in many non-western countries of the need to revive the science embedded within various Indigenous Knowledge systems" (Ogunniyi, 2004, p. 290). In other words, integration occurs when Indigenous Knowledge and science exhibit commonalities in terms of facts embedded in traditional and cultural practices. The process of identifying and reviving scientifically inclined Indigenous Knowledge is also known as defrosting the scientific knowledge contained in Indigenous Knowledge Systems. Contrary to this idea, it is the position of this study that Indigenous Knowledge does not have to fit the criteria of Western Knowledge. In fact, the attempt to match Indigenous Knowledge with Western Knowledge, and strip the former of associated ontologies and cultural beliefs, is often termed the recolonisation of Indigenous Knowledge (Shizha, 2010). The position of this study in this regard is to describe Indigenous Knowledge without subjecting it to the scientific criteria in instances where the criteria seem to contradict Indigenous Knowledge.

An idea similar to the revival of the science embedded within Indigenous Knowledge as a form of integration is based on the understanding of science as a practice rather than a set of theoretical constructs (Le Grange, 2007). Specifically, Indigenous Knowledge can be located in science if science is understood as performance, i.e., action: "science as performance refers to the doing of science, that is, science is a human and social activity that is messy, heterogeneous, and situated" (Le Grange, 2007, p. 587). In this sense, although indigenous communities may not have text-based scientific knowledge, they possess forms of the same knowledge acquired through interaction with the natural environment and demonstrated through performance.

This assumption leads to an acknowledgment of potentially scientific knowledge which exists among indigenous communities in a performative sense as opposed to theoretical. As such, curriculum integration would comprise of "determining how the new information [from Indigenous Knowledge] and the existing knowledge [western scientific knowledge] interact, how existing knowledge should be modified to accommodate the new information, and how the new information should be modified in light of the existing knowledge" (Bohensky & Maru, 2011, p.2). Although in this study Indigenous Knowledge does not and, indeed, should not seek

scientific validation, a conception of science as performance represents the potential for Indigenous Knowledge to complement Western scientific knowledge. In this regard, the key argument for this study is that the exploring Indigenous Knowledge does not imply exploring a knowledge form which is entirely contrary to Western Science. Rather, the focus is on describing this knowledge in its entirety, whether or not it is contrary to western scientific knowledge.

Since the integration of Indigenous Knowledge with Life Science CAPS is explored through a decolonial lens, the various decolonial approaches that are used for the integration of Indigenous Knowledge with science are discussed. The first approach is embedded in the manner in which teachers use Indigenous Knowledge pedagogically as everyday knowledge to relate to existing curriculum concepts in their classrooms. In this way, Indigenous Knowledge is used as a foundation upon which teachers may build learners' understanding of science. Indeed, the majority of Indigenous Knowledge and Science integration has only been realised at a pedagogical level as opposed to curriculum or epistemological level (Le Grange, 2007; Devie, 2010; De Beer & Mothwa, 2016).

This constitutes a basic, add-on integration of Indigenous Knowledge at a superficial level. This approach does not alter the curriculum/content. Rather, Indigenous Knowledge is used as a tool t o enable learners to access western scientific knowledge. In other words, Indigenous Knowledge is integrated with science when the teacher wishes to relate scientific concepts with learners' everyday knowledge (Le Grange, 2007). In thismanner, the integration process occurs when Indigenous Knowledge is treated as a pedagogical resource, not a resource for the content of the curriculum. This implies that Indigenous Knowledge is not suitable to inform the knowledge contained in the curriculum and demonstratesa limitation in the use of Indigenous Knowledgein the field of education in South Africa. For thisstudy, the limitation of this approach is that, although integration seems to occur, prominence continues to be given to western knowledge in the curriculum since it is the centre of curriculumknowledge while Indigenous Knowledge is only a constructivist pedagogical aid. It is against this marginal form of integration that this study seeks to explore Indigenous Knowledge as curriculum knowledge, i.e., beyond constructive pedagogic and add-on use.

The marginal form of Indigenous Knowledge integration with the Grade 12 Life Sciences CAPS is demonstrated in that integration is not defined elaborately in terms of the content knowledge. Indeed, the Department of Basic Education (2011) in the Curriculum and Assessment Policy Statements suggests the integration of Indigenous Knowledge with Life Science. However, the Indigenous Knowledge which is described relates more to cultural values than knowledge for the curriculum. For example, the Life Science CAPS proposes the following principle in an attempt

to form the basis for integrating Indigenous Knowledge with the Life Science Curriculum: "valuing IKS [Indigenous Knowledge Systems], acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the constitution" (Department of Education, 2011, p. 5). This, and similar statements in the Grade 12 Life Sciences CAPS as noted earlier, is vague and does not account for the specific Indigenous Knowledge to be integrated with the Grade 12 Life Sciences CAPS.

In addition, this vague principle may contribute to the marginalisation of Indigenous Knowledge as a valuable form of knowledge since it does not necessarily prescribe even the pedagogic use of Indigenous Knowledge in Life Sciences classroom. Hence, Gumbo (2016) notes that CAPS terms such as 'where applicable' in relation to Indigenous Knowledge integration suggest a lack of urgencyfor integration at pedagogical level. Indeed, pedagogical integration of Indigenous Knowledgeinto the Life Science curriculum is not prescribed but suggested. The possibility of integrationis further diminished by the fact that Life Science teachers lack sufficient training on how to integrate the two forms of knowledge in Life Science classrooms (De Beer & Muthwa, 2014). As such, some teachers avoid pedagogic integration of Indigenous Knowledge with Life Sciences altogether (Ned, 2019; Gumbo, 2016). Beyond the limitation of using Indigenous Knowledge as a pedagogic resource, a more fundamental limitation is the lack of relevant database of documented Indigenous Knowledge at the disposal of teachers. Therefore, teachers may not have the correct account of Indigenous Knowledge in their attempt to integrate it in their classrooms. A central contribution of this study, in relation to the lack of documented Indigenous Knowledge in the South African context is to contribute to the database which describes Indigenous Knowledge that is relevant to the Grade 12 Life Sciences CAPS.

A second and radical approach to decolonising the curriculum is the complete removal of western scientific knowledge, and its replacement with Indigenous Knowledge. Mashiyi et al. (2020) note some calls in the Rhodes Must Fall and the #Fees MustFall movements to remove western scientific knowledge as a way to decolonise the curriculum. Firstly, these calls are driven by the recognition that "Eurocentrism seeks to universalise the West and provincialize the rest" (Zeleza, 2009, p. 133). The second approach for an integration which achieves decolonization in the South African curriculum is a means through which postcolonial South Africa is afforded its epistemological agency and an escape from the provincialization imposed by the West. In this case, South Africa is afforded, through the exclusion of Western scientific knowledge and associated ideologies, its own epistemological and ontological identity for the purpose of knowledge production and, thus, curriculum development.

Secondly, the calls for the removal of western scientific knowledge in the curriculum are

heightened by the recognition that the marginal inclusion of Indigenous Knowledge in post 1994 policies has not yielded the desired results of transformation. For example, Mahabeer (2018) notes that the changes which have taken place in an attempt to decolonise the curriculum are minimal, thus giving legitimacy to the radical approach of decolonising the curriculum by removing western scientific knowledge entirely. A key limitation of this approach, however, is the loss of the valuable contributions of Western Knowledge to humanity. In other words, it cannot be ignored that Western Knowledge has, to date, paved the way for innovation and scientific developmentand may still have more to offer. As such, this approach is not aligned with this study since its purpose is not to replace western scientific knowledge in the Grade 12 Life Sciences CAPS, but to explore curriculum knowledge which consists of both western scientific and Indigenous Knowledge. The position of the study in light of the second approach to integration is that the central issue should not be the obliteration of Western scientific Knowledge but de-centring it from the curriculum.

A third approach, which is largely an alternative to the second approach discussed above, is centring Indigenous Knowledge in the curriculum, and placing Western Knowledge on the periphery (Wa Thiongo, 1986). It is the position of this study that this approachto decolonisation is most appropriate because it does not seek to invalidate the merits of Western scientific knowledge but rather to appreciate the epistemological value of Indigenous Knowledge. The centring approach recognises the value, inclusion, and use of Indigenous Knowledge as curriculum knowledge not only as a pedagogic resource but as a viable source of curriculum content. This is accordance with Ngugi's (1986) suggestion of an African education system which moves African knowledge, culture and identity to the centre, and all other forms of knowledge, cultures, and identities to the periphery. In other words, the curriculum would put Indigenous Knowledge at the centre.

The premise of this approach to integration is that "…different knowledges can coexist and … different knowledges can complement each other" (Dei, 2002, p. 120). The claim of the coexistence of different knowledges is in accordance with pluriversal thinking because there are many realities, worlds, and ways of knowing which constitute the pluriverse rather than the universe (Escobar, 2007). According to Querejazu (2016) the pluriverse implies the existence of the human, natural and spiritual world, all of which are interconnected and co-existing in space and time. The many worlds which co-exist are incommensurable and not subjected to one reality. Pluriversality, therefore, is contrary to "universalist discourses and globalist projects [which] are grounded in a unitary ontology and imperialist epistemologies which assume that the world is one…" (Conway & Singh, 2007, p.701). Since the pluriversal world implies a coexistence of

people and worldviews, it enables the integration of Indigenous Knowledge and Grade 12 Life Sciences CAPS as occurring from different realities which do not subscribe to a western universalist framework of a unitary ontology. As a result, this approach affirms the equal validity of all knowledge forms owing to the incommensurability of the multiple ontologies and epistemologies in the pluriverse.

It is important to emphasise that in this study, the coexistence of the different forms of knowledge is viewed in light of an African centre as opposed to the current Western centre and hegemony of knowledge in formerly colonised countries. Furthermore, the centring approach does not propose the eradication of Western knowledge but rather the dominance ofIndigenous Knowledge in the curriculum as it contains the indigenous epistemologies, values,culture, and identities of African learners (Le Grange, 2007). In this way, western scientific knowledge is one of the many valid epistemologies which coexist in the pluriverse. Although the integration of Indigenous Knowledge is not to discredit western science, it is the focus of this study as an engagement of the process of Africanising the curriculum (Mashiyi et al., 2020), a key component of the Afro-centricity of education (Wa Thiongo, 1985). The new curriculum which moves away from the dominance of WesternKnowledge and culture and replaces it with a centralisation of Indigenous Knowledge and culture would be referred to as an Afro-centric curriculum (McLaren, 2008; Wa-Thiongo, 1986). It is the position of this study, therefore, to explore the integration of Indigenous Knowledge with Life Sciences from the pluriversal position which informs the realization of the central position of Indigenous Knowledge in the curriculum.

2.6 Empirical review of Indigenous Knowledge and Science Integration

There have been empirical studies into the prospects of Indigenous Knowledge and Science Integration (Mandikonza, 2019; Zinyeka et al., 2016; Govender & Mudzamiri, 2022; Parmin et al., 2019). These studies will be discussed in terms of their methods and findings on the subject of Indigenous Knowledge and Science Integration. The discussion of these empirical studies aims to enhance an understanding of the various methods used in studies aimed at describing Indigenous Knowledge and its integration with the science curriculum. Furthermore, the findings of the various studies will be discussed in relation to the purpose of this study.

The empirical studies reviewed in this section are qualitative in nature. This research approach is appropriate because the studies sought to understand the Indigenous Knowledge which existsin a particular community, and this cannot be done without understanding the experiences of the participants. As such qualitative studies enable the researcher to gain a deeper understanding of

the participant experiences (Yin, 2002), which is beyond the affordances of numbers as in case of a quantitative approach. The studies differ in terms of the design, for example Mandikonza (2019), used case study design located in an interpretive paradigm to allow the researcher to learn about the specific world in which the study was conducted by focusing on what the participants said and did. On the other hand, Govender and Mudzamiri (2022) employed a Transformative Participatory Research Design which allowed a decolonial approach that empowers the participants and puts them at the centre as creators of knowledge. Although the former aligns with the decolonial purpose of my study, it is not desirable due to its transformation of research methods rather than a complete adoption of research methods which emanate from, and are rooted in, Indigenous paradigms.

The qualitative study conducted by Zinyeka et al. (2016) was similar to Mandikonza (2019) in the data collection methods used, i.e., interviews and observations as data collection methods. However, the purpose and, therefore, the findings of the study were different to Mandikonza (2019). As opposed to collecting data on how a single practice (sustainability) could inform the teaching of science concepts, Zinyeka et al. (2016) collected data from a range of Indigenous practices. These practices included the Cereal Seed Preservation Method, making a fire, local fertilisers, and roof thatching. Beyond these, data on various indigenous treatments was collected and it included treatment of abdominal diseases using the 'Munhunguru' Tree (Flacourtia indica) as well as treatment of abdominal Pain using Chimuwatonzvi (Dicoma anomala). It can be concluded that more Indigenous Knowledge could have been collected in Mandikonza (2019) if the limitation was not sustainability practices. As such, the broader focus on a range of practices in Zinyeka et al. (2016) aligns with my study because the conception of Indigenous Knowledge adopted herein is broad and could be undermined if a single practice is selected. Furthermore, my study is different from Mandikonza (2019) and Zinyeka et al. (2016) in that the Indigenous Knowledge which is described from the local communities is not limited to practices but also includes Indigenous Knowledge which is embedded in songs and the spirituality of the community members.

On the other hand, Govender and Mudzamiri (2022), also conducted a qualitative study aimed at exploring "teacher perspectives on the possibility and necessity of creating Indigenous Knowledge spaces in physical learning environments for learningphysics in high schools in Zimbabwe" (p. 1628). Essentially, this study was aimed at providing an understanding of the manner in which Indigenous Knowledge Spaces may be created and sustained in order to improve Physics learning. However, contrary to the interviews and observations used in Mandikonza (2019) and Zinyeka et al. (2016), Govender and Mudzamiri (2022) collected the data through

focus group discussions from 10 community elders, 5 teachers and 5 learners. The use of focus group discussions was in recognition of the fact that group discussions during community meetings are an important part of knowledge-sharing in rural communities. As such,this method would not disrupt the normal processes of knowledge sharing which are observed in the community. This idea is relevant to my study since Indigenous Knowledge is not everyday knowledge, thus necessitating participation and insights from community elders. As such, conducting focus group discussion in my own study will be useful in engaging a cultural acceptable knowledge-sharing practice while getting the necessary data for the study.

The findings of the various studies identify relevant Indigenous Knowledge for the purpose of pedagogical integration (Mandikonza, 2019; Govender & Mudzamiri, 2022; Zinyeka et al., 2016) and curriculum knowledge integration (Parmin et al., 2019, Zinyeka et al., 2016). In the case of Mandikonza (2019), the findings showed that the indigenous practices of various participants in the community were useful in teaching sustainability concepts of Grade 12 Life Sciences CAPS. This study through its approach to integration sought to support teachers in relation to Life Sciences concepts to indigenous practices. Although this may be a way of minimising the cognitive dissonance which would exist if learners could not locate the theoretical concepts in their daily lives, this integration approachuses Indigenous Knowledge as a pedagogic resource and not as a source for curriculum knowledge. As a result, this integration method is still subordinate to the colonial matrix of power and knowledge which instigates a hegemony of western knowledge in the curriculum and, therefore, the classroom (Quijano & Ennis, 2000). The contribution of my study in this respect, is to explore Indigenous Knowledge as a source of Life Sciences curriculum knowledge and challenge the hegemony of Western Knowledge rather than accepting its dominance and marginally adding Indigenous Knowledge as a pedagogic resource.

The findings from the various practices studied in Zinyeka et al. (2016) reveal that teachers wished for a centring of Indigenous Knowledge as they advocated for its value in that "…IK practices and beliefs are practiced on the basis of logically sound and valid reasons" (p. 9). The integration approach of this empirical study is similar to Mandikonza (2019) since it is aimed at creating a pedagogical framework for the integration of Indigenous Knowledge and science. However, the Indigenous Knowledge described in Zinyeka et al. (2016) has potential to be integrated as curriculum knowledge. As such, my study complements the latter by considering the Indigenous Knowledge which exists in a local community and how it may be integrated with the Grade 12 Life Sciences CAPS as curriculum knowledge.

Similar to the pedagogic focus of Mandikonza (2019), Govender and Mudzamiri (2022) found

that teachers wished to incorporate Indigenous Languages in the pedagogy as well as physical infrastructure. As such, Physics lessons would be taught in the indigenous language and the laboratories would have posters which are written in those languages. The reason for this form of integration is similar to what Le Grange (2007) recognised as the importance of minimizing the conflict between the indigenous and school identities of learners. Accordingly, the expectation is that learners would learn best by having a continuous relationship with the language (and identity) which they engage at school as well as the one they engage at home. The limitation of this study is that much like previous studies, it looked at the incorporation of indigenous languages as a pedagogic resource and not a fundamental part of the content knowledge. Therefore, my study contributes by approaching Indigenous Knowledge and Science integration from a knowledge perspective which would subsequently inform pedagogy.

An Indonesian study conducted by Parmin et al. (2019) within a higher education context required 58 science student-teachers to explore Indigenous Knowledge and see how it may be used as curriculum knowledge in the science curriculum. Their exploration of Indigenous Knowledge led them to a realization of multiple trees which indigenous communities used for various health benefits. This knowledge included that of Serep leaves (Arythrina Lithosperma), Mulberry leaves (Morus alba) and Tembelekan leaves (Lantana Camara) as scientific sources of medicinal herbs, all of which are relevant for the Indonesian Science curriculum. The findings concluded that Indigenous Knowledge could be integrated to the Science curriculum when using the Science Integrated Learning model. This study is different from Mandikonza (2019) and Govender and Mudzamiri (2022) but is closely aligned with my study in exploring Indigenous Knowledge as curriculum knowledge rather than pedagogic aid. According to Parmin et al. (2019), this model allows various indigenous experiences and knowledge to be included in the curriculum. My study complements this by sharing an integration approach at the level of curriculum knowledge. Furthermore, conducting a similar study in a different context may further show the value and merits of Indigenous Knowledge as viable curriculum knowledge across contexts.

2.6 Key Concepts: Meaning and Application

The purpose of this section is to provide a guiding conceptual framework for the exploration of Indigenous Knowledge as curriculum knowledge in the Life Science CAPS. This frameworkwill include the following concepts: rurality, Indigenous Knowledge, and decolonisation. Although these concepts have been described in previous sections, the aim here is to show the relationship between them and how they relate to the study.

2.6.1 Rurality

The concept of rurality is important because it describes the state of rural areas. According to Nelson et, al. (2021), rurality has been used to describe conditions which are distinct (often negative) from urban conditions. In the South African context, rurality is defined in terms of the poverty, unemployment, lack of infrastructure and low-quality education in rural communities (Moletsane, 2012; Hlalele, 2014). Therefore, rurality can be described as the experiences, conditions, and elements of rural life (Ashley & Maxwell, 2001). However, a different perspective of rurality is needed beyond deficit terms (Halfacree, 1991; Ashley & Maxwell, 2001). The perspective looks at what is present in rural areas rather than what is absent and thus informs a research focus which explores rural conditions beyond the need and lack which is often described in literature (Moletsane, 2012; Hlalele, 2019). Rurality, therefore, is not limited to the absence of material in rural communities but encompasses much more.

In keeping with this transformative view, this study defines rurality in terms of the practices which prevail in rural areas, whether for sustenance or cultural expression. In this instance, rurality can be understood as being informed by community capital such as farming practices, social bond, shared culture, and shared values such as Ubuntu (Hlalele, 2014; Hlalele, 2012). This transformative conception of rurality guides this study by exploring a knowledge capital which is not dominated by narratives of lack, need and poverty. In other words, rurality is taken to mean all the elements of the community from which Indigenous Knowledge can be describedto inform the Life Sciences curriculum. As such, the rural context of this study informs the Indigenous Knowledge which will be described and related to the Life Sciences curriculum.This conception of rurality has a transformative and decolonial use compared to colonial conceptions which defined rurality in terms of the poverty, backwardness, and uncivility of culture in rural communities (Louis, 2007).

2.6.2 Indigenous Knowledge

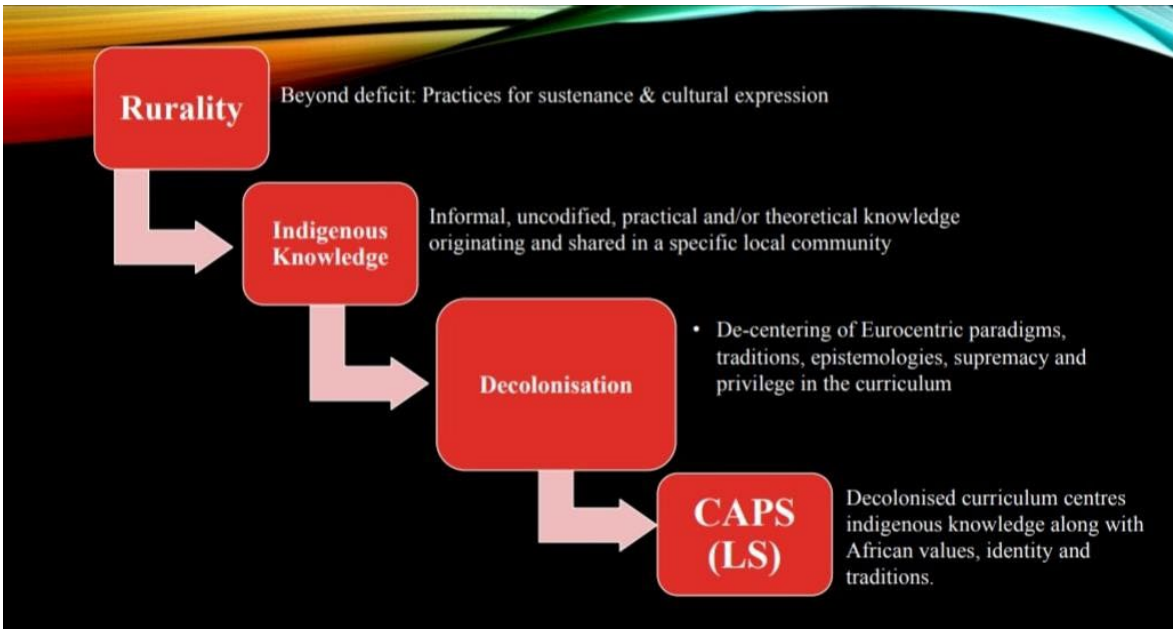
Indigenous Knowledge refers to the formal and informal, uncodified, practical, and theoretical knowledgeoriginating and shared in a specific local community (Hountondji, 1997; Senanayake, 2006). Although some conceptions have portrayed Indigenous Knowledge as backward and primitive against a Western criterion (Horsthemke, 2004), Indigenous Knowledge is not associated with any validating criteria in this study. This study conceptualises Indigenous Knowledge, therefore, in terms of the theoretical and practical understanding possessed by members of arural communities. Indigenous people have always possessed complex knowledge of the environment they live in (Gardgil et al., 1993). Therefore, Indigenous Knowledge does not require Western validation because it is based on people's experiences of the world and of their

environment. In addition, the rural dimension is necessary in Indigenous Knowledge because it is available to all rural community members who rely on directinteraction as opposed to advanced industrial technology to conduct their daily lives (Hlalele, 2019). By conceptualising Indigenous Knowledge in terms of rurality, this study stands to gaina wealth of knowledge from the strong social bond and interaction of community members from which knowledge is formed in rural communities. This concept will be applied in this study to describe practical and theoretical knowledge without any assumptions of inferiority based on the Westernscientific criteria of knowledge, hence its decolonial use.

2.6.3 Decolonisation

Decolonisation is a concept used to describe the removal of western identity, culture and influence fromex-colonies (Le Grange, 2016). In the curriculum context, decolonisation meansthe dismantling of the supremacy and privilege of Eurocentric paradigms, traditions, epistemologies inthe curriculum (Heleta, 2016). Whereas colonisation meant the erasure of African contributions to global development, decolonisation in this study is taken to mean the curriculum application of Indigenous Knowledge in a manner that gives Indigenous South Africans an epistemological, ontological, and cultural voice in their education. As previously mentioned, the approach to decolonization which is used in this study is one which decentres (not removes) Western Knowledge and juxtaposes Indigenous Knowledge. In this sense, the dominant application and representation of Indigenous Knowledge in the Life Sciences Curriculum would constitute a decolonised curriculum. In this study, therefore, the decolonisation of the Life Sciences curriculum as a concept will be synonymous with the centering of Indigenous Knowledge which is formed in rural communities. In respect of the research question, the concept of decolonisation serves as a guide to answering the question: *what content constitutes the Indigenous Knowledge which is to be centred in the Life Sciences curriculum?*

Figure 2. 1: The relationship between the key concepts



2.7 Conclusion

This discussion has critically discussed the conceptions of Indigenous Knowledge and demonstrated narrow conceptions as they have been previously used to justify the marginalization of Indigenous Knowledge from the curriculum. Accordingly, the broader conception of Indigenous Knowledge was adopted in order to broaden the epistemological base from which the description of Life Sciences relevant Indigenous Knowledge may be described from the local community. The review has further demonstrated that the exclusion and marginalization of Indigenous knowledge from the South African curriculum was not a natural occurrence, but an intentional political phenomenon aimed at alienating indigenous people from their ontologies, knowledges, cultures, and beliefs. As such, the call for integration was justified as potentially reversing the knowledge-apartheid which has been dominating the South African curriculum landscape.

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Chapter 3: Methodology

"Ngumthi nexolo"



Ngumthi nexolo is a Xhosa expression which defines the connectedness of two things as similar to that of a tree and its bark. This expression captures the connectedness of the ontology and epistemology of indigenous communities. As symbolised in the rightful containment of the brew in the pot, the epistemology of indigenous people can only be understood when rightly studied from their ontology. The theme song for the chapter is Masiyembo by Sinomusa Cultural Group and it alerts Africans to return to their roots. The song gives life to my desire to employ research methodological processes which do not undermine Indigenous Knowledge and communities, thus symbolising a metaphorical return to a methodological process that closely resembles an African indigenous way of life.



https://youtu.be/Ps0zai7us90?si=bv0_rxxuItEsJSJU

3. Methodology

3.1 Introduction

Research on indigenous communities aspiring to generate Indigenous Knowledge has often used western methodologies (Louis, 2007). The methodology proposed in this study recognises the hegemonic influences of western research methodologies and, therefore, seeks to employ an alternative, non- western/traditional research methodology. Latulippe & Klenk (2020) refer to the processes of making room and moving over when conducting indigenous research.

> To make room is to change what is known about Indigenous peoples and the way research is conducted in relation to Indigenous peoples. It is to expand and fundamentally transform ways of knowing and being in the world - including western research itself, through meaningful contact with Indigenous Knowledge paradigms… To move over is to de-centre western science and institutions as primary sites of knowledge production and leadership – to give up power and privilege. Moving over is about the wholesale transfer of research resources and authority to Indigenous-led knowledge gathering, generation, and mobilization. (Latulippe & Klenk, 2020, pp. 8-9)

Therefore, the study adopted an Indigenous research approach, paradigm, method, and ethical considerations as means of making room and moving over. Although some elements of conventional research are discussed, the focus was on applying them in a decolonial and transformative manner.

3.2 Positionality

The positionality of the researcher is particularly important in a research process that seeks to be decolonial and that works with indigenous communities (Keane et al., 2016). Therefore, this section aims to describe my position in relation to the research and the identity of the indigenous community members and participants who informed my study.

I am a twenty-six-year-old young man who was born and raised in Mount Fletcher, the town in which the research site is located. I have undergone the traditional Xhosa initiation to manhood, and I am accepted as a man in the community. This means that I am an insider in the local community in which the study was conducted because I share the same values and traditions.This afforded me a level of acceptance into the community as I was able to conduct the research in a more sensitive manner. Although I was taught in rural schools from the first to the twelfth grade, I completed my qualifications in various city-based universities. During this period, I have kept the beliefs, traditions, and conceptions of my people from my undergraduate to my postgraduate levels of study, and they have informed my research interests. However, the fact that I do not spend much time in the local community means that I am an outsider to the local community. Specifically, my education and research may be interpreted by the communitymembers as evidence that I have adopted Western conceptions and values. My position in this study, therefore, is one of shared identity, language, and culture with prospective participants, albeit with some differences. Although this may be interpreted in terms of bias, it afforded me a better understanding of the cultural context and easy access into the research site.

3.3 Indigenous Research approach

This study has employed a qualitative research approach. According to Creswell (2009), qualitative research allows for an understanding of people's experiences, perceptions and meanings. As such, a qualitative study provides an in-depth understanding of social phenomena by allowing participants to interpretively articulate their experiences and perspectives (Yin, 2015). Therefore, this research approach has been selected for this study because, as described in McMillan and Schumacher (2010), it allows me to "describe … document, to understand, and to discover" (p.324) the participant's perceptions and understanding of the Life Science-related Indigenous Knowledge which is available in the community.

In response to calls for the decolonisation of research methodologies, however, Ubuntu is proposed as a key element for studies involving indigenous communities (Murove, 2012; Khupe, 2014;Keane et al., 2017). Ubuntu is a concept which is essential to the fibre of the cultural relations in South African rural communities (Khupe, 2014). The concept of Ubuntu emphasises

the solidarity and oneness of people in a community (Murove, 2014). As a result,Ubuntu as a practical approach to research asserts both the attainment and giving of knowledge by the researcher as they stand in a mutually beneficial relationship with the participants and the environment at large (Keane et al., 2017). This affirms the Xhosa proverb that *Umntu ngumntu ngabantu* – "I am because, because we are" (Seehawer, 2018, p. 445). This study, therefore, adopts a practical understanding of Ubuntu as a research approach to demonstrate respect to the culture, beliefs, and knowledge of the indigenous people, as well as their contribution to the researcher's humanness. In addition, Ubuntu necessitates that research participants contribute to my own understanding of the world such that my knowledge and humanness is incomplete without them. In the context of research therefore, Ubuntu is an African concept which foregrounds the learning of the researcher in a relational sense with, and from, the participants. This is different from conventional research approaches in which the researcher may be independent from the participants (Louis, 2007).

Ubuntu is further used as a practical research approach in this study in order to diminish any power relations which might exist in conventional western methodologies. This is true since Ubuntu dispossesses the researcher of the position of expert, but rather engages him as an active participant in the process of being human (Murove, 2014). Ubuntu affords me an opportunity to interact with the participants from a position of social equality. More specifically, Khupe (2014) advocates for this research approach because it creates a power sharing platform between the researcher and participants. In the context of this study, the indigenous people hold valuable knowledge, without which I cannot conduct the study. Contrary to conventional research approaches which may uphold the validation of western conceptions regarding Indigenous Knowledge (Hart, 2010), my engagement of Ubuntu means I recognise any differences I might share with the participants as contributing to the development of my humanness. Thus, I approached this study in a manner that seeks to learn (in the process of becoming human) and not to validate previously held assumptions.

3.4 Indigenous research paradigm

The Indigenous Paradigm views reality from relationships formed with other people and with nature, i.e., a relational ontology (Hart, 2010). Accordingly, it is a worldview grounded in the culture, beliefs, practices, and knowledges shared by indigenous people within their natural and spiritual ecosystem (Louis, 2007). The conception of an Indigenous Research Paradigm is necessitated by the recognition of marginalising western paradigmatic hegemonies used in indigenous research. As such, the indigenous paradigm attempts to afford the previously

marginalised people an epistemological voice in the research process (Hart, 2010). Furthermore, the use of an indigenous research paradigm is important in order value and appreciate the worldview of the communities in which the research is conducted (Keane et al., 2017). This is contrary to colonial/western paradigms which evaluate and validate Indigenous Knowledge according to exclusive, undermining, and discriminatory methodological frameworks (Louis, 2007; Hart, 2010). The dual affordance of the Indigenous Paradigm in this study, therefore, is enabling the decentring of western research methodologies which impose foreign worldviews in the indigenous research process and enablingthe unadulterated contextual description of Indigenous Knowledge from the local community. This paradigm informed this study because it acknowledges the relational worldview of the indigenous people and does so without undermining the context, beliefs and cultures which form part of this worldview.

3.5 Indigenous research methods

The purpose of this section is to describe the methodological foundations of Indigenous research as well as to describe how they informed the data collection methods which were used. The Indigenous paradigm comprises relational accountability, respectful representation, reciprocal appropriation, and rights and regulation (Louis, 2007). The research methods employed in this study were guided by these key ideas of the indigenous paradigm. The first component of the indigenous paradigm is relational accountability, which refers to the connectedness of the indigenous people with other members of the community and with nature (Khupe, 2014). Accordingly, I was accountable to creating relationships as well as maintaining them in order to understand the worldview and experiences of the participants in the research process. The nature of my research methodology accounted for the relationship I have with the participants, and the one which they share with each other and the environment. This way, I was engaged in the social ecosystem of the community, a process which Keane et al. (2017) describe as fundamental to the Indigenous Paradigm.

The second component that informed my research methods is respectful representation, which is defined by Le Grange (2016) as rightfully giving a voice to indigenous people in the research process. This is important for the researcher so as not to impose their own worldview, beliefs, and ideas onto the indigenous people (Louis, 2007). In line with my positionality in this study,I sought to represent the perspectives and opinions of the participants in a manner which is not contrary to their beliefs, cultures, and worldview. A third component is reciprocal appropriation and is defined by Khupe (2014) as a recognition that both the researcher and participants must share in the value of the knowledge produced in the research process. Accordingly, I conducted

this study in consultation with the community members. In other words, the participants were given the opportunity to define the benefit they intend to reap from this research, and I will then communicate the findings of the research to them so that theresearch process is beneficial to both participants and researcher. Lastly, rights and regulation refer to the knowledge ownership of the indigenous people (Le Grange, 2016). Therefore, I have credited the knowledge produced in this study to the indigenous people who have formed the knowledge through interaction with one another and with the environment they share.

The data for this study was collected using two research methods: semi-structured interviewsand focus group discussion, both of which were guided by the indigenous research approachand paradigm. Semi-structured interviews are two-way conversations which consist of predetermined open-ended questions (Wagner et al., 2012). Semi-structured interviews afford the research to explore the participants' responses deeper as it allows the researcher to probe the participants for responses which are aligned to the research focus of thestudy (Brinkman, 2014). Although semi-structured interviews were conducted, the conversation was premised on Ubuntu. In other words, I viewed myself, and the research, in light of the cultures, beliefs and practices of the community and, therefore, showed respect to the perspectives offered by participants. As such, I attempted to abide by the values of the indigenous people in my interaction with them (as outlined in the research protocol) through the semi-structured interviews. A key limitation of the semi-structured interviews, due to its open-ended nature, is that it enables the researcher to ask leading questions, thus promoting a level of bias. Therefore, this method was complemented by a Focus Group Discussion to ensure that bias is minimized, and to allow for the multiple voices of the participants who may hold differing ideas to be heard.

Another data collection method employed was a Focus Group discussion. Focus groups are beneficial because of the group dynamic they offer. Specifically, focus group discussions involve multiple participants, therefore, they account for different perspectives, experiences and conceptions which constitute rich data (Wagner et al., 2012). In accordance with the interactive process of the formation of Indigenous Knowledge, the dialogical nature of the focus group allowed multiple voices to be represented. More importantly, however, this form of data collection promotes the significance of relationships inindigenous communities. In other words, focus groups acknowledge the indigenous participants' value of community relationships, and the role of each member in the community because of the philosophy of Ubuntu. A key limitation of a Focus Group discussion is that, if not directed properly, the group dynamic may obstruct some participants from voicing their views (Wagner et al., 2012). This is why the Focus Group discussions were complemented with Semi-structured interviews with individual participants.

Focus groups are composed of five to twelve participants (Wagner et al., 2012). For the purpose of my study, I conducted one focus group session consisting of seven participants. The absence of the three members who were part of the interview sessions but not the focus group is due to the traditional activities which were taking place, as the season for the initiation of boys into manhood had arrived. The remaining members who were part of the focus group discussion, on the other hand, are held in high regard by the community leadership and were able to articulate themselves clearly to generate sufficient data which is for the study. Each member of the focus group had enough time and space to express their opinions in order to have a more accurate description of the different perspectives.

3.6 Data Analysis

In this study, data were analysed through Thematic Analysis. Thematic Analysis (TA) is a method, technique or tool used for the identification and interpretation of patterns of data which are referred to as themes within qualitative data (Braun & Clarke, 2016). TA was a technique of choice in this study because it complements the Indigenous Research Methodology employed. Specifically, it is not bound to specific theories and paradigms, i.e., it is not theoretically confined (Braun & Clarke, 2006). As such, it has a level of flexibility which allows its use across different epistemologies and research paradigms including the Indigenous Research Paradigm. Therefore, since Thematic Analysis is flexible enough to be modified according to the needs of the study, it is able to provide thick and detailed descriptions from complex data (Braun & Clarke, 2006).

There are two ways of identifying themes within qualitative data when using Thematic Analysis, Inductive (bottom-up) and deductive (top – down) approach. Inductive analysis refers to the process by which themes arise from what is available in the data set (Braun & Clarke, 2006). In this instance, the preconceptions and presuppositions of the researcher during the analysis of the data does not inform the themes which are generated. This is different from the deductive approach in which the data is interpreted in light of the researcher's preconceived ideas to generate the themes (Braun & Clarke, 2006). In this study, the inductive approach was used to identify themes. This is in accordance with a decolonial research methodology such as the one employed in this study. Allowing the data to speak, as opposed to imposing preconceived ideas regarding the knowledge located in the community, is a crucial aspect of acknowledging the voices, perspectives, and ideas of the participants. The researcher followed all six phases of Thematic Analysis which are familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining, and naming themes and producing the report. Although these phases are listed in a linear form, the process from the familiarisation with the data to producing the report was a reflective process which entailed a back-and-forth movement through which the

researcher attempted to accurately describe the data in light of the research question (Nowell, et al., 2017).

Table 3. 1: Example of initial coding from the dataset

Expressions from the participants	**Initial Code**	**Theme**
"Phate ya ngaka is very useful when you have flu, like me right now"	Medicine for flu	Indigenous Knowledge of traditional medicinal plants and herbs
"…there is lekgala which they dig from the mountain, it helps people with high blood pressure as well as heart problems".	Medicine for high blood pressure and related problems	
"The plant I am talking about, Isihlehle is useful when a person has moles, and blisters on your feet".	Medicine for moles and blisters	

3.7 Trustworthiness as Ubuntu

The trustworthiness of the data is ensured through its credibility, dependability, and transferability (Denzin & Lincoln, 2011). In terms of credibility, Cope (2014) states that it is the truthfulness of the representation of participants' views by the researcher. To ensure that the views of the participants were accurately represented in this study, the interviews and focus group discussions were audio-recorded and later transcribed verbatim. This ensured limited chances of misinterpretation in the compilation of the research report. Secondly, Cope (2014) defines dependability as the consistency of the data in similar contexts and circumstances. To ensure this, I involved my research supervisors in the research design process so they could evaluate the practicality and accuracy of the research methods in light of the questions. This ensured that the research was conducted in a manner that would yield consistent results in similar rural areas given selected methods. Transferability refers to the generalisability of the data across different contexts (Cope, 2014). As already explained Ubuntu entails the entanglement of individuals and environment constituting an intertwined entity born out of mutual respect and responsibility (Keane et al, 2017). The overriding notion of oneness and unity of beings allows for generalisation of data from the sample to the particular community. More broadly, it is not the aim of the study to generalize the findings given the diversity of Indigenous Knowledge across different geographical and cultural contexts. However, the context of the study has been thoroughly described to allow an informed evaluation of the generalizability of the study in a similar context.

3.7 Sampling

Purposive sampling was used to determine the sample from which participants will be selected. Wagner et al. (2012) state that purposive sampling includes the researchers' decision in selecting participants who are representative of the general population based on a specified selection criterion. More specifically, purposive sampling entails a specific rationale for the selection of participants in line with research aim. In section 2.2 of this study, Indigenous Knowledge was described as encompassing a specialist form of knowledge. Furthermore, the Life Science-related Indigenous Knowledge which the study sought to describe exceeds the everyday knowledge of the community members. In line with purposive sampling therefore, the participants of this study

were selected in accordance with pre-existing criteria in the expectation that their indigenous knowledge would not be limited to the everyday knowledge of the general population.

Table 3. 2: The selection criteria for the participants

Selection Criterion	**Justification for the study**
The participant must be an indigenous community member who was raised in the region (if not the community).	The formation of Indigenous Knowledge has been described as resulting from cultural interaction in the community. Therefore, individuals who are not indigenous to the land may not be critically informed of the knowledge and culture shared by the community
The participant must be between ages 40 and 75 years old	Older people who possess more experience may have deeper knowledge of the practices,beliefs, and culture of the community.
Participants should hold a respectable position in the community or at least have a commendable reputation.	In order to show respect to the community, the participants should hold the values and traditions of the community to a high regard. The reputation of the participants, as definedby the *Sebota* was inclusive of such values.

Given the selection criteria, the sample composition for both the interviews and focus group discussion was made up ten community Elders, five of whom were male and another female. The concept of Eldership as described by Dei et al., (2022) refers to senior members of the communities who have come to be the embodiment of Indigenous Knowledge as reflected in their social status and roles in the community. As such, the roles and social positions of the community Elders include members of the traditional council, advisors to the chieftess for women's traditional practices, community project farmers and community church leaders. In accordance with the conception of Indigenous Knowledge as encompassing explanations which are beyond commonsense knowledge, the community Elders occupy positions and functions in roles which allow them a more nuanced understanding of the Indigenous Knowledge that is available in the community.

3.8 Research Site: Access, Stay and Departure

The purpose of this section is to provide the contextual basis of the research site as well as the processes which I went through in order to access participants for my study. Furthermore,

descriptions of my stay and departure are also discussed in relation to the cultural and traditional processes which I had to observe. These processes are important in indigenous research because they acknowledge the traditional practices that the researcher has to observe inorder to gain a contextual understanding of the participants' experiences, perspectives and meanings.

The research site is located in the north-eastern region of the Eastern Cape Province. The village has an arguably balanced population of Xhosa and Sotho ethnic groups. Despite their ethnic differences, both groups practice a similar culture and lifestyle as a result of their shared environment. Furthermore, members of each ethnic group are largely fluent in the language and traditional practices of the other group. Characteristic of most villages in South Africa, the community members engage in subsistence farming as a way to sustain themselves (Baiphethi & Jacobs, 2009). There is no industrial activity happening in the village, therefore, employment (where applicable) occurs in the town of Mount Fletcher. Alternatively, members of the village move to larger cities in search of job opportunities.



Figure 3. 1: The geographical position of the research site on the map 1

The village is ruled by the chief of the *Batlokwa* people. The traditional monarchy is characteristic of other villages in South Africa (Mazibuko, 2014). The chief is monarch and overseer of the administration of fourteen villages. However, he has appointed a *sebota* (Sotho) or *isibonda* (Xhosa) for each of the fourteen villages, an individual who is in charge of the general oversight in each village. The *Sebota,* whether man or woman, functions with a village council for decisions relating to traditional and other matters. In line with Ubuntu as a practical research approach, my access to the participants began with an engagement with the chief. As a function of Indigenous Research Methodologies, this was a direct acknowledgement of the importance of traditional protocol in the local community.

The engagement involved a conversation in which I introduced myself and my clan as a way of respecting the cultural discourse of the *Batlokoa* people. In this engagement, I was expected to bring a gift as a sign of goodwill as a matter of cultural practice. As such, I brought three buckets of home- brewed beer, *Umqombothi.* Upon the chief's agreement to my request of conducting a study in his village, he introduced me to the *Sebota* of the village in which I conducted the study. Subsequently, I was introduced to the village council and a meeting was held to introduce me to the community members who were to be participants of my study. Therefore, my access to the participants was in observation of the cultural and traditional authority of the community, from the chief to the S*ebota.* I practiced Ubuntu as a key element of this study as reflected in my honour of the cultural practices of the community which, in turn, inform my research as well as being.

Figure 3. 2: The Umqombothi presented as a gift to the Chief



Once I had attained access to the research site and participants, I continued to conform to the cultural practices which guide the daily life of the local community. The use of clan names is an important cultural practice when addressing elders in South African rural areas (Simelane-Kalumba, 2014). These names carry honorific significance and are to be used when referring to the community members. In keeping with this value, I addressed the participants and the community members at large by their clan names. The use of clan names when referring to an elder is not limited to gender. Therefore, I used clan name salutations and phrases when addressing both male and female participants of my study in order to show my respect. In addition to this, I also paid my respects to any cultural activities such as rituals and ceremonies which

were occurring at the time of my stay at the local village so that my presence did not undermine tradition. Specifically, I could not hold focus group discussions or interview sessions concurrently with any ceremonies which were taking place. This was an important consideration since the data gathering process for this study took place during the beginning of the traditional initiation season.

Lastly, my departure from the local community continued to be informed by, and be in harmony with, traditional community practices. Custom necessitated that a community meeting be called at the conclusion of the data collection process. In this meeting, the *Sebota* informed the community members of the conclusion of the data collection process. At this point, I expressed my gratitude to the community at large and committed myself to returning at the completion of my degree to share the findings of the study. In keeping with Keane et al. (2017), this completes the reciprocal activity in which the researcher is benefitted by the study as much as the community. Unlike colonial studies which sought to extract knowledge from indigenous communities (Louis, 2007), this act represents a sharing of knowledge which is characteristic of the concept of Ubuntu.



Figure 3. 3: Satellite image of the research site

3.9 Ethical Considerations

The observation of community tradition and culture in this study was preceded by an ethical clearance obtained from the University of the Witwatersrand. Accordingly, the study was only conducted when it had been cleared of any potential harm to participants. In addition to the local community chief's approval for the interviews to take place, written consent was obtained from all the participants regarding their participation in the interviews. This included consent for the audio-recording of the focusgroup discussions, and the use of data in the writing of the research. In instances where the community members could not read or write, they could give verbal consent and appoint a temporary proxy to sign on their behalf in their presence. During the research process, the participants were reminded that this was a voluntary activity and that they had a legal right to withdraw at any time. Lastly, the anonymity of the participantswas guaranteed in the writing of the final research report, although it could not be guaranteed in thedata collection process. The real names of the participants are not used in the research report, rather, their clan-names/totems are used as an acknowledgement of their identity as it relates to their cultures, traditions, and knowledge. Lastly, the protection of the data (audio-recorded interviews and transcriptions) was ensured by storing it on a password-protected personal computer to which only the researcher had access.

3.10 Conclusion

The research methodology which was described in this section was developed from a decolonial, and thus unconventional, perspective. This was a careful response in recognition of the marginalizing methodological processes, which include Western paradigms and research practices. As such, the study adopted an Indigenous Research Approach and Indigenous Research Paradigm and located the research methods within the Indigenous Research Paradigm. Subsequent ideas of trustworthiness, data analysis, sampling and ethical considerations were also rooted in the methodology's decolonial position. In the next section, I will present the findings of the study and their meaning.

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Chapter 4: Data Presentation and Findings

"Kungaf'intak'enkulu amaqand'ayabola"



Kungaf'intak'enkulu amaqand'ayabola is a xhosa expression which literally means 'the eggs begin to rot at the death of a great bird'. This expression means the death of elders will always result in the loss of everything they worked hard to attain. I selected this expression as a theme in the recognition that Indigenous Knowledge erodes if the wisdom & knowledge of the elders is not documented. The picture symbolises the seemingly ordinary rural practices informed by the wisdom of the elders, which this study seeks to understand in an attempt to describe Indigenous Knowledge related to the Life Sciences CAPS. The theme song for this chapter is Amawele by Iinkonjane zooFaku. The song is a declaration that the healing of Xhosa people is with those who are selected as messengers of the ancestors. This song is selected because it articulates the relational ontology which informs the knowledge of the community members.



https://www.youtube.com/watch?v=UR7uopcVnp4

4. Data Presentation and Findings

4.1 Introduction

The research problem which this study seeks to address is the lack of specificity in the grade 12 Life Sciences CAPS regarding the Indigenous content Knowledge which may be integrated with the Life Science content. In accordance with this problem, two questions guided the study: what Indigenous Knowledge is available in the local community that would be relevant to the Life Science CAPS; and how would this Indigenous Knowledge be integrated into the Life Sciences curriculum? The following data was gathered through semi-structured interviews from 10 community members as well as a focus group discussion with 6 members selected from the same group.

Table 4. 1: Participant information

Assigned Name of the Participant	Gender	Age	Occupation/ role in the community	Semi-Structured Interview/ Focus Group
Mrs Mntambo	Female	54 Years	Advisor to the Chief's wife	Both
Mrs Mokoena	Female	61 Years	Former Traditional Healing Apprentice	Both
Mr Tlokoa	Male	51 Years	Member of Traditional Council	Both
Mrs Lekgolokwe	Female	48 Years	Advisor to the Chief's wife	Both
Mr Lerotantshwe	Male	66 Years	Member of Traditional Council	Semi-Structured Interview
Mr Sgubevu	Male	57 Years	Community Council Member	Both
Mr Sobhuza	Male	45 Years	Tour Guide, Rock-art Specialist	Semi-Structured Interview
Mrs Leqalana	Female	48 Years	Advisor to the Chief's wife	Both
Mrs Mangwanya	Female	63 Years	Community Church Leader	Semi-Structured Interview
Mr Khumalo	Male	49 Years	Community Farming Project Member	Semi-Structured Interview

Three themes emerged from the data: the Indigenous Knowledge of traditional medicinal herbs and plants; Issues of sustainability for traditional medicinal plants and herbs; and knowledge of cultural practices and beliefs. In this section, I will present the findings of the study and their meaning in relation to the aim of the study which is to describe grade 12 Life Sciences CAPS related Indigenous Knowledge from a local community.

4.2 Indigenous Knowledge of Traditional Medicinal Herbs and Plants

The Indigenous Knowledge found in the community which is relevant to the Grade 12 Life Sciences CAPS was, first and foremost, the knowledge of medicinal herbs and plants, also known as, ethnobotany. Although these medicinal herbs and plants were referred to in Sesotho and IsiXhosa, their terminology has been translated to the English language for the purposes of this report. The following is a table of the Xhosa/Sotho and scientific terminology for the medicinal plants and herbs found in, and known by, the community (members) of eZwelitsha. Although the English terms will be used, the ethnic terms of the plants will be used where emphasis is given to the meaning ascribed by the community.

Table 4. : Traditional Medicines and plants known to the community.

Sotho/Xhosa term	Scientific terminology
Lesoko/iqwili	Alepidea amatymbica
Lengana/Umhlonyana	Artemisia afra
Setima-mollo	Pentanisia Prunelloides
Tshita-baloi/Labatheka	African Potato
Phate ya Ngaka	Helichrysum caespititium
Matekwane - intsangu	Cannabis
Sehlehle	Euphorbia clavarioides
Phefo/Impepho	Helichrysum odoratissimum
Poho-Tshehla	Xysmalobium undulatum
Magageni	No known scientific term
Teletsi	Candalabra Aloe

In the interview and focus group discussions, the community members referred to the traditional medicinal plants and herbs in terms of the sickness which they treat. As a result, the presentation of the plants and herbs will be categorised in terms of the illnesses which they treat.

4.2.1. Medicinal Herbs and Plants for the Treatment of Influenza

The most common traditional medicinal herb which the community members noted is the Helichrysum Caespititium, locally known as Phate ya Ngaka. The community members stated that the traditional herb was found on the mountain which surrounds the village of Zwelitsha. Mrs Sgubevu noted the following

> *"Helichrysum Caespititum is very helpful when you have fever like me right now. This is because it causes a particular sensation on the throat when consumed, so it helps with flue. You boil it… you pick it as it is [from the ground] and then you boil it in water and then you drink".*

Mrs Mntambo went beyond a sore throat in the description of the illnesses cured by the Helichrysum Caespititum and stated that it is also appropriate for children.

> *"Helichrysum caespititium goes further [than other indigenous flu medicines] because it also heals chest sores. When a child start panting/breathing in a strange way, Helichrysum caespititium is able to cure that child, because they are suffering from internal/chest sores as a result of flu… it burns them away so that the child is healed"*

The Helichrysum Caespititium was described as performing a similar function to Artemisia Afra.

Artemisia Afra, known as Lengana or Umhlonyane in the community, is known in the community to cure a sore throat, chest pains (including breathing difficulties), as well as a dry cough. Some participants recalled its prevalent use in the COVID-19 period when community members could not access western medicines for the prevention and/or treatment of COVID-19. Mr Tlokwa described valuable use in the following terms:

> *"Artemisia Afra was the most prevalent in many households during COVID-19. We would walk long distances to go pick it out, down there as you cross the Hlophe river [to another village]. You would find us running to go get it."*

The dependence of community members on these medicinal plants is critical for the community and is encouraged by clinical workers in the absence of western medicines at the community clinic. Mrs Mntambo stated the following:

> *"The nurses tell you when there is no flu medicine that you need to pick out some Artemisia Afra. You see, Artemisia Afra and Helichrysum caespititium are traditional medicinal plants which are specifically mentioned that side [the clinic]. They tell us to pick them out and drink because there is no western medicine. It means they also trust it as something that works, maybe it works in the same way as their own medicines".*

The third traditional medicine used for the treatment of Influenza is made from Eucalyptus leaves. The Eucalyptus leaves are sourced locally from a man-made Eucalyptus Forest found in the area. During the focus group discussion, Mr Khumalo stated that:

> *"In fact, there is another one, Eucalyptus – when you have flu you can cut some trees and use them to steam… and I am sure that you can even immerse them in water to drink"*

The method of using the traditional medicine to steam rather than just drinking, particularly in the case of Eucalyptus leaves was further highlighted by Mrs Mokoena:

> *It helps when you have flu. You can pick the leaves and boil them so you can steam. You can even drink it. Actually, if you decide to steam with it then you can also add Helichrysum odoratissimum. You can do this at night, and you will feel better by the time you wake up in the morning.*

There was mention of the use of Eucalyptus in western medicine. The community saw this as an acknowledgement of the potency of the medicinal plants available in, and known to, the local community. This is evident in the following statement by Mrs Mokoena:

"... you see, all these western medicines are actually made up of plants which we have in our environment, stuff like camphor and eucalyptus oil are actually made from the very plants which we know here. They process them to make medicines."

Another plant which was noted for its uniqueness in how it is used in the treatment of Influenza is the Alepidea Amatymbica. This medicinal herb was more preferred because the community members did not have to boil it before using it. The use of Alepidea Amatymbica represents a much more efficient medicine for the treatment of infludenza in the local village since it can be chewed at any time during the day. This was noted by Mrs Mokoena:

"...When you have flu, it will just die down when you constantly chew the Alepidea Amatymbica, spit out the solid contents and swallow the liquids extracted from the plant."

The fifth medicinal plant used for the treatment of influenza in the community is Helichrysum Odoratissimum. The community members prepare the medicine by boiling the Helichrysum Odoratissimum, cooling it and then drinking. Alternatively, it can be drunk while hot. However, the use of Helichrysum Odoratissimum as a single source of medicine was not emphasised. Rather, the community members referred to it when discussing the mixture of the previously mentioned plants for a potent traditional medicine. For example, when referring to the use of Eucalyptus leaves as medicine for the treatment of influenza during the focus group discussion, Mr Sgubevu and Mrs Mokoena, respectively, stated that:

"In fact, you can even mix them, Helichrysum caespititium, Artemisia Afra and Helichrysum odoratissimum and drink that boiled mixture. It causes the flu to disappear!"

And

"Artemisia Afra, Helichrysum odoratissimum, Eucalyptus are things you can mix to make traditional medicine [for flu]"

4.2.2. Traditional Medicine for the treatment of High Blood-Pressure and Diabetes

The traditional medicinal plant most notable in this category is the African Potato. The Sotho name for this plant is *Tshita-baloi* which means something that overpowers the witches. As such, the potency of this plant is described in relation to spiritual as well as physical afflictions. The various uses and methods for its preparation were described by Mr Sgubevu:

"[Labatheka/African Potato] helps with conditions such as high blood pressure. I have seen many

people with high blood pressure using it… You also dig it, slice it, and boil it in water so you can drink. It does not only help with High blood pressure, but it is also a medicinal plant that cures everything"

Furthermore, Mrs Mntambo noted that it was also useful for pregnant women. It is known to help the woman sustain a safe pregnancy from evil spirits which may cause complications before and after birth, as well as from sickness such as high blood pressure and diabetes.

"It helps with high blood-pressure and diabetes. The pregnant lady can boil it in water… they can also cut it into slices and eat it raw, she can even put the slices in a water bottle and drink regularly… I used it with all my children, and it really helped."

An alternative use of the traditional medicinal plant was steaming rather than boiling to drink it so as to repel evil spirits. However, this was reportedly done when mixed with other plants such as Helichrysum odoratissimum. Another plant which was described as being useful for high blood pressure is the Candalabra Aloe. Mrs Leqalana reported the following:

I know of its effects on my own body. I was sick recently and I drank the mixture [Candalabra Aloe and water], I was feeling better in no time. It's very helpful for people with high blood-pressure, [I know this] because it increases when you are sick, but it decreases once you have drank Candalabra Aloe.

In terms of its preparation, Mrs Lekgolokwe noted that:

you grind it and boil it in water or even if you don't boil it, but you add a little bit of salt and drink. It also cleans your stomach so you will have a runny tummy. We even give the chickens to drink

4.2.3 Medicines for Cleaning the Stomach

Most of the community members noted the use of various medicinal plants and herbs to "clean the stomach", a process which can be explained as detoxification through the use of medicinal plants and herbs as laxatives. In explaining this during the focus group discussion, Mr Tlokwa noted the following:

You can drink water which has been mixed with magageni. You drink it so as to clean your stomach and it causes you to have a runny tummy quite nicely. This helps reduce the effects of bile reflux in the body.

Adding onto this statement, Mrs Lekgolokwe stated that this traditional medicine for detoxification can be supplemented with the African Potato:

> *you can also mix it with the African Potato when you are boiling then drink the mixture afterwards. You should be aware that you will be running to the toilet afterwards, it really cleans the stomach. You won't feel any stomach aches though, but you will be constantly running to the toilet.*

Noting a different use of Candalabra Aloe, Mrs Leqalana asserted that:

> *It also helps with stomach aches. If you have prepared the mixture and you drink it, you will have a runny stomach and the pain will go away.*

A different medicine, Euphorbia clavarioides, was mentioned by Mr Tlokwa and it was praised for its appropriateness in children. Although it was not necessarily for detoxing, the community elder mentioned it for its benefit in killing stomach worms.

> *Euphorbia clavarioides, it helps a lot in children. You prepare it by boiling it in water, once you children have drunk it, they won't have any worms inside their stomachs. Just grind it and boil it then have your child drink it.*

An alternative to Euphorbia clavarioides was a boiled mixture of various fruit tree leaves. This is especially used for children since they were expected to start consuming sweet food in Christmas as well as fruits from various trees around the households.

4.2.4 Medicines for the treatment of General Illnesses

Although the most common medicinal herbs were related to the treatment of influenza, there we other medicines which were noted for their potency in treating general illnesses such as stomach aches, body rash, cracked heels, and bone health,

Another common illness for which the community members of Zwelitsha resort to traditional medicinal plant and medicine is the headache. According to Mrs Lekgolokwe, Xysmalobium undulatum is a useful traditional medicine for headaches:

> *I know about its use when one has a headache. You grind it and then inhale the powder through the nose, you will sneeze after this, but the headache will eventually go away.*

An additional use for Xysmalobium undulatum is body rash. Mrs Leqalana described its

potency and use in the following terms:

> *It even helps with rash, when your entire body is covered with rash, and you scratch yourself. You can use phoho-tshehla, you can mix it with water and drink, or you can simply add a bit of water to the powder and then apply to the area of your body where there is a rash.*

Describing her dependence on prickly pears for bone health, Mrs Mangwanya noted the following:

> *Prickly pears helps with joint pains, as well as pains on cartilages. As you grow old it becomes painful, hence people complain of knees. You take the leaf, put it in water and drink. It becomes a bit thick then you can drink it, that helps with joints.*

Given the socio-economic situation of the village, and the fact that some people do not have shoes, Mr Sgubevu noted a different use for Euphorbia clavarioides.

> *Do you guys remember that when we were growing up we had cracked heels? Euphorbia clavarioides helped with those because it had some liquid coming from it. If you applied that liquid on your feet, then cracked heels would close.*

4.3 Issues of sustainability for traditional medicinal plants and herbs

A second theme which emerged from the data relates to the sustainability processes of digging up the traditional medicinal plants and herbs found in the local community. The ideas related to the issue of sustainability stem from a recent growth in the commercialisation of traditional and medicinal plants and herbs in the local community town.

A growing concern for a majority of the community members is the increase of the number of people who harvest the traditional medicinal plants and herbs to sell them in the local town. The commercial traders are typically traditional medicine specialists from other regions, who possess more knowledge than the average community member. The community members lamented the agenda and methods of digging the plants, noting that these reduce the quantity of the plant or herb available to the community in times of need.

> *I recently sent someone to the mountain, the guys from Kgalatsu (a neighbouring village) and asked them to dig some [Alepidea amatymbica] for me and they found that it's no longer there on the mountain. You see? We used to dig up Alepidea amatymbica up there by the cliff when we were growing up, it's not there today. Now the reason for the absence of Alepidea amatymbica there is… I heard that there are people who frequently dig it up to sell it in town, you see that. And there used*

to be a lot of it on the mountain but now I have heard that it's difficult to even find it up on the mountain. (Mr Lerotantshwe)

The issue of the commodification of the traditional medicinal plants was described as the main cause of erosion of the plants as well as the knowledge which the community members have about them, especially the youth. Specifically, the participants explained that the individuals fromhad dug up the plants to a point of overharvesting.

There isn't any [Artemisia Afra] because they pick all of it and sell it in town, it has now become a business is it not so? In the olden days you would not find these medicines in town but now they make money because people can only get them in town. We used to pick these medicines when someone had some minor illness, now there is no mangana, you see? (Mrs Mntambo)

And

…to a point that we are to be blamed for the destruction of these medicines we claim to be African. We sell them on the street and [when they have been sold] we go pick out others [to replenish the stock], as a result we overharvest these plants and they end up not growing. In so doing, the knowledge of these plants won't be transferred because the plants are now scarce. (Mr Sobhuza)

The commodification of the traditional medicinal plants and herbs in the local community is a critical factor in the Indigenous Knowledge of the community members because much of it arises from their interaction with the environment. Therefore, the commodification of these plants undermines the sustainable processes which have long been observed in the community, thus reducing the knowledge available, or more accurately, what may be known about the environment. In contrast, A more sustainable procedure for digging up the traditional medicinal plant called Lengana (Artemisia Afra) was noted by Mrs Mntambo in the following terms:

You pluck it up or dig it, [in fact] it has leaves so you pluck out the leaves and not the stem. You pluck out the leaves, perhaps a handful of them and pour them in a pot.

The conscious decision and awareness of this method of plucking out the plant is based on the perceived importance of the plant and the community member's recognition that it should be handled in a manner that will enable it to grow again. In response to the issue of commercialisation and the unsustainable harvesting of traditional medicinal plant by the local sellers, Mr Sobhuza noted the following:

I took it [Euphorbia clavarioides] and planted it in my own garden because of the overhunting challenge we face where people dig these plants to sell in town. Some plants are practically finished now on the mountain, that's why I chose to plant them in my own garden.

This was a popular alternative for the community members because they rely on the traditional medicinal plants and herbs but cannot afford to travel to other communities to harvest them every time the need arises. It was noted as the alternative of choice because it constitutes sustainable harvesting of the traditional plants while keeping them sacred, i.e., away from the local town.

4.4 Indigenous Knowledge of Traditional and Cultural Practices

A third theme which emerged from the data is the community member's Indigenous Knowledge relating to various traditional and cultural practices. The community of Zwelitsha is a relatively small rural village, therefore, the practices defined below make up a large part of the community member's daily lives.

4.4.1. Traditional practices for blessings and protection

There is a fundamental relationship which exists between the community members and their ancestors. As a result, the traditional and cultural practices observed in the community are influenced by, and in observation of, a spiritual connection and relationship with the ancestors. Burning Helichrysum Odoratissimum, (phefo/impepho) is an old traditional practice which is still observed in the community. The regular practice of burning Helichrysum Odoratissimum is defined in the following statements

You burn Helichrysum Odoratissimum for the smoke… to invite the presence of ancestors so you can speak to them (Mrs Lekgolokwe)

And

You burn it so there is a smoke and then you speak to the ancestors.(Mrs Mokoena)

The practice of burning Helichrysum Odoratissimum reveals a multifaceted understanding and use of the Helichrysum Odoratissimum plant, that is, beyond a physical healing perspective to oneof a spiritual connection. The presence of the ancestors is also known to bring protection and blessings toa family.

Other people also burn incense when there is lightning so that it does not strike in that household. (Mr Sobhuza)

And

> *Traditional medicines heal you [holistically], not only the illness you have. There are blessing which I get because I have used the Helichrysum Odoratissimum, it's a plant of the ancestors. (Mrs Lekgolokwe)*

For the people of eZwelitsha, the Helichrysum odoratissimum enables a healing which goes beyond the flu to spiritual illnesses and attacks which can only be evaded at the presence of the ancestors. In addition, there is another plant which is it is used to attract financial blessings and provide protection, the Alepidea amatymbica, locally known as Lesoko. However, this plant does not symbolize nor invite the presence of the ancestors.

> *They [people] keep a small piece in their wallets. You know how you sometimes receive money, but it gets finished before you could do meaningful things? No evil spirit can affect your finances! I mean fly-by-nights [Witches] will struggle to reach you.*

The Sesotho name for this medicinal plant is Lesoko, and it means something which is hard to find. It is apparent that the name is derived from its function, making those who carry it in their wallets to be inaccessible to evil spirits and witches who cause financial afflictions. The portability of the plant by the respective individual means that it offers a protection which is not confined to a particular space.

4.4.2. Umqombothi: Traditional Beer

The making and use of Umqombothi was a key discussion relating to some of the cultural practices which the community engages. Specifically, the method of its preparation as well as the preparation of the ingredients demonstrates a complexity which disqualifies this Indigenous Knowledge as everyday knowledge. Mrs Mokoena explained the process in the following terms:

> *For [the making of] Umqombothi, its malted sorghum, Maize- meal, and wheat - you mix them together. Then you warm up some water and then add to your mixture but be careful not to heat your water too much. After this, you boil water again and then add it to the mixture, the water should have boiled this time! Having done this, you stir everything together and then close the lid of the container in which you made the mixture. During that period, the beer is brewing, and it will even become sweet, you should boil water again. When the beer is now sweet, you add it to the mixture again so as to dilute it. Then, when the mixture is lukewarm, you add homemade yeast, if you add it in a hot mixture then it won't work, it should be lukewarm. Now when everything has fermented, you take the water which has risen to the top of the container and pour it into a pot and*

boil it. When it has boiled you take beer dough from the side and add it into the pot until it is thick enough – let's just say you cook it until it is ripe. Then you remove the pot from the fire and when it has cooled, it should not be cold because it will delay the fermentation process so it should be "lukewarm" – a term of your people, you now pour malted sorghum on the mixture and homemade yeast if you are in a hurry. When everything has fermented but not sifted for the grains, you look at the foam/bubbles if you are someone who doesn't know how to make Umqombothi. If the amount of foam in the container is increasing and then turns white first and then later decreases in the container altogether, you know it is ready. After this you will sift it so as to remove the grains and then it is ready for drinking.

This procedure was described as an intricate and complex process which requires the utmost attention and skill. During the focus group discussion, the participants noted how the practice of preparing Umqombothi had changed compared to the time of their youth. Particularly, they noted that the ingredients were did not include much of the western ingredients used today. In terms of Malted sorghum, for example, Mrs Lekgolokwe noted that there was a traditional method of making it rather than buying it:

You immerse the maize in a bucket of water for about three days and then when it has softened you can take it out and place it inside a sack and put it out in the sun where it can harden, you put it out there for about 7 days. By the time you take it out you will find that the maize kernels are attached to each other. You can then use this instead of malted sorghum.

Unlike in western culture, the primary use of the traditional beer was described in terms other than intoxication. Umqombothi was described as a basic and sacred requirement which is used for communication between the living and their ancestors.

For us African people, it's a necessity to have Umqombothi in any event because it's our way of communicating with our ancestors who are no longer in this world. We communicate with them through Umqombothi, so everything we do needs to have Umqombothi. (Mrs Mokoena)

The events implied in this statement were described to be celebratory events, ceremonies dedicated to the ancestors, funerals, and even parties of a western nature which are hosted by the youth. In the latter case, the justification of the making and presence of Umqombothi during the party was to invite the presence of the ancestors for blessings and protection. The dependence on Umqombothi as a means for inviting the ancestors was constantly highlighted in the focus group discussion.

Umqombothi is a way of connecting the ancestors with the living so that they are present in our lives. If there is any ceremony you need to perform then you should make Umqombothi otherwise the ancestors are not a part of it (Mr Sgubevu)

It is evident from these statements that the presence of ancestors is an important part of the lives of the community members. Since, protection and blessings are highlighted as primary dutiesof the ancestors in the community member's lives, it can be inferred that they are the mostimportant part of the daily lives of the community Elders., Consequently, this places the ancestors at the centre of life in the local community.

4.4.3 Traditional Practices related to Pregnancy

In relation to teenage pregnancy, there were two traditionalpractices which were discussedin the focus group discussion. It is important to note, however, that much of the practices were amatter of abstinence rather than prevention. The first practicedescribed for its usefulness in the prevention of teenage pregnancy is the use of Cannabis or, more precisely, its grains which are to be takenorally by the teenage girl. Mrs Leqalana described it in the following terms:

As far as I know, what prevents pregnancy is the grain of cannabis (thotse ya matekwane). You drink it in the same manner you drink pills. In fact, it is known that if you drink one grain then you won't be pregnant for an entire year, if you drink two years it will work for two years and so on. That is one way of preventing pregnancy.

The use of cannabis grains to prevent teenage pregnancy was a practice of which only a few of the community members were aware. As a result, the community members were not able to account for the origin of the practice. A second practice which was more common in the community was the eating/drinking of milk for new brides.

Even now as a xhosa bride, my sister who is married to a xhosa family told me this, you cannot eat milk just after arriving at your new marital home. There is a specific time you should spend first, after which the elders will inform you that you are now able to eat milk and they give it to you for

the first time. You do not eat it as a new bride!

In this case, milk was thought to be a food which would increase the fertility of the woman and potentially disrupt them from fulfilling their bridal duties in their marital home. The tradition of setting apart a specific period for the eating of milk by the bride represents a traditional practice observed in the marital context. An additional cultural practice observed in relation to milk was its ingestion when girls were at a house which is not their home.

Our elders also forbade us from eating anything with milk when we are outside of our homes. We were told to eat milk only if we are in our own homes, not as visitors in other homes. (Mrs Leqalana)

During the focus group discussion, the community members expressed some reliance on the abstinence of certain foods as means to reduce the possibilities of pregnancy. Specifically, the foods from which teenagers abstained include eggs (both boys and girls) and animal intestines (girls). Furthermore, meat was also noted through the abstinence of food called 'matshela-nokana', food which has crossed the river.

Let us say for example, there is meat coming from another village coming to this household, teenagers are not allowed to eat this meat because it has crossed a river. (Mrs Mntambo)

The observation of this traditional practice was noted for its effectiveness among the women who were part of the focus group discussion. The practice was something which they had held dear from their youth and continued to observe it today, transmitting it to the daughters. In addition, the logic of a reduced consumption of meat was described by the community members in the following terms:

The elders taught us never to eat food that causes blood to flow faster increases. So, the idea is that food which causes this condition should not be eaten by children.

The fast flow of blood noted in the previous quote is understood to be an increase in blood pressure. This condition is understood by the community members as the cause of sexual stimulation which would lead to teenagers engaging in sexual activities. As a result, the practice of abstinence from meat and milk (when the girl was away from home) was valued for its perceived normalisation of blood pressure. Foods which were consumed by teenagers as alternatives included the following:

It is pap and mageu, and home cooked bread made from wheat as well as vegetables. (Mrs

Lekgolokwe)

The previous food items were regarded as potential triggers for an increased blood pressure which may lead to sexual stimulation and teenage engagement in sexual activity. In relation to the prevention of pregnancy, traditional practices which includeabstinence from certain food types were important practices maintained by the community members.

4.4 Conclusion

The findings of the study demonstrate the Indigenous Knowledge which is relevant to the grade 12 Life Sciences CAPS in the local community. The knowledge of traditional medicinal herbs and plants; sustainability for traditional medicinal plants and herbs; and cultural practices and beliefs were largely described in relation to the ancestors, thus demonstrating the relational ontology of the indigenous community. In the next chapter, I will discuss the meaning of these findings in light of existing literature and make a case for the integration of the knowledge with the grade 12 Life Sciences CAPS.

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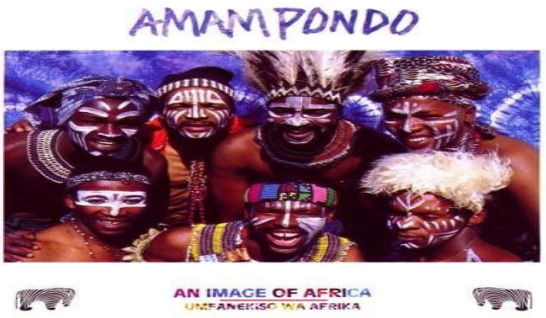
Chapter 5: Discussion of Findings and Conclusions

"Amahlathi aphelile"



Amahlathi aphelile is a Xhosa expression which means there is no longer a forest in which one may hide. This is selected as a theme because it articulates my aim to describe a form of indigenous knowledge and science integration which leaves no hiding place for the persisting colonisation of the curriculum.

The theme song for this chapter is Majola by Amampondo. The song calls for the release of the man Majola from prison so he can assist in solving problems at home. Thissong resonates with the call made in this study for the metaphorical release of Indigenous Knowledge from the shackles of inferiority imposed by western narratives. The picture demonstrates one of many ordinary South African villages in which this knowledge is available.



https://www.youtube.com/watch?v=sOTi5d0YKy8.

5. Discussion of findings and conclusions

5.1 Introduction

In the previous Chapter, I presented the findings of the study and described them in terms of three themes which emerged: Indigenous Knowledge of Traditional medicinal plants, Issues of sustainability for traditional medicinal plants, and Indigenous Knowledge of traditional and cultural practices and beliefs. In this chapter, I will discuss the indigenous knowledge presented in the themes in light of existing literature and its relevance to the grade 12 Life Sciences CAPS. I will subsequently draw a conclusion on how the integration of this Indigenous Knowledge with the Grade 12 Life Sciences CAPS may occur, and also offer a few recommendations.

5.2 Indigenous and Scientific Knowledge: A convergence

The Indigenous Knowledge described in the previous chapter holds demonstrable comparability with western scientific knowledge, implying a convergence between the two forms of knowledge. For example, the use of traditional plants has long been a source of western medicinal innovation (Du Toit & Van Der Kooy, 2019). Specifically, the Indigenous Knowledge of traditional medicinal plants such as the Artemisia Afra and Xysmalobium undulatum has been empirically generated and tested by the community members and verified through western scientific methods and standards (Novotna et al., 2020). The health purposes for which Artemisia Afra is used in the community, as informed by the beliefs and convictions of the indigenous community members,

has been scientifically justified in that the plant possesses pharmacological properties which are useful for the relief of flu symptoms such as sore throat (Suliman, 2010; Taaka, 2016).

Similarly, the African Potato which is used for the treatment of high blood pressure in the local community has been scientifically proven to have anti-inflammatory, antineoplastic, antioxidant, antidiabetic, and anti-infective properties (Owira & Ojiwole, 2009). As such, the community member's knowledge of traditional medicinal plants satisfies Horsthemke's (2008) criteria for scientific knowledge because it can be objectively and universally studied and proven. In accordance with Hountondji (1997), It is clear from the findings that bodies of knowledge which are generated and stewarded in local communities cannot always be reduced to myths and legends but can be critically tested and verified. This scientific knowledge, as it exists in the local community, is precisely what Gibbons (2000) refers to as a context-sensitive science which is defined as scientific knowledge which has been produced and verified outside the confines of a western scientific laboratory. As noted in this study, this knowledge is important for rural communities because it provides alternative access to medicine in instances where the clinic is too far or lacks the required western medicine. Thus, it is a science which is practiced in service of the needs of the community members rather than for the purposes of theory and abstraction (Le Grange, 2007).

There is also a science which is embedded in traditional practices such as the making of Umqombothi. In other words, there is an existence of a body of Indigenous Knowledge which comprises conscious scientific choices, logics, and activities. On one hand, Xolo et al. (2024) demonstrate that the making of Umqombothi can be studied for its chemical and microbiological changes during the process of fermentation. This is a recognition of the chemical reactions which are ignited at the making of Umqombothi. As demonstrated in the findings, the making of Umqombothi in the local community comprises intentional decisions aimed at a specific outcome, thus it is not a random mixture of products. On the other hand, Hlangwani et al. (2020) show that Umqombothi, as a final product of a chemical process, can be studied for its composition and characteristics. In both cases, the assertion made by Ogunniyi (2004) of a science embedded within Indigenous Knowledge is demonstrated by the findings of this study inthe case of the making of Umqombothi.

The community's Indigenous Knowledge of the making of traditional beer and use of traditional medicinal plants, therefore, demonstrates the practice of science albeit without the abstract, theoretical values (Le Grange, 2007). It is evident, therefore, that a selection of Indigenous Knowledge from the community can be prescribed without compromising the scientific nature of

the Life Sciences curriculum. It is important to note however, that although Horsthemke (2008) would describe this knowledge as scientific on the basis of its non-context dependent nature, it is in fact indigenous because it is generated from the indigenous worldview of ubuntu and has been in the stewardship of indigenous people long before their contact with colonial forces (Ndofirepi & Ndofirepi, 2012). Therefore, the continuous (rather than discrete) relationship between indigenous and scientific knowledge suggested in this study does not imply the reduction of the former to a scientific paradigm. Rather, it is a decolonial lens of the content of Indigenous Knowledge beyond and contrary to colonial narratives of its inferiority.

5.3 Indigenous and Scientific Knowledge: A divergence

Although some elements of the Indigenous Knowledge described in the previous chapter has comparability with scientific knowledge, both remain different. The distinct feature which differentiates Indigenous Knowledge from western scientific knowledge is that the former arises out of a relational worldview (Khupe, 2014; Latulippe & Klenk, 2020). As such, it accounts for the seen and unseen, the physical as well as spiritual, thereby creating a point of divergence between the two forms of knowledge since western scientific knowledge largely (if at all) accounts for the seen and the physical. The ontological basis of the community members in this study is in line with Makgoba's (2014) assertion of the spiritual essence of Indigenous Knowledge. Specifically, Makgoba (2014) states that Indigenous Knowledge comprises a spiritual aspect which arises from the relationship of the living-dead (ancestors) with living relatives and their environments. This is an important element of Indigenous Knowledge which stems from a worldview that is fundamentally holistic, i.e., body and spirit, thus informing an epistemology which comprises these elements (Khupe, 2014). The community member's cultural practices are informed by their relationship with the ancestors and constitute an important part of their identity. Recognising this reality in indigenous communities, Le Grange (2007) asserts that the Indigenous Knowledge generated from such communities should not be excluded from the educational experience of the learner because this undermines their identity.

Whereas the Indigenous Knowledge of traditional medicinal plants and the making of Umqombothi may be complementary to western scientific knowledge, it is clear from the findings that these forms of knowledge are fundamentally different. For example, as noted by Makgoba (2014), the importance, and singular role of traditional beer in South African indigenous communities is that it is a form of prayer to invite and acknowledge the presence of the ancestors. The conceptualisation of umqombothi as a traditional type of prayer by the local community, therefore, is in line with Makgoba's (2014) understanding of the role of traditional beer. Importantly, the making of Umqombothi is not a practice which is engaged for scientific and

chemical purposes but for the connection and communication of the living-dead and their relatives. As a result, the spirituality which informs practices found within the local community cannot be masked in an attempt to socialise Indigenous Knowledge into the framework of science. Indigenous Knowledge remains indigenous and elusive of the narrower framework of scientific logic.

This idea extends to some traditional medicinal plants noted in the findings such as the Helichrysum odoratissimum which was been conceptualised as 'the plant of the ancestors' by community members, that is, a plant which is sanctified and empowered by the living-dead. As a result of this understanding, findings of the study which are inconsistent with scientific knowledge, for example the oral ingestion of cannabis as a prevention for pregnancy, remain true for the community members because of the dedication of the plant to the powers of the ancestors. In this case, the spirituality of Indigenous Knowledge is not only confined to practices which may be described as subjective, but also extends to account for naturally observable objects. Therefore, the knowledge pertaining to traditional medicinal plants, issues of sustainability as well as the knowledge of traditional and cultural practices have been defined in ancestral terms, thus demonstrating spirituality as an unavoidable centrepiece of Indigenous Knowledge in the local community in which the study was conducted.

5.4 Integration of Indigenous Knowledge with the Grade 12 Life Sciences CAPS

Two important ideas have been discussed in this section: the convergence of indigenous and scientific knowledge in which the former is a part of the latter, and the divergence in which the two forms of knowledge cannot be reconciled due to their distinct ontologies. Furthermore, two further ideas emanate from the discourse of Indigenous Knowledge and science integration: the value of Western Scientific Knowledge and its role in global development (Horsthemke, 2008), and the value of Indigenous Knowledge and its value in the everyday cultural-spiritual lives of the indigenous people and as a potential source of scientific innovation (Makgoba, 2014; Odora Hoppers, 2004, Hountondji, 1997). According to Taylor and Cameron (2016), the convergence of the two forms of knowledge discussed in the findings can be described as an inclusive perspective of IKS where Indigenous Knowledge is understood as a part of science. In contrast, the divergence of the two forms of knowledge can be described as an exclusive perspective in which Indigenous Knowledge and science are based on different worldviews which cannot be integrated (Taylor & Cameron, 2016).

Given that the position taken in this study is that both forms of knowledge are valuable for a decolonised Life Sciences curriculum, I reject the inclusive perspective of Indigenous Knowledge

and Science integration because it masks the ontological bases of Indigenous Knowledge and socialises Indigenous Knowledge into the narrower scientific framework. Specifically, this approach to integration uses a form of particularisation where the Indigenous Knowledge that is useful for, and in agreement with, science is selected as curriculum knowledge while its relational ontology and associated beliefs are ignored (Agrawal, 2002). More explicitly, it can be determined from the findings that the inclusive perspective is not an appropriate approach for Life Science CAPS because the knowledge found in the community is derived from a different ontology to scientific knowledge. For example, although the making of Umqombothi can be described in scientific terms, it cannot be ignored that the choices, logic, and activities engaged by the community members arise out of a relational worldview inclusive of spirituality. As such, this knowledge does not form part of the scientific framework of knowledge and is not accounted for.

It is apparent, therefore, from the Indigenous Knowledge described by the local community members of Zwelitsha that an intersecting approach of integration is both appropriate and justified. The intersecting perspective of Indigenous and Scientific knowledge sees the two domains of knowledge as intersecting (Taylor & Cameron, 2016). With specific reference to the findings of the study, the two domains of knowledge intersect at the point of procedural knowledge such as the making of Umqombothi, and at the point of factual knowledge such as the knowledge of traditional medicinal herbs. As such, meaningful integration of Indigenous and Scientific knowledge in the Grade 12 Life Sciences CAPS can occur when the knowledge described by the community members is included in the curriculum due to its intersection with scientific knowledge but inclusive of its relational ontology and associated beliefs. The curriculum which is the product of this form of integration acknowledges the knowledge, beliefs, and ontology of indigenous people without compromising scientific knowledge. Therefore, it is the position of this study that the juxtaposition of the two forms of knowledge with a clear articulation of the worldview of the indigenous people in the Grade 12 Life Sciences CAPS constitute a decolonised curriculum.

5.5 Decolonising grade 12 Life Science CAPS - Some suggestions for integrating Indigenous Knowledge to the present curriculum

Due to the social realist structure of CAPS as stated by Zippin et al. (2015), western scientific knowledge dominates in the Grade 12 Grade 12 Life Sciences CAPS while Indigenous Knowledge is marginalised if not excluded. As a result, the grade 12 Life Sciences curriculum in its current form has limited space for the integration of the Indigenous Knowledge described in this study. In order to define the space for Indigenous Knowledge integration, I consider the

Specific Aim 3 of the Life Sciences CAPS as an indication of the possibility for Indigenous knowledge to be integrated with the grade 12 Life Sciences curriculu. Specific Aim 3 "relates to understanding the applications of Life Sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between Indigenous Knowledge and science" (Department of Education, p. 13). Given this overarching principle and basis for integration, I use the three strands of knowledge which exists and are assessed in the current Grade 12 Life Sciences CAPS as a framework for the meaningful integration of Indigenous Knowledge. The strands which make up the framework consist of: Life at the molecular, cellular and tissue level; Life processes plants and animals; and Diversity, change and continuity. These strands are broad enough to account for the integration of Indigenous Knowledge with the grade 12 Life Sciences curriculum. However, the topics which are describedin the Grade 12 Life Sciences CAPS as subsets of these knowledge strands are too narrow to allow for meaningful integration. As such, integration of Indigenous Knowledge can meaningfully occur if the basis is the knowledge strand rather than the specific topic. Given this framework which considers the various topics prescribed by the CAPS, the integration of Indigenous Knowledge according to the pluriversal orientation means an expansion of the existing Grade 12 Life Sciences curriculum to account for new knowledge.

In the first knowledge strand, Life at the molecular, cellular and tissue level, the topics include Deoxyribonucleic acid (DNA), Ribonucleic acid (RNA) and Meiosis. These topics are founded on the premise that "all living organisms are made of atoms which combine to form molecules" (Department of Education, 2011, p. 23). However, in light of the spiritual emphasis in the way of life of the community members described in the findings, scientific explanation of the origin of life is insufficient as it does not acknowledge indigenous worldviews. Therefore, although this is valid knowledge according to the epistemological implication of pluriversal perspectives, it neglects the spirituality embedded within Indigenous Knowledge as demonstrated in the findings, thus undermining indigenous culture, beliefs, and identities. In order to meaningfully integrate Indigenous Knowledge in the grade 12 Life Sciences curriculum, the scientific explanation of what makes up living organisms can be complemented by Indigenous Knowledge of traditional and spiritual activities that sustain life. As evident in the findings, these traditional activities include the making and use of Umqombothi, as well as the use of Xysmalobium undulatum and African Potato as means of acquiring health, blessings, and protection from the ancestors, without which individuals are understood as incomplete and vulnerable living beings. The spirituality of Indigenous Knowledge is a central component which arises from their relational worldview. Accordingly, scientific explanation of the origin of life is insufficient and remains a colonial

interpretation without the spiritual emphasis in the knowledge of indigenous people.

In terms of the second strand of knowledge in the grade 12 Life Sciences which is life processes in plants and animals, there is greater space for the integration of the Indigenous Knowledge described in the findings. The topics in this strand of knowledge are reproduction in vertebrates and human reproduction. The strand focuses on "the ways in which animals are able to respond to their environments in order to ensure survival" (Department of Education, 2011, p.55). Accordingly Indigenous Knowledge of traditional medicinal plants such as the African potato as well associated beliefs of spiritual protection against evil can be integrated as it shows the various methods which indigenous people have been using to improve their sexual health and sustain their pregnancy to term. Indeed, this would strengthen the social basis of the Grade 12 Life Sciences CAPS in accordance with the curriculum's aim of showing the application of science in everyday life. Furthermore, the traditional food practices such as prohibiting teenagers from eating eggs and meat, as well as prohibiting newlywed brides from consuming milk before the appointed time could be integrated in the human reproduction topic. It is important to note that this would not compromise the validity of scientific knowledge. Rather, it would ensure the representation of epistemologies, cultures and beliefs which operate outside the universalist framework of scientific knowledge, thus showing the multiple epistemologies of the various worlds which make up the pluriverse.

The fourth knowledge strand in the Grade 12 Life Sciences CAPS is environmental studies. However, this strand of knowledge is neither taught nor assessed in grade 12 Grade 12 Life Sciences CAPS, as such no topics are prescribed. On the contrary, the curriculum focuses on the third knowledge strand which is diversity, change and continuity in which topics of Darwinism and human evolution are prescribed. It appears that the exclusion of this knowledge strand at grade 12 level limits the possibility of the sustainability issues described in the findings. This includes the methods used by the community members to harvest the plants, as well as the cultural significance which is contrary to the commodification of the traditional plants. As such, integration of Indigenous Knowledge in this case would mean inclusion of the environmental studies strand of knowledge for the grade 12 Grade 12 Life Sciences CAPS. Indigenous Knowledge integration would include a description of the spiritual significance of various plants such the Helichrysum Odoratissimum which was referred to as the plant of the ancestors. Rather than a botanical description, the topic of sustainability could be introduced in relation to the health uses of the plants (physical and spiritual) as well as the importance of the plants as key aspects of Indigenous Knowledge. In this way, rural learners would have access to the knowledge of traditional medicinal plants and the general population of learners would understand how

scientific medical innovation can be informed by indigenous communities.

Although some space exists for various elements of Indigenous Knowledge in theGrade 12 Life Sciences CAPS, the integration of Indigenous Knowledge and, therefore decolonisation,cannot occur unless the curriculum is repositioned to account for the multiple epistemologies which exist in South Africa and the world. As such, it is the position of this study that the integration of Indigenous Knowledge has to be preceded by a conceptualisation of a Life Sciencescurriculum which shifts away from social realism to pluriversality. This would enable an integration which does not compromise the relational nature of Indigenous Knowledge by fitting it to an existing subject which is already dominated by Western Scientific Knowledge. Limitations of the Study

Ease of communication with the participants during the semi-structured interviews was a significant limitation of this study. Due to the historical perception of researchers coming into villages with oppressive and invasive intents, a number of the participants were initially uneasy since they had never been part of a research interview before. However, this was overcome by the researcher through prior engagement with the participants to thoroughly explain the nature of research interviews.

In addition, writing was a barrier for some of the participants as they did not attend formal school. As such, they could not read nor sign the consent forms themselves. This was overcome in two ways, firstly, by allowing the community members to give verbal consent upon reading the consent forms in IsiXhosa and Sesotho depending on the language spoken by the community member. Secondly, by allowing them to appoint a person to sign on their behalf for the purposes of accountability. This is noted as a limitation because it may have suggested a marginalisation of community members who cannot read or write in accordance with the process of academic research.

5.6 Suggestions for future research

Based on the research findings, it is evident that more Indigenous Knowledge could have been described from a larger sample comprising participants from different communities. This is possible because local community members are custodians to diverse knowledge(s). As a result, more conclusive generalisations and theorisation of Indigenous and Scientific knowledge integration can be made from a larger sample of participants who are located in different rural communities with different needs, cultures, and geographies.

Furthermore, the scope of this study did not extend to the pedagogies which are required to implement the intersecting approach of Indigenous and Scientific Knowledge integration.

Therefore, a study which looks at the appropriate pedagogical theories and strategies for the implementation of this form of integration would make a much-needed contribution to literature. This is particularly the case since existing theories allude to socio-constructivist pedagogies which imply an inclusive approach to integration.

Finally, as alluded to in the study, the theorisation of Indigenous Knowledge and science integration can benefit from scientific investigations of the plants and herbs which are used traditionally within indigenous rural communities. This could possibly inform the extent of the intersection of Indigenous Knowledge with Scientific knowledge for broader understanding ofthe former's integration in the Life Sciences CAPS.

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Appendix

Semi-Structured Interview Schedule

This interview is based on the knowledge which is used in this community. Specifically, I am interested in knowledge regarding community medicine, health foods, farming methods and conservation of natural resources. Although I am familiar with some of the knowledge and practices in the community, I will maintain a partial stance in the descriptions and perspectives offered by the participants.

1. Who are you in the community?
2. How would you describe the Zwelitsha community?
3. Which of the following fields are you more knowledgeable in between community medicine, farming method, health foods, conservation of natural resources?
4. Which community members do you think are more knowledgeable in the fields you didnot choose?
5. How is this knowledge used in the community?
6. Who possesses this knowledge in the community?
7. Why is this knowledge important for you?
8. How has the knowledge changed over time?

Focus Group Interview

Medicinal Plants and Practices

1. In cases of illness, what are some of the indigenous medicines that you use in this community?
2. Which diseases are cured by the respective medicines?
3. Are these medicines easily accessible or only specialist people know them?

Biodiversity & Classification

1. How do you make Umqombothi?
2. What are some of the ways you use to turn fresh milk into maas?
3. How do you make poor infertile soil fertile without using fertilizers?

Human Reproduction

1. What traditional methods do you know for the prevention of pregnancy?
2. What are some of the cultural responsibilities assigned to teenagers during puberty?
3. What herbs are available to make men sexually active and productive?
4. What traditional processes and medicines are given to pregnant women?

Participant Information Sheet



Dear Sir/ Madam

My name is Neo Lefora, I am a master's student in Curriculum Studies at the Wits School of Education, University of the Witwatersrand, Johannesburg. I am conducting a research study under the supervision of Dr Alfred Masinire. The study is entitled "Exploring Indigenous Knowledge as Curriculum Knowledge for the Life Sciences Curriculum and Assessment Policy Statements: What Rural Communities Can Offer in South Africa".

This letter is an invitation requesting your presence and participation at a Focus Group Discussion involving you and four other members. The focus group discussion, which last about one hour, will be followed by individual interviews on a different date and will last not longer than 45 minutes. The date, time and location of the sessions will be announced closer to the date.

I would like to request that the focus group discussion and individual interview be recorded so that I can accurately represent your views in the final Research Report. The data which will be generated from these sessions will be stored safely in a password protected computer that only I will have access to.

The confidentiality and anonymity of your name is guaranteed in the Research Report. Specifically, any identifying information such as your name or specific address which may come up in the interview process will be omitted from the report. Furthermore, with your permission, other researchers may use the data collected from this research, but your name and identity will remain confidential.

There is minimal risk associated with this study. As such, the likelihood and magnitude of possible harm are no greater than those imposed by daily life in a stable society. If the focus group or interview session becomes uncomfortable or stressful for any reason, you have the right to withdraw without any chargers or penalty. There is no remuneration, financial or

otherwise, which will be received as a result of your participation in this study. In the same manner, there is no payment which will be expected of you in order to participate.

Since this research study will be written up as a research report and publication, it will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

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

Yours sincerely,

Neo

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Focus Group Consent Form

Title of project: Exploring Indigenous Knowledge as Curriculum Knowledge for the Life Sciences Curriculum and Assessment Policy Statements: What Rural Communities May Offerin South Africa

Name of researcher: Neo Lefora

I,....., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study	YES	NO
I agree that the focus group discussion may be audio recorded	YES	NO
I agree that direct quotations from the focus group discussion maybe used by the researcher in their research report and/or manuscript	YES	NO
I agree that my participation will remain anonymous (my name will not be used by the researcher in their research report and/or manuscript	YES	NO
I agree that other researchers may use the information I provide in the focus group (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on	YES	NO

…… (signature)

…… (signature)

…… (name of participant)
…… (date)

…… (signature)

…… (name of researcher/person seeking consent)

Semi-Structured Interview Consent form

Title of project: Exploring Indigenous Knowledge as Curriculum Knowledge for the Life Sciences Curriculum and Assessment Policy Statements: What Rural Communities May Offerin South Africa

Name of researcher: Neo Lefora

I,....., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

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

…… (name of p1a0rticipant)

…… (signature)

…… (name of participant)

…… (date)

…… (signature)
…… (name of researcher/person seeking consent)
…… (date)

Ethical Clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | WSoE Wits School of Education

SCHOOL OF EDUCATION ETHICS COMMITTEE

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

CLEARANCE CERTIFICATE	PROTOCOL NUMBER: 2023ECE33M
PROJECT TITLE	Exploring Indigenous Knowledge as Curriculum Knowledge for Life Sciences Curriculum and Assessment Policy Statements: What Rural Communities May Offer In South Africa
INVESTIGATOR	Neo Lefora
SCHOOL/DEPARTMENT OF INVESTIGATOR	Wits School of Education
DATE CONSIDERED	10 July 2023
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	Minimal risk
EXPIRY DATE	Date of submission of the Research Report
ISSUE DATE OF CERTIFICATE	CHAIRPERSON
29 August 2023	Dr. Batseba Mofolo-Mbokane

cc: Dr Alfred Masinire

DECLARATION OF INVESTIGATOR

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

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

Signature _____ Date _26_/_09__/2023___

Letter of Approval from the Chief

BATLOKOA TRADITIONAL COUNCIL

Enq: Chief Lehana
Cell: 079 976 4718 / 078 029 4758
: 083 295 1567
Fax: 039 257 9008

Hill Gate Great Place
P.O. Box 374
Mount Fletcher
4770

Email Address: lehana@jgdm.gov.za
chiefmontoeli294@gmail.com

The TO WHOM IT MAY CONCERN

Sir/Madam

This serves to confirm that Batlokoa Traditional Council does not have any objection against Mr Neo Lefora ID no: 971118 5921 080, student no: 2622451 as he will be conducting his research study in Tlokoeng Town that is under my jurisdiction. His research will be based on exploring indigenous knowledge as curriculum knowledge for life sciences curriculum and assessment policy statements : what rural communities may offer in South Africa.

Yours Faithfully,

Chief Montoeli Tyrone Lehana

10 OCT. 2023
Date

BATLOKOA TRADITIONAL COUNCIL
HILL GATE
P.O. Box 374 / 20
Mount Fletcher, 4770
Date.....Signature:.....