

Exploring working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in food preservation

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By

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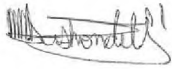
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January 2020

Declaration of Originality

I Hashondili Sabina; hereby declare that this thesis is my own original work and has not been previously submitted in any form for assessment or for a degree in any other higher education institution. All ideas, quotations and other materials used in this study derived from the work of other people have been acknowledged using complete references according to Rhodes University Education Department Guidelines.



05 March 2020

Signature

Date

Abstract

Many scholars have reported that science teachers are grappling with linking science to learners' everyday life experiences and Namibian science teachers are no exception. As a result, learners are finding that scientific concepts often remain decontextualised and abstract. In light of this, the Namibian National Curriculum indicates that teaching and learning should start with the knowledge and experiences of learners from home. It also encourages teachers to integrate local knowledge into their science lessons but does not give proper guidelines on how science teachers should go about enacting this. This tension between curriculum formulation and implementation triggered my interest to carry out an interventionist research study aimed at exploring working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge on food preservation in particular.

This study is underpinned by an interpretive paradigm, within which a qualitative case study was employed. It was conducted with three Grade 6 Elementary Agricultural Science teachers from three different schools in the Oshana region of Namibia. I used semi-structured interviews, document analysis, workshop discussions, participatory observation and reflections to gather data. Vygotsky's socio-cultural theory together with Shulman's pedagogical content knowledge theories was used as lenses to analyse my data. The findings of the study revealed that the sample teachers understood what indigenous knowledge is and its benefits but struggled to integrate it in their lessons. The findings of the study further revealed that the presentations by the expert community members enabled these teachers to identify possible science topics that they could teach, using some of the traditional practices such as food preservation. The study thus recommends that teachers need to be supported on how to integrate local knowledge or indigenous knowledge in their classrooms. Teachers should therefore be involved in professional learning communities that will help them share their difficulties they encounter during their teaching practices and to collaboratively come up with strategies to overcome such difficulties. Community members who are custodians of the cultural heritage should be invited to share their indigenous knowledge with science teachers so that they can link it from community members to classroom science.

Key words: Agricultural Science, scientific knowledge, food preservation, local knowledge, socio-cultural theory, PCK

Dedication

This thesis is dedicated to my precious children Salom Kondja- Tate, Sereny Ndapanda and my husband Phillipus Shetunyenga who gave me moral support during my study. He took care of our children while I was away from home.

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List of Abbreviations and/or Acronyms

ACE:	Advanced Certificate in Education
BEd:	Bachelor of Education
BETD:	Basic Education Teacher Diploma
CK:	Curricular Knowledge
CPD:	Continuing Professional Development
ETSIP:	Education Training Sector Improvement Programme
IK:	Indigenous Knowledge
LCA:	Learner Centered Approach
MKO:	More Knowledgeable Other
MoE:	Ministry of Education
NCBE:	National Curriculum for Basic Education
NLC:	Network Learning Communities
PCK:	Pedagogical Content Knowledge
PK:	Pedagogical Knowledge
PLCs:	Professional learning communities
SMK:	Subject Matter Knowledge
TSPCK:	Topic Specific Pedagogical Content Knowledge
TMESD:	Transformational Model of Education for Sustainable Development
UNAM:	University of Namibia
UNICEF:	United Nations International Children's Emergency Fund
UNESCO:	United Nations Educational Scientific and Cultural Organisation
ZPD:	Zone of Proximal Development

CHAPTER ONE: SITUATING THE STUDY

1.1 Introduction

The main aim of this study was to work *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge on food preservation. In this chapter, I describe the background of the study based on the National Curriculum for Basic Education in Namibia, as well as the subject policy for Agricultural Science (Namibia, 2009). This is followed by my personal experiences, the statement of the problem and the significance of this study. The research goal, questions and summary of the theoretical and analytical frameworks of the study are highlighted. Lastly, the key concepts used in the study are defined and the thesis outline is provided. I end with a chapter summary.

1.2 Background of the Study

Due to colonialism in most of the African countries, Africans were forced to adapt to the Western culture resulting in them undermining their own culture (Du Preez, Fernandez & Shaanika, 2016). Such colonial hegemony was exacerbated by the fact that the African education system valued westernised science and regarded it as a powerful epistemology (Ogunniyi, 2007a; Shizha, 2013). Furthermore, Shizha (2013) bemoans the fact that African learners are taught science with no reference to their local or indigenous knowledge. Additionally, most teachers do not seem to be making an effort to integrate local or indigenous knowledge in their classrooms.

For instance, in Asheela's (2017) study conducted in Namibia, some teachers involved in her study indicated that they had no experience on how to use local or indigenous knowledge to carry out hands-on practical activities in their science classrooms. This is caused in part by lack of indigenous knowledge (IK) features in the curriculum and the structure of the education system that makes it hard for teachers to integrate IK into their teaching practices (Seehawer, 2018). They thus only teach what was in the textbooks (westernised science). In consequence,

this affects learners' performance in science since they cannot link the westernised science taught at school to their everyday experiences (Le Grange, 2007; Shizha, 2007).

This dilemma persists even though many educational curriculums have recognised the importance of integration of local or indigenous knowledge in science classrooms (Nyika, 2017). In the case of South Africa, the integration of indigenous knowledge into education is featured in the curriculum but this knowledge is not yet part of the exam (Seehawer, 2018). Bourke (1999) accentuates that the Australian curriculum for indigenous people should reflect indigenous heritage and experiences. This was done to value their indigenous ways of doing things (Aikenhead & Jegede, 1999; Kibirige & van Rooyen, 2006). These scholars believe that indigenous knowledge has the potential to reduce the feeling of foreignness within learners and might help them to close the border between their everyday experience and westernised science, what Aikenhead and Jegede (1999) refer to as border crossing.

Similarly, the Tanzanian former president Benjamin Mkapa, pointed out at the UNESCO 10th intergovernmental meeting on intangible cultural heritage that indigenous knowledge has all along been and continues to be the primary factor in the survival and welfare of the majority of Africans. As a result, the University of Namibia (UNAM) has also looked at the importance of indigenous knowledge and builds its international reputation on it. In light of this, UNAM documented and interfaced Namibian indigenous knowledge systems and cultures with other knowledge systems. This gives Namibian IK value to create bridges with other cultures and knowledge systems.

For instance, it states that teaching should always begin from the wealth of knowledge or cultural capital that learners bring with them from their homes or community (Namibia. Ministry of Education (MoE), 2016). Likewise, the Senior Primary Phase Elementary Agriculture Syllabus (Namibia. MoE, 2014) reiterates that the starting point for teaching and learning should be from the wealth of knowledge and experience gained from family, community and through interactions with the environment (Klein, 2011; Ngcoza, 2019). Seehawer (2018) suggests that the integration of IK is a process of intellectual empowerment and decolonisation, thus she calls on the agency of teachers, parents and community elders to enter the academic arena. It is further stated that each learner is an individual with his/her own needs, pace of learning, experiences and abilities. It is suggested, therefore, that teachers should

take into consideration learners' socio-cultural backgrounds (Mavuru & Ramnarain, 2017; Vygotsky, 1978).

In addition, the National Curriculum (Namibia. MoE, 2010) states that learners learn best when they are actively involved in the learning process through a high degree of participation (Sedláček & Sedova, 2017). The study conducted in Namibia by Asheela (2017), also revealed that IK promotes learners' participation and interest in science and helps them ask questions and think critically, making the link from what they know to classroom science.

Both the curriculum and the syllabus are in favour of integrating IK during teaching and learning. However, IK is hardly specified in these curriculum documents and do not give clear guidelines on how IK should be integrated in science lessons, especially considering that teachers might have no IK themselves (Seehawer, 2018). In addition, the curriculum does not explain how teachers should teach in multicultural classrooms and is silent on the integration of local or indigenous knowledge during teaching and learning.

The Namibian government also realises that its society needs to acquire entrepreneurial skills in order to cope with economic challenges. Thus, Elementary Agriculture has been introduced as a subject to lay the foundation for development of human resources as the basis for self-employment (Namibia. MoE, 2015). Teachers are required to provide scientific background for learners with the hope to produce agriculturalists for the country.

1.3 The Namibian National Curriculum of Basic Education

The National Curriculum for Basic Education (NCBE) is the official policy for teaching and learning (Namibia. MoE, 2016). The NCBE is the policy that guides schools on how to organise teaching and learning processes and ensure coherent and consistent education in each Namibian school. The NCBE provides the framework for development of syllabi, learning materials, and textbooks to be used in the various subject and areas of learning. This document was developed based on the Constitution of the Republic of Namibia, as well as to give direction towards the realisation of Namibia's Vision 2030.

Namibia Vision 2030 describes a Namibian society that strives to achieve the vision of having citizens who are proficient in language, who understand the processes of development and environmental issues, and who are healthy and creative. *Vision 2030* requires a regular review

of the National Curriculum in order to strengthen the teaching of science and allow the science curriculum to respond to the needs of the learners. For this vision to be realised, every citizen should at least have a basic understanding of Natural Science and learners should be empowered with scientific knowledge and skills which they can use to improve their living standards, as well as sustain the natural resources. This empowerment can be done through various means including teaching approaches. Thus, the NCBE emphasises the use of a learner-centred approach (Nyambe & Wilmot, 2008).

A learner-centred approach is a teaching and learning strategy in which learners are at the centre of learning. In this approach, teaching and learning processes consider the cultural capital of learners and the starting point should be what learners already know from their homes (Roschelle, 1995). Thus, learners are required to use their cultural background knowledge when constructing their science knowledge (Mavuru & Ramanarain, 2017). Ogunniyi (2007a) indicates that learners are loaded with science from their home backgrounds. In this regard, Nyika (2017) stresses that what learners learn from their homes or from their culture can be used in the classroom as the foundation for learning new concepts. This should be taken advantage of, so that they can share their experiences and learn science concepts in relation to their experiences.

The National Curriculum states that Agricultural Science should be optional. My assumption is that the curriculum developer did not regard this subject as important. The National Curriculum is not responding to the goal of *Vision 2030* that states that by the year 2030, the country wants to have agriculturalists in order to meet the government's needs.

The Namibian Curriculum was revised in 2016, aiming to develop learners' competencies, attitudes and emphasising the participation of learners during teaching practices. However, after the revised curriculum, teachers were not given in-service training to help them change their pedagogic strategies (Shulman, 1986). As an attempt to address this challenge, the Namibian government developed the Education and Training Sector Improvement Programme (ETSIP) with the intention to improve continuing professional development of teachers. Essentially, this programme was developed to provide teachers with the necessary skills in order to upgrade their knowledge and ultimately ensure quality teaching. In the same vein, the National Subject Policy for Agriculture (Namibia. MoE, 2009) encourages schools to have school-based staff development programmes on a regular basis, to ensure that all subject

teachers are professionally developed. This is also emphasised in the national policy for Agriculture.

1.4 National Subject Policy for Agricultural Science

This is the subject policy that provides guidelines for subject managers. It guides teachers in organising their administrative duties and planning teaching and learning to meet the expectations of the national standards and performance indicators. It encourages individual teachers to take initiative, especially in presenting subject content and facilitating learning of Agricultural Science. Agricultural Science was introduced in schools in order to lay the foundation for the development of human resources as the basis for occupation or self-employment. The aim of teaching Agricultural Science in schools is to provide learners with a scientific background with the hope of producing more scientists and agriculturalists that are needed in the country.

The National Subject Policy for Agricultural Science (Namibia, MoE, 2009) also encourages teachers to consider learners' prior knowledge in their teaching practices. In the context of this study, prior knowledge could be in the form of learners' local knowledge. Prior knowledge serves as a starting point for constructing new knowledge in the classroom (Angaama, Fatoba, Riffel, & Ogunniyi, 2016). Agricultural Science has the potential to afford teachers an opportunity to build a relationship between the school and the local community and to ensure effective teaching and learning. The involvement of community members in teaching might improve learning outcomes and reduce absenteeism in schools (Klein, 2011).

Additionally, the National Subject Policy for Agricultural Science (Namibia. MoE, 2009) encourages teachers to create their own teaching aids so that they are able to link their explanation to teaching materials. Furthermore, the National Subject Policy for Agricultural Science (Namibia. MoE, 2009) encourages teachers to create awareness among learners on how they can use agricultural skills for entrepreneurship and self-employment. Lastly, teachers are thus advised to demonstrate how agriculture can contribute to world-wide freedom from hunger and teach how food is preserved. It is against this backdrop that this study sought to explore ways of working *with* Grade 6 Elementary Agricultural Science teachers in understanding and developing model lessons that integrate local knowledge on food preservation.

1.5 Personal Experience

I grew up in a rural area in which local or indigenous knowledge was part of my upbringing. Being raised by a grandmother, gave me an opportunity to learn much about my culture and what was expected from me as a young girl. For instance, my grandmother taught me how to make *Oshikundu*¹ as our dairy drink and as a source of food. I grew up in the house where my grandmother used to brew *Ombike*² almost every Saturday. Pounding *mahangu*, collecting fire wood and fetching water were my daily chores.

During my time in school we were never taught something that related to what we did at home. As a result, the examples that the teachers used were things I had never heard of. This forced me to memorise what I was taught without understanding. After I completed Grade 12, I went to college to study science. The curriculum at the college did not feature local or indigenous knowledge (IK). What we were taught there was also not related to what we knew from our homes or communities and this affected my teaching. That is, my teaching was only based on what I had learnt at school and college. Admittedly, I did not know then, that what I had learnt from my grandmother was also part of science.

I have learned in the past eight years teaching science, that it is not an easy subject to teach, since imparting scientific knowledge has its own challenges. I hardly ever took the context of the learners into account by considering what they knew from home in the lessons I taught. I only taught according to what I had planned, following the basic competencies from the syllabus. I also only followed what was in the textbook, without bringing in the traditional ways our parents used to teach us back home.

I remember one time when I was teaching the topic ‘groups of animals’ to a Grade 6 class. Since they had to give examples of each group of animals, a certain learner asked me to classify *Etikinyau* (an animal similar to a dog kept as a pet and linked to witchcraft) in one of those groups. It was hard for me to answer this question because I did not know such an animal. Other learners also tried to find out more from this learner, while others concluded that the family of this learner were ‘witches’. This made me nervous to ask about learners’ prior

¹ *Oshikundu* is the home made Namibian Oshiwambo traditional drink that is made from *mahangu* flour. It can be given to children as a form of food.

² *Ombike* is traditional brew.

everyday knowledge (Kuhlana, 2011). In addition, I only concentrated on finishing my scheme of work, unknowingly depriving the learners of opportunities to learn.

The other weakness I have noted in my teaching career is that I neglect valuable knowledge from our community. There are times when I teach some topics of which I have little understanding, yet there are people in the community who are more experienced in that area. In my experience on Agricultural Science where my study is focused, I realised that the Namibian government views Agricultural Science as a less important subject. When I started teaching I was given Agricultural Science to teach, even though I was not trained to teach this subject at college. The school management gave me this subject just because I had studied science. Yet, the National Curriculum stipulates clearly that the subject needs qualified and well trained teachers to be able to deliver agricultural skills to learners. Besides that, since I have started teaching this subject, I have not attended any workshops or training to share the difficulties I have encountered regarding this subject. This was also indicated by a research participant during our first workshop.

Agricultural Science is a subject that reflects what learners do at home, but many people do not view it as an important subject. Instead of relating our teaching to what learners know from home, we only teach exactly what is in the textbooks. My participants expressed the same problem. They also indicated that the 40 minutes allocated to this subject is not enough to demonstrate and show learners how they preserve food traditionally.

When I joined Rhodes University to do an honours degree, I was exposed to how indigenous knowledge could be integrated in science lessons. I found out that indigenous knowledge is important to learners and how it makes the lessons more interesting to learners. For instance, during our first contact session in Namibia, a practical demonstration of preparing *Oshikundu* was done to show the process of fermentation and formation of carbon dioxide (Asheela, 2017). Similarly, when I was doing my master's degree, we attended a research design course in Grahamstown and experienced the indigenous practice of making *umqombothi*³. Additionally, we were given an assignment in our second year, where I invited a parent to come and show how they purify water traditionally. All these experiences motivated me to do research on the

⁴ *Umqombothi* is traditional alcoholic beverage made in South Africa.

integration of local or indigenous knowledge on teaching, by inviting community members who are the custodians of this cultural heritage of how food is preserved traditionally. This was done in order to integrate IK and to improve pedagogical knowledge towards science.

In Namibia, studies have explored opportunities for including indigenous knowledge and practices into animal husbandry for Grade 10 Agricultural Science lessons (Siseho, 2019). This scholar found out that there is indigenous knowledge in animal husbandry for disease prevention and treatment of livestock. Similar studies on integration of indigenous knowledge, for example, Nikodemus (2017), has shown how important indigenous knowledge is to learners and how learners link what is taught in the classroom and what they know or see in their local contexts. However, the focus of these studies was not explicitly looking at working with community members to demonstrate cultural practices to teachers in order for them to use the local knowledge in their classrooms. My study thus sought to close the gap by working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in the topic of food preservation.

1.6 Statement of the Problem

In Namibia, the National Curriculum is in favour of integrating local or indigenous knowledge (IK) during teaching and learning. However, the curriculum documents do not give clear guidelines on how local or IK should be integrated in science lessons. Most of the studies conducted in Namibia have indicated that teachers face some challenges in integrating IK in their teaching practices (Asheela, 2017; Nikodemus, 2017; Mika, 2018). It is against this background that in this interventionist study, I explored working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in the topic of food preservation, so that they could integrate IK in their Grade 6 classrooms.

1.7 Purpose and Significance of the Study

Central to this study is the use of community members' cultural heritage on traditional ways of food preservation. I thus aimed to work *with* Elementary Agricultural Science teachers in co-developing model lessons that integrated such local knowledge. Therefore, the study informed the teachers (including me) involved in this study on the importance of local knowledge and how to integrate it in our lessons. Additionally, the presentations by the community members might help teachers to value their cultural heritage and use it to contextualise westernised

science. Hopefully, this might lead to culturally responsive instructional practices as recommended by Mhakure and Otulaja (2017).

1.8 Research Goal and Research Questions

1.8.1 Research goal

This main goal of this study was to explore working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in the topic of food preservation.

To achieve this goal, the following research questions were addressed.

1.8.2 Research questions

1. What are Grade 6 Elementary Agricultural Science teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?
2. What lessons can Grade 6 Elementary Agricultural Science teachers learn or not about food preservation through co-analysing the curriculum documents?
3. In what ways did Grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the community members?

1.9 Theoretical Framework

This study is informed by two theoretical frameworks, namely, Vygotsky's (1978) socio-cultural theory, as well as Shulman's (1986) pedagogical content knowledge focusing specifically on the five components of Topic Specific Content Knowledge (TSPCK) by Mavhunga and Rollnick (2013). Vygotsky (1978) believes that learning takes place through social interactions with materials from people's cultures in their society. Shulman (1986, 1987) states that a teacher needs to present the subject matter knowledge drawing from learners' knowledge, in order to facilitate learning to enhance the understanding of the subject content.

1.10 Data Gathering Techniques

- Semi-structured interviews;
- Document analysis;

- Workshop discussions;
- Participatory observation; and
- Journal reflections.

1.11 Definitions of Key Concepts

Agricultural Science: Science that deals with the production of crops and farming and how food is processed.

Scientific knowledge: Knowledge that is supported and proven by validation.

Food preservation: The process of storing food for later use.

Local knowledge: This is the knowledge we learn locally or from parents or society.

Socio-cultural theory: A theory that focuses on learning and how knowledge is constructed in the dynamic interactions between people and their society (Vygotsky, 1978).

Pedagogical content knowledge: The way of representing and transforming subject matter knowledge to make it comprehensible to others (Shulman, 1986).

1.12 Thesis Outline

The thesis consists of six chapters and an overview of these chapters follows.

Chapter One: Situating of the study

In the first chapter, I explained the context of this study. The Namibian National Curriculum and the subject policy for Agricultural Science were discussed. It also provided reasons as to why this study was carried out. This included the purpose, the statement of the problem, significance of the study, research goal and questions. Theoretical and analytical frameworks were introduced. The data gathering techniques were described and the key concepts defined.

Chapter Two: Literature review and theoretical framework

The second chapter of the study provides an overview of the literature relevant to the study. It also looks at the concepts of indigenous knowledge, food preservation, professional development and professional community learning. The theoretical and analytical frameworks used in the study are described in this chapter.

Chapter Three: Research design and methodology

The third chapter presents the research design, methodology and data gathering techniques used to gather data and the rationale behind their use. Further, the research paradigm, research site, participants and sampling are explained. Lastly, an overview of the data analysis process is presented.

Chapter Four: Semi-structured interviews and document analysis

This chapter gives a narrative description of data generated from the study. I present, analyse and discuss the qualitative data generated from semi-structured interviews and document analysis. This chapter begins with the teachers' profiles and the findings are discussed according to the literature related to the study.

Chapter Five: Presentation by the expert community members and reflections

In this chapter, I present, analyse and discuss the data generated from observations during the presentations made by the community members on how food is preserved. The data gathered from reflection as a technique tool used in this study, are also discussed under this chapter. The findings are discussed with reference to the theoretical framework and literature used in this study.

Chapter Six: In this chapter, I outline the summary of the findings of the study, recommendations and my personal reflections during the research process are highlighted. I also provide recommendation areas for future research. The limitations of the research are also discussed.

1.13 Chapter Summary

In this chapter, the context of the study, research goal and research questions were discussed. In addition the key concepts were defined and the thesis outline was highlighted with the intention to help readers to navigate the study.

In the next chapter, relevant literature informing this study is reviewed and the theoretical framework underpinning the study is discussed.

CHAPTER TWO: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The purpose of this study was to work *with* Grade 6 Elementary Agricultural Science teachers in understanding how to integrate local knowledge in the topic of food preservation. In the previous chapter, I discussed the context of this study.

In this chapter, I thus explore various literatures relevant to my study. I first discuss the methods of preserving food culturally and in western ways. I also discuss the concept of indigenous knowledge (IK) and the importance of integration of local or indigenous knowledge in the classroom. Additionally, the challenges of integrating local or IK in classrooms are discussed. The theoretical and analytical frameworks, Vygotsky's (1978) socio-cultural theory and Shulman's (1986) pedagogical content knowledge (PCK), are discussed. The concept of food preservation is discussed next.

2.2 Food Preservation

Foods are raw materials, processed or formulated and consumed orally by animals and humans for growth and to satisfy social needs (Rahman, 2007). There are a number of different ways of preserving foods. Some involve storage methods, some involve packaging, and some involve treating the food in particular ways prior to or during storage, either cooking it whole or in parts or combining it with other foods or substances.

Aluga and Kambwe (2016) argue that food preservation has become more popular which is happening for many reasons. One reason is that the growing population places pressure on food production to produce enough food with high nutritional value (da Silva, 2019). Da Silva (2019) posits that another reason, is that food in nature begins to spoil the moment it is harvested and can quickly be spoiled by post harvesters' microorganisms. Thus, food needs to

be preserved in order to overcome inadequate planning in agriculture and provide variation in diets (Rahman, 2007).

Essentially, food preservation is the science of extending the shelf life of food while maintaining its nutritional quality as much as possible and avoiding the growth of unwanted micro-organisms (Reza Mozafari, Johnson, Hatziantoniou, & Demetzos, 2008). Following a same line of argument, Preis (2015) affirms that preservation protects food against contamination to make it last longer. This science has been practiced in a variety of ways for hundreds of years (Bureau et al., 2009). Other scholars, notably Nott (2013), defines preservation as doing something to food so that it can be stored and used later. Accordingly, Prokopov and Tanchev (2007) accentuate that food preservation is an action or method designed to maintain food at a desired level of quality. Additionally, they argue that food preservation prevents outbreaks of food borne illnesses resulting from the consumption of contaminated food (Prokopov & Tanchev, 2007). Essentially, preserving food minimises the preparation time and helps people keep their products for later use (Aluga & Kambwe, 2016). Thus, people should know the methods of preserving food.

2.3 Methods of Preserving Food

There are different methods of preserving food traditionally and in western ways. For example, salting, chilling, drying and smoking are some ways of preserving food culturally. Due to the high demand from people, however, the traditional ways of preserving food could not meet the needs of people in society. This meant that modern ways of preserving food were introduced. However, these modern ways have had a negative impact on the younger generation and environment. The younger generation may not know how to preserve their foods in times of crisis because of the electronic ways that have overshadowed or blinded the traditional ways. Notwithstanding, the traditional ways of preserving food have also been critiqued by da Silva (2019), who argues that the process of salting and heating results in a loss of essential components such as vitamins, especially in fruits and vegetables.

The increase in the population and the high demand for food have prompted scientists to come up with modern ways of food preservation, in order to overcome inadequate planning in agriculture to produce value added products (Rahman, 2007). Rahman (2007) acknowledges that the preservation techniques are divided into three categories, namely, *inhibition*,

inactivation and *avoid recontamination*. Even though the traditional ways of preserving food have been critiqued, in this category, inhibition is much the same as how people preserve food traditionally. That is, it has similar characteristics of preserving food culturally by controlling water and temperature.

In the same vein, da Silva (2019) considers the application of enzymes to be the best method of preserving food especially fruits and vegetables. He points out that enzymes are used as bio control agents against fungal infections in post-harvested fruits and vegetables. The enzymes do not change the taste. Instead, they act on the components which mostly attract the fungal cell walls without causing any damage to the food. He further states that enzyme application prolongs the expiry date and offers a promising approach to improve the shelf life of food.

Despite the modern ways of preserving food, the application of enzymes is considered by other scholars as an expensive method of preserving food which might not be affordable to all people. This application is necessary for modern society, but may also have a negative impact on human health. Thus, health programmes are encouraging people to eat and love their traditional foods. African people are also advised to follow their African roots by valuing their culture (Aluga & Kambwe, 2016). Notwithstanding this critique, Aluga and Kambwe (2016) assert that cultural ways are still the best ways because we want the younger generations in Africa to know how to preserve food and pass on such cultural heritage to other generations to come (Mateus & Ngcoza, 2019). Thus, Aluga and Kambwe (2016) encourage people to have knowledge of their indigenous ways of preserving food.

2.4 Indigenous Knowledge

Nyika (2017) refers to indigenous knowledge (IK) as the knowledge gained by people as they live and work in their communities or society. He further extends his definition, saying that IK can be in the form of beliefs and norms; it can include songs, local language and even agricultural practices. Nyika (2017) also posits that this knowledge is learnt from birth and it becomes the foundation for all the kinds of knowledge a person is going to learn.

Thus, Rosales and Sulaiman (2016) propose that people should see IK as an important approach to teaching science. Similarly, Mukwambo, Ngcoza and Chikunda (2014) affirm that there is a dialectical relationship between IK and westernised science. That is, IK is embedded in westernised science and it can be used as prior knowledge to reduce challenges associated with

westernised science (Roschelle, 1995). Again, Kibirige and Van Rooyen (2006) confirm that science teaching is enriched when IK is used in the classroom as a starting point to explore concepts associated with westernised science. African science and westernised science could serve as a bridge that might help discussions in the classroom within the area of science (Aikenhead & Jegede, 1999; Ogunniyi & Hewson, 2010).

Boven and Morohashi (2002) conceptualise IK as a complete body of knowledge knowhow and practices that are maintained and developed by people generally in rural areas that have extended history of interaction with the natural environment. Similarly, Kibirige and van Rooyen (2006) posit that IK is a different and unique knowledge from society to society. Concurring, Rengalakshmi (2013) refers to IK as local or unique knowledge of a specific culture or society. This knowledge is acquired through the accumulation of informal experiences and the intimate understanding of the local environment (Rengalakshmi, 2013).

It for these reasons that United Nation International Children Emergency Fund (UNICEF) (2004) points out that every child has the right to participate fully in *family, culture and social life*. This organisation states that every child has the right to education in cultural contexts which are familiar to their indigenous people. That is, as reiterated by Mavuru and Ramnarain (2017), learners' socio-cultural background is critical in the learning process. This is done with the reasoning that indigenous knowledge should be transferred from one generation to another generation through interaction with the environment (Kibirige & van Rooyen, 2006). This school of thought resonates with Mhakure and Otulaja's (2017) call for culturally responsive pedagogies. Concurring, Govender (2018) has made it clear that African learners are learning in abstract situations because they are not taught science with reference to their local experiences.

Some scholars view indigenous knowledge as a significant contributor in the science discourse. Many studies have concluded that the inclusion of IK in science promotes awareness, provides motivation and self-esteem. It creates cooperative learning that enhances the learners' interaction and results in advantageous learning outcomes (Ogunniyi, 2012). The inclusion of IK in classrooms plays a major role in learning as it helps learners to learn from others who are from different backgrounds and are able to relate their culture to others (Shetunyenga, 2019).

When indigenous knowledge is visible in science lessons, it gives learners the opportunity to develop their ability to gain confidence and self-esteem (Shizha, 2007). Furthermore, it helps learners to link school experience to what they know from home or community and Aikenhead and Jegede (1999) refer to this as border crossing. Hence, IK is understood as a tool to facilitate learners' access to 'real' science (Aikenhead & Jegede, 1999; Seehawer, 2018). The South Africa Department of Basic Education (2011) insists that learners should be taught science in the context of their cultural knowledge from their society. If IK is not included in science, learners might find it difficult to move between the micro culture of family and the school and this will negatively influence their success in science (Aikenhead & Jegede, 1999).

Kibirige and Van Rooyen (2006) acknowledge that when IK is integrated in teaching science, it enhances participation because learners can experience or feel the connection between what they are learning and what they do at home. Even though IK is considered to be the best approach that helps learners to link science to everyday life, some teachers find it difficult to use this approach. In Nikodemus's (2017) study, for instance, teachers indicated that they found it difficult to integrate it in teaching and learning to make science more interesting to learners. They also did not know whose IK they should use in the classroom, because IK is different from culture to culture.

Kibirige and Van Rooyen (2006) also argue that IK is not easily shared among members from different cultural backgrounds because some elements can cause problems for dissemination across cultures. They added that this can pose a challenge especially in multicultural classes. However, Hewson and Ogunniyi (2010) and Shetunyenga (2019), do not agree that there are challenges faced when IK is integrated in the multicultural class, as they believe that the inclusion of IK in science at schools promotes the awareness of different viewpoints in learners' multicultural society and can improve the low achievement rates in science. These scholars thus encourage science teachers to identify and discuss the validity of the beliefs associated with IK. In a similar line of thought, Keane and Malcolm (2003) and Mawere (2015) encourage teachers to make classroom science more relevant through teaching knowledge that is relevant for learners' daily lives and to use IK as a tool to make westernised science more accessible, moving from the known to the unknown.

Besides the difficulties that teachers are experiencing in the integration of IK in their science classrooms, they are encouraged to identify the needs of their learners and design classroom

tasks that bring in the elements of indigenous knowledge that will help learners to connect with classroom science (Kibirige & van Rooyen, 2006). These authors further point out that science teachers should themselves better understand IK so as to identify and discuss the validity of the beliefs associated with it and connect these to the science curriculum to avoid possible misconceptions and potentially harmful information embedded in IK. In light of this argument, Kasanda, Lubben, Kapenda and Campell (2005), advise that teachers should adopt a teaching approach where learners can discover knowledge on their own. If learners are involved, they will be motivated and participate freely and link what is taught and assimilate the new knowledge. In this regard they will learn without any fear especially in multicultural classrooms.

There are, however, counter arguments against the integration of IK in science lessons. For instance, other scholars, notably Cobern and Loving (2001), Hodson (2009) and Horsthemke and Schafer (2007) argue that good science explanations will always be universal even if they contain indigenous knowledge. These authors posit that indigenous knowledge will always be valued on its own merit and plays a vital role in science education. Cobern and Loving (2001) further argue that the reason why science is included in a multicultural classroom is to strengthen and expand the definition of science, which will serve the needs of learners coming from diverse socio-cultural backgrounds (Mavuru & Ramnarain, 2017).

Regrettably, integration of IK in multicultural classrooms is one of the main challenges that science teachers are faced. In response to this dilemma, the conference held at the University of Cyril in 2014 aimed at looking at the challenges teachers face when teaching in multicultural classrooms. The conference identified that one of the specific challenges is working in a multicultural environment and developing multicultural skills in learners during the educational process. Similarly, many scholars also found that teachers should be well prepared to face challenges they might meet in their work and face in multi-cultural classrooms; they should develop skills on how they will integrate IK during teaching for them to share IK through communication and practice (Kibirige & van Rooyen, 2006).

Klein's (2011) study conducted in Namibia revealed that school principals stated that they experienced better performance when there is integration with local communities and an improvement in the high dropout rates of learners. This was attributed in part to the positive relations between schools and parents or community members who are custodians of cultural

heritage. Similarly, Manzini's (2000) findings revealed that learners appreciate the teaching of indigenous knowledge, and classroom observations suggest improved participation (Sedláček & Sedova, 2017).

Nonetheless, Villegas and Lucas (2002) encouraged teachers to be critical examiners of their programmes when teaching in multicultural classrooms. They came up with six salient characteristics of teaching in a class with learners from different cultural backgrounds: (1) Socio-cultural consciousness whereby they need to critically examine their own socio-cultural identities in the school and in society; (2) An affirming attitude towards students from culturally diverse backgrounds: the need to find out the impact of learners' progress, learning, beliefs and the overall academic performance; (3) Commitment and skills to act as agents of change, this enables teachers to confront barriers and obstacles to change and develop skills for collaboration; (4) In line with constructivist views of learning, teachers should provide scaffolding between what learners already know through experiences and what they need to know. Constructivist teaching promotes critical thinking, problem solving, collaboration and the recognition of multiple perspectives; (5) Learning about students: teachers need to know the past experiences, community, cultural and social world both in and outside of school to help to build relationships and the use of experience in the context of teaching and learning; (6) Culturally responsive teaching strategies: it supports the constructivist view of teaching and learning as well as knowledge and includes how teachers assist students to construct knowledge, build their personal and cultural strength and how an inclusive classroom environment is created.

Banks (2006) explicitly describes how teachers should teach in a multicultural classroom. He argues that teachers need to realise that learners learn in different ways and thus we need to teach in different styles that will benefit all learners in class and engage in social activities that might help them to develop professionalism in order to change their teaching practices (Shabani, 2016).

2.5 Professional Development

Teacher development is the professional growth a teacher achieves as a result of increased experiences and examining his or her teaching practices (Kennedy, 2016). Ngcoza and Southwood (2019) define continuing professional development (CPD) as ongoing capacity and

knowledge building. CPD plays a major role in changing teachers' teaching by moving beyond "comprehension of the surface features of a new idea and innovation, to a deeper understanding of a topic" (Rout & Behera, 2014, p. 9).

Professional development is a concept with a meaning that applies to more things. At this point it is referred to the development of a person in his or her professional role (Villegas-Reimers, 2003). "Teacher development is the professional growth a teacher achieves as a result of gaining, increased experience and examining his or her teaching systematically" (Glatthorn, 1995, p. 41). Villegas-Reimers (2003) argues that workshops and in-service training should always be considered, especially during the revision of the curriculum. She further posits that workshops should be conducted to upgrade teachers in order to prepare them for new roles and curriculum related responsibilities.

Eun (2008) suggests that professional development is one of the most effective ways to improve the teaching and learning process. He further explains that workshops are essential in professional development as they create opportunities for teachers to interact with others (Vygotsky, 1978). Workshops are also seen to contribute positively towards professional development of teachers. In this regard, Eun (2008) encourages people, especially educators, to have frequent workshops because workshops are regarded as a learning place that affords teachers an opportunity to share their experiences, knowledge, skills, problems encountered, difficulties and possible solutions (Ngcoza & Southwood, 2019; Nhase, 2019). Nhase (2019) refers to such a space as a 'reflective space'. Borko (2016) also argues that teachers need to be involved in professional development programmes to increase their knowledge and help them to change their teaching styles.

Professional development of teachers can be called in-service education or staff development that is delivered through workshops and mentoring meetings (Villegas-Reimers, 2003). Borko (2016) affirms that professional development is the theoretical framework in which learning is conceptualised through socially organised activities. In this study, the social activities were in the form of workshops that were presented by the community members on how food is preserved traditionally and when we were analysing documents together with the participants. These presentations or activities are regarded as professional learning community.

Professional learning communities (PLCs) are groups of teachers who come together to analyse and improve their classroom practice (Brodie, 2016; Chauraya & Brodie, 2017). It is also a convenient platform for the teachers to share their opinions and teaching experiences with respect to teaching methods and learning processes. From these ideas, it is clear that professional learning communities play a major role in the teaching profession as shown. Teachers voluntarily join these groups with the aim of improving their teaching practice, as there are no external expectations and authorities from the Ministry of Education to direct such discussions. Studies have shown that the success of a PLC is mostly determined by the motivation, aims and goals of the learning community.

Another form of community learning known as Network Learning Communities, focuses on a group of schools working as a unit to enhance the quality of professionalism and to strengthen capacity for continuous improvement (Katz & Earl, 2010). This is based on the ideas of Hargreaves (1998) that teachers should strive to make their professional experiences visible and translate them into shareable knowledge. The idea of Network Learning Communities is similar to the context of this study, whereby teachers came together to discuss syllabus coverage, common plans, scheme of work and other important issues affecting them. Thus, Guskey and Yoon (2009) state, that the most effective way to bring improvement is to have teachers meet to explore common problems and seek solutions based on experiences.

Some professional learning community groups focus on beliefs and practices, because beliefs and practices shape professional success or failure. It is believed that due to the involvement in PLC, teachers might change their curriculum teaching, their learning roles and learning to teach, change their practice but not their belief, change their belief but not their practice, or change their practice and belief; it has also been noted that an effective PLC is essential for teacher development. Professional learning communities tend to benefit the teachers who find themselves in the teaching profession. For instance, teachers can reflect on their teaching methods and other important educational issues. Novice teachers find it easy to find help from their colleagues rather than from experts or heads of department who might visit or never visit the class at all. Again, teachers can engage in collaborative activities such as peer teaching and class observation, with the aim of giving or receiving constructive feedback. As peers or colleagues, teachers can discuss educational issues without fear or favour. This kind of cooperation among the teachers will assist them to be more efficient and effective in their

subject areas, and as a result, learners will benefit. Now I discuss the theoretical and analytical framework below.

2.6 Theoretical and Analytical Framework

This study is underpinned by two theories, namely, socio-cultural (Vygotsky, 1978) and Pedagogical Content Knowledge (PCK) (Shulman, 1986). The socio-cultural theory is a learning theory and it acknowledges social primacy in all human developmental processes. On the other hand, PCK is a teaching theory focusing on pedagogical knowledge which teachers draw on to teach learners. Within PCK, I drew on the seminal work of Mavhunga and Rollnick (2013), and I focused on the five-topic specific pedagogical content knowledge (TSPCK) components as my analytical framework. I now discuss each of these below.

2.6.1 Theoretical Framework: Socio-cultural theory

Vygotsky (1978) argues that people's cognitive development occurs sequentially in two different phases: initially through social interaction on the social plane and then internalisation on the psychological plane. Vygotsky (1978) suggests that there is a link between social interaction and human development in terms of learning, which is, development follows and is created by learning.

Socio-cultural theory is focused on the key role of the society in learning and on how knowledge is constructed in the dynamic interactions between people and their social environment (Vygotsky, 1978). Furthermore, the socio-cultural theory emphasises that interaction, historical and individual factors are key to human development. Vygotsky believes that the community plays a central role in the process of making meaning through social interaction. Stears, Malcolm and Kowlas (2003) stress that individual knowledge is constructed socially and is mediated as a result of cultural experiences.

Social cultural theory describes learning as a social process based on the understanding of human intelligence in the society or culture (Vygotsky, 1978). Vygotsky (1978) believes that meaningful learning is enhanced when learners (teachers in the context of this study) learn through social interactions with materials from their culture. Social interactions should be framed by purposive activities in order to lead to development (Eun, 2008). Lave and Wenger

(1991) also suggest that effective learning for children is formulated within the contexts of their lives including their daily activities, social world and culture.

I am mindful of the fact that this theory is focused more on how children learn or develop (Vygotsky, 1978). However, Eun (2008) suggests that learning and development should not be restricted to children only. He argues that learning and development are essential for both children and adults, especially teachers in the context of my study. Concurring, Shabani (2016) posits that learning in school is applicable to teachers, in order to help them to grow in their work place.

Lemke (2001) took Vygotsky's work further by explaining that socio-cultural theory views science education as social activities conducted within an instructional and cultural framework. He further formulates questions about the role of social interactions in teaching and learning science and in studying the world in both classrooms and research laboratories. In addition, socio-cultural theory also gives theoretical weight to the role of social interactions.

The socio-cultural perspective is more on the development of teaching and learning (Rojas-Drummond, Torreblanca, Pedraza, Velez & Guzman, 2013). These scholars posit that learning and development are achieved through interaction between teachers and learners. They further stress that interaction should reflect the cultural and social practices of the community. In this study, the interaction was between teachers and the community members when they demonstrated how food is preserved culturally, so that teachers were able to integrate this knowledge in their teaching practices.

In my study, I used socio-cultural theory as a lens to determine how teachers learn through social interactions (amongst themselves and with expert community members) and how learning takes place in a social cultural context (Mavuru & Ramnarain, 2017). Within this theory, I used three concepts; namely, *mediation*, *social interactions* and *Zone of Proximal Development (ZPD)* and I now discuss each of these below.

Mediation

Vygotsky (1978) defines mediation as the link between teachers and learners that directly affects learners' understanding of knowledge and skills in science. Furthermore, Vygotsky describes mediation as involving a person who purposefully intervenes in the learning process.

He also argues that mental functioning and human activities are mediated by cultural tools such as language (Gibbons, 2003). Similarly, Eun (2008) accentuates that language plays an essential role in the mental life of an individual. Vygotsky (1978) explains mediation as a tool used in cognitive change. In addition, he further classifies mediational tools as abstract or concrete. In support of this classification, Donato and MacCormick (1994) state that the source of mediation is either a material tool such as language, or behaviour of another human being in social interaction.

Vygotsky (1978) identified three categories of mediation: through material tools, symbolic systems and mediation through other human beings. The important category in this, is mediation through symbolic systems. Teachers need to act as a medium of symbolic mediation especially in the multi-cultural classroom, whereby learners have different understandings and meanings, so teachers have to treat learners fairly to avoid criticism and show them that everyone's culture is important. Teachers need to create a learning environment that maximises interaction and discussion between different learners. Every teacher should be able to show how food is preserved in different cultures. Woodfolk (1998) suggests, that learners should be given opportunities for co-operative learning and encourages them to use language to organise their thinking. Expanding on Vygotsky's seminal work, Eun (2008) further explains mediation as the specific mechanism involved in the transition between social interaction and individual mental function.

Social interaction

According to Vygotsky (1978), learning takes place through social interactions with peers or knowledgeable others (parents, teachers, or learners). He further explains that social interactions can be between different social groups, by interacting with other people, and communicating and sharing the expectations to those new to the situation. Social interaction is the mechanism of distribution of functions and a method of mastering those functions (Rubtsov, 2016). In this study, I realised that when the community members (more knowledgeable others) explained and demonstrated how food is preserved culturally, they were likely to contribute to learning experiences amongst the teachers. The influence of social interaction in this study played an important role. It was through workshop presentations by the community member that I could observe whether or not the participating teachers learned through social interactions with more knowledgeable others (MKO); as well as how these

contributed to the improvement of the zone of proximal development (ZPD) of the participants. This provided an answer to what lessons can Grade 6 Elementary Agricultural Science teachers learn or not about food preservation through co-analysing the curriculum documents.

Zone of proximal development

Vygotsky (1978) described the concept ‘zone of proximal development’ (ZPD) as what a child can do on his/her own and what a child can do with the help of a knowledgeable person. He further extends his description by stating that what a child can do in cooperation today, he can do alone tomorrow. For Stott (2016), the actual development zone is the skills a learner has which can be used to tackle a given problem without assistance. The potential zone is that which can be developed through assistance from the knowledgeable individual or peer (Stott, 2016). The potential of teachers was developed during the development of the lesson plan and science concepts that were constructed during the demonstration of how food is preserved traditionally, made by community members (a discussion and findings from the lesson plans are not part of this study's scope, but an example is given in Appendix H).

Vygotsky (1978) further categorises ZPD in three zones, namely anxiety zone (what a learner can do now), learning comfort zone (what a learner can do with the assistance of a more knowledgeable person) and a comfort zone. Vygotsky (1978) suggests that people who are working in groups, have larger ZPDs compared to individuals.

Gauvain (1993) further defines ZPD as the distance between the actual development as determined by independent problem solving, and the level of potential development as determined through problem solving under adult supervision or guidance in collaboration with more capable peers. Gauvain (1993) further visualises ZPD taking place in three stages: first, what you can do independently; second, what you can do with a bit of help; and third, what you cannot yet do, no matter how much support you get. Vygotsky (1978) proposes that learning needs to move from the known to the unknown, to take the child from the stage of not fully capable to capable, from the stage where learners require help to a stage of self-sufficiency.

Shabani (2016) extends the concept of ZPD from a school setting to teachers. The ZPD of teachers is a learning space between the present level of teaching knowledge and pedagogical knowledge of teaching at the next level, with the support from others (Eun, 2008).

The model (Figure 2.1) below, is adapted from Shabani, Khatib and Ebadi (2010, p. 242) to show how the ZPD of teachers is affected by influential factors.

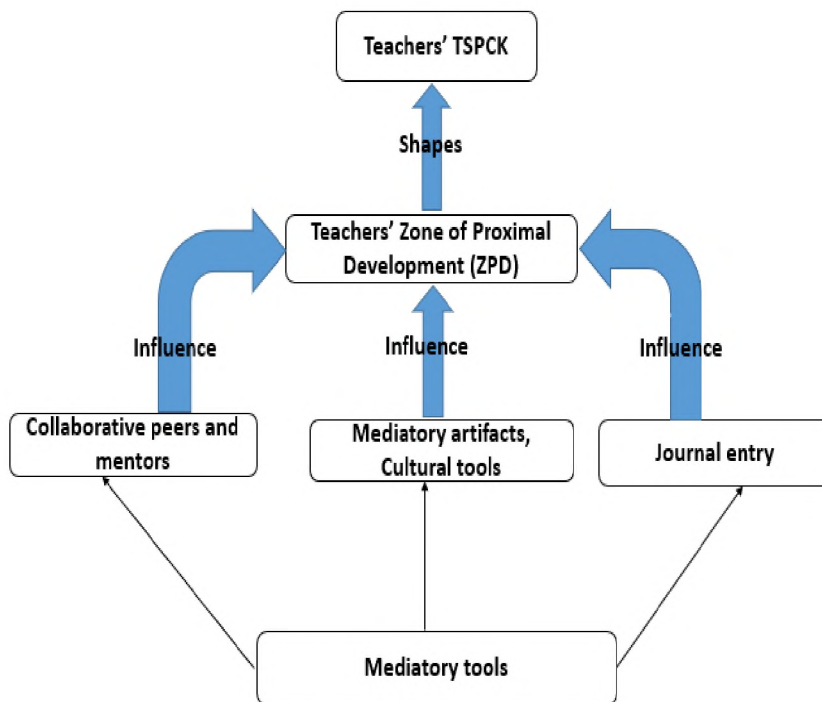


Figure 2.1: *Influential factors on teachers' ZPD (adapted from Shabani et al., 2010, p. 242)*

Vygotsky's (1978) theories consider social interaction to be the main source of professional development. He believes that learning occurs when people are interacting with others in a socially set up environment. The cultural tools used by community members during the demonstration on how food is preserved, acted as mediatory artefacts that mediated learning. These tools also influenced teachers' ZPD, as they asked questions based on them. Kibirige and van Rooyen (2006) argue, that knowledge is reinforced through interactions with more knowledgeable others. The workshops that the community members demonstrated allowed them to share their cultural knowledge on how food is preserved and gave teachers an

opportunity to evaluate and share their experiences on how they teach the topic of food preservation. The reflections that they wrote, were also a mediatory tool to assess their ZPD.

Table 2.1: *Shows a summary of key theoretical concepts related to the intervention within professional development practices (adapted from Eun, 2008, p. 144)*

Key theoretical concepts	Related professional development practices
Social interaction	Workshops, colloquia, seminars, mentoring, meetings, and/or study.
Mediation	Continuous follow-up support that includes the three types of mediators: Tools (material resources); signs (newsletters and journals); and other people (professional networks).
Zone of Proximal Development	Learning and developmental space of knowledge within the teachers' practices, in terms of what the teachers were able to do before the intervention and their abilities to integrate IK in the topic of food preservation.

In this study, the presentation by the two expert community members helped teachers (less knowledgeable) on how foods are preserved culturally and hence contributed to teachers' pedagogical content knowledge (PCK).

2.6.2 Analytical Framework: Pedagogical Content Knowledge

The pedagogical content knowledge (PCK) theory was introduced by Shulman (1986). He defined this theory as the ways of representing and transforming subject matter knowledge to make it comprehensible to others. He based his argument on teachers' knowledge and his interest was on how teachers transfer knowledge to learners, that is, the knowledge that teachers draw from to teach and how they present their lessons to learners. Shulman (1986) proposed three categories of content knowledge for teachers: subject matter knowledge (SMK), pedagogical content knowledge (PCK) and curricular knowledge (CK). According to Shulman (1986), SMK equates to the amount of knowledge in the mind of the teacher. The second category, PCK suggests "the ways of representing and formulating the subject that make it comprehensible to others" (p. 13). The third category, CK, equates to syllabus, scheme of work, textbooks, laboratory demonstrations and other mediating tools in the classroom that make the work understandable to learners. He further stipulated that for teachers to mediate learning

effectively, they should know the subject matter and find the best strategies to employ, to make the content understandable and interesting to learners. Shulman (1986) thus placed emphasis on the knowledge base of teaching, the sources of teacher knowledge and how new knowledge is retrieved. He further stipulated that for teachers to mediate learning effectively, they should know the subject content and find the best strategies to employ in order to make the content understandable and interesting to learners.

Furthermore, Shulman (1986) identified seven categories of teachers' knowledge, namely, subject matter knowledge (SMK), pedagogical content knowledge (PCK), curriculum knowledge, general pedagogy, learners and their characteristic, educational contexts and educational purposes. That is, in order teachers to develop PCK they should know the SMK (Shulman, 1987). He further stated that to foster learning, teachers need to present the SMK to ensure learning is taking place.

These categories were meant to highlight the important role of CK and to situate content-based knowledge in the larger landscape of professional knowledge for Elementary Agricultural Science teachers. In my study, Shulman's categories address general dimensions of teacher knowledge that are the backbone of the teaching profession. This goes along with research question 1: *What are Grade 6 Elementary Agricultural Science teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?*

Moreover, Kind (2009) defines PCK as a concept that represents the knowledge teachers use in the process of teaching and a means of enhancing both teachers' professional status and the process of educating them. Kind (2009) posits that, even though PCK is a useful construct, finding out exactly what it comprises and using this knowledge to support good practice in teacher education is not easy. This knowledge is a hidden concept of teachers' professional views and is not clearly defined and easy to classify. She added that pedagogical content knowledge is not yet an explicit tool used by teachers (Kind, 2009). Even though Shulman views PCK as a distinctive body of factual knowledge for teaching, some scholars criticise his theory that it is not yet backed by theoretical evidence to support the existence of PCK.

Mavhunga and Rollnick (2013) argue that PCK has a topic-specific nature. However, its implementation in teacher education programmes has remained generic and tacit. These authors attempted to improve the quality of PCK in pre-service teachers in a specified topic in

science with the reasoning that, teachers cannot use the same teaching methods for different topics within a subject. They add that teachers need to develop the awareness that teaching requires the transformation of their subject matter knowledge in general; this was also emphasised by Shulman (1986). Mavhunga and Rollnick (2013) further state, that when a specific topic is taught, certain topic specific components of PCK should be considered. Thus, they adapted the five-content specific components of the topic specific pedagogical content knowledge (TSPK). These authors further argue that the five knowledge components are base knowledge that are influenced by the beliefs of the teacher teaching science. Below is the model that shows the identification of the components that Mavhunga and Rollnick (2013) adapted from Geddis and Wood (1997, p. 613) (see Figure 2.2 below).

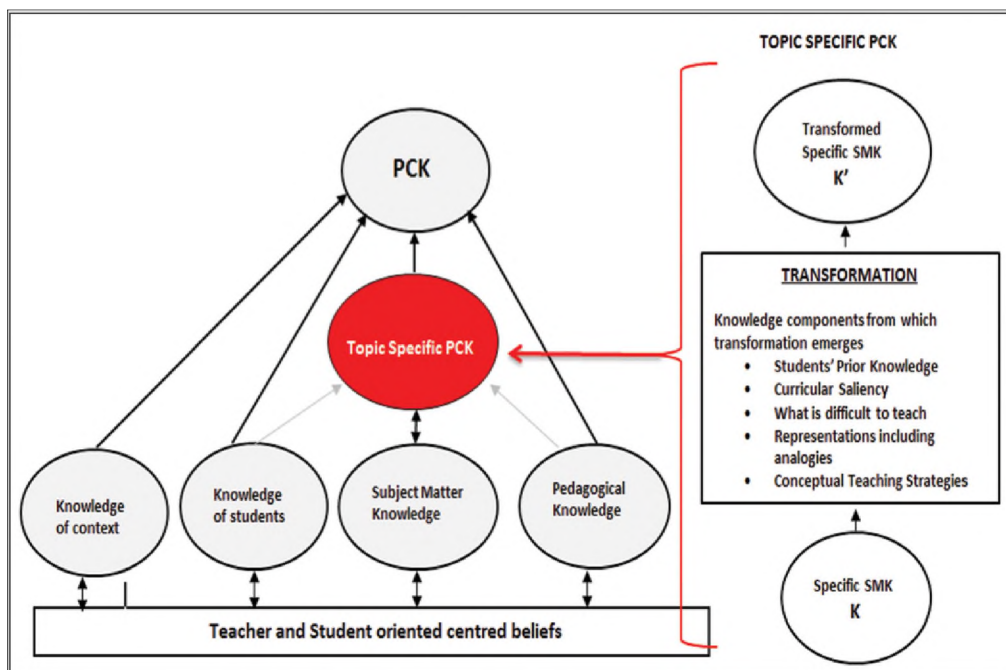


Figure 2.2: *Showing the five components of TSPCK (Adopted from Mavhunga & Rollnick, 2013, p. 115)*

As I said earlier, the diagram shows the model on TSPCK that is needed for teachers to develop awareness that teaching requires the transformation of knowledge. There are five knowledge components from which transformation emerges, namely: “students’ prior knowledge, curricular saliency, what is difficult to understand, representations including analogies and conceptual teaching strategies” (Mavhunga & Rollnick 2013, p. 115). All these mentioned

components play a major role in teachers' pedagogies. Students' prior knowledge requires teachers to have skills in order to understand and handle the misconceptions learners might have on a specific topic. Curriculum saliency also requires teachers to identify the concepts around the topic and the concepts that are needed by learners before the presentation of the topic; the component 'what is difficult to teach', focuses on how teachers deal with concepts which are difficult for learners; representations, have to do with various forms of presenting the subject matter to make it easier for learners to understand, and the last component is the gatekeeper of all the other components and it has to do with the strategies that need to be used in teaching.

I found this important and linked it to my study, as we looked at how to come up with model lessons to use when integrating local knowledge in the topic of food preservation. The model for Topic Specific PCK was used as a lens to co-develop a model lesson on the topic of food preservation and guided the intervention.

Vygotsky's (1978) socio-cultural theory, as well as Shulman's (1986) PCK theory were suitable for this study because teachers within the same community, but who taught in different schools, socially interacted with more knowledgeable others – who were the community member – to share their knowledge on how food is preserved traditionally (Vygotsky, 1978). Teachers then used the knowledge from community members to co-develop a lesson plan in order to improve their PCK on the subject matter content on the topic of food preservation (Shulman, 1986).

2.7 Chapter Summary

This chapter aimed at discussing the various literature that informed this study. I started the chapter with the concept of food preservation and the methods of preserving food. Indigenous knowledge and the importance of IK were also highlighted and I then discussed the analytical concepts from the socio-cultural theory. Lastly, I discussed the theoretical and analytical framework of this study.

In the next chapter I describe the research design and methodology employed in the study.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The aim of this study was to explore working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local or indigenous knowledge on the topic of food preservation. To achieve this goal, I used different research techniques that were needed to achieve the goal of the study. In the previous chapter, I discussed the literature around this study, and the theoretical and analytical tools were also presented. In this chapter, I thus discuss the research methodology that guided this study, and the research design, orientation and paradigm employed in the study are explained. Thereafter, I discuss the research site and participants, as well as data gathering techniques used in this study. Validity, trustworthiness and ethical issues which were considered in this study are also discussed.

3.2 Research Design and Orientation

Research design has to do with how the researchers systemically plan to gather data and how gathered data are analysed to answer the research questions (Bertram & Christiansen, 2015). In this regard, Creswell (2016) explain that research design is a strategy moving from underlying philosophical assumptions to data gathering techniques to be used and data analysis to be done. Bertram and Christiansen (2015) further explain that there are certain criteria to meet the research design, namely, the type of data the researcher needs to collect in order to answer research questions.

The research should stipulate the method the researcher needs to employ in order to collect the expected data. Maxwell (2008) asserts that research design is not only influenced by goals, the conceptual framework, methods of collecting data, research questions, the research setting and conclusions of the study, but it should indicate how the researcher will analyse the data (Bertram & Christiansen, 2015). The research paradigm employed in this study is discussed in the following section.

3.3 Research Paradigm

The term “paradigm” refers to a set of general philosophical assumptions about the nature of the world and how we can understand it (Maxwell, 2008). Okeke and Van Wyk (2015) define a paradigm as a sort of camp to which a researcher belongs in terms of assumptions thinking and approach to research. A paradigm can be used as a lens by which reality is interpreted simultaneously (Nieuwenhuis, 2007).

This study was conducted within the interpretive paradigm. In an interpretive paradigm the researcher aims to describe and understand how people make sense of their worlds, lives and what things mean to them (Bertram & Christiansen, 2015). An interpretive paradigm was used in this study to understand Elementary Agricultural Science teachers’ attitudes towards the presentation of local knowledge from community members on food preservation. It explores in depth each individual’s experiences of the phenomena (Okeke & Van Wyk, 2015). In this study, an interpretive paradigm helped me as the researcher, to better understand teachers’ experiences and understandings of local knowledge on food preservation. Cohen, Manion and Morrison (2018) maintain that, an interpretive paradigm aims to understand the subjective world of human experiences and views the social world as an emergent social process. These authors assume that people construct their own meaning when they interact with the world around them (Okeke & Van Wyk, 2015). However, a researcher should not predict what people might do, but rather understand how people make sense of their world and how they make meaning of their actions.

An interpretive paradigm has to do with people understanding experiences from the individual behaviours and actions (Cohen et al., 2018). The interpretive paradigm was deemed appropriate to my study, as I was interested in teachers’ experiences and understandings towards the presentation of local knowledge from community members on food preservation. It also helped me to investigate how teachers made sense of the local knowledge to develop model lessons as an end product of this study that integrated IK in food preservation. Within the interpretive paradigm, a qualitative case study approach was adopted.

3.4 Case Study

Cohen et al. (2018) define a case study as a specific instance that is frequently designed to illustrate a more general principle. The case study explores the context or the phenomenon and

describes it in more detail. In addition, Yin (2009) suggests that case studies have a particular ability to answer the ‘*why*’ and ‘*how*’ research questions, rather than simply the ‘*what*’ questions. Therefore, they have the potential to evaluate or explain why a particular phenomenon did or did not work. It allows a researcher to examine particular issues in a great deal of depth, rather than looking at multiple instances superficially. A case study was deemed appropriate in this study because I intended to obtain in-depth information on how to integrate local knowledge on food preservation. Hence, my case in this study was exploring selected community members’ cultural heritage on traditional ways of food preservation, with a view to co-developing model lessons that integrated such local knowledge. My unit of analysis, therefore, was the social interactions, participation and learning experiences during the presentations on traditional ways of food preservation by the community members. The reason for this research approach was to do research on how Elementary Agricultural Science teachers’ could integrate IK for the effective teaching of food preservation, from knowledge received from community members.

3.5 Research Goal, Questions and Research Process

The main goal of this study was to explore working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge on food preservation.

To achieve this goal, the following research questions were addressed.

3.5.1 Research questions

1. What are Grade 6 Elementary Agricultural Science teachers’ experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?
2. What lessons can Grade 6 Elementary Agricultural Science teachers learn (or not) about food preservation through co-analysing the curriculum documents?
3. In what ways do Grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the community members?

3.5.2 Research process

Phase 1: Semi-structured interviews were conducted with three teachers who were interviewed individually. The interviews helped me to find out teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation. Additionally, the interviews helped me to gain more information about the importance of integration of local knowledge in Agricultural Science. That is, it helped me to find out how teachers teach the topic on food preservation, and hence guided me on what to ask during the presentations by the community members. This was aimed at answering my first research question of this study.

Phase 2: This phase was divided into two sections. Firstly, I conducted an orientation workshop with the three Grade 6 Elementary Agricultural Science teachers. The aim was to build relationships and trust with these teachers and also to explain to them the significance of the study. We hence set up our research programme for the days we would meet for our workshops, as well as the presentations by the expert community members. We then shared and analysed the National Curriculum, subject policy and syllabus for Agricultural Science (2016), to find out the requirements for teaching the topic of food preservation and elementary Agricultural Science in general. This was also done with a view to strengthening the context of this study.

Phases 3 and 4: The expert community members presented workshops on how food is preserved traditionally or culturally. The first community member demonstrated how a traditional vegetable (*ombidi*) is preserved and the second expert community member presented how wild fruits (*eembe* and *Eenyandi*) are preserved traditionally. During the practical demonstration on how foods are preserved traditionally, I had an opportunity to find out how the process of preserving food could help us link the information to scientific concepts. Additionally, the practical demonstrations by the expert community members also helped me to gain some insights on how teachers interact and participate during the workshops, and how teachers learnt through social interactions as reiterated by Vygotsky (1978). This also helped me to realise the importance of local language and its affordances on how it could be used during mediation of learning (Gibbons, 2003; Msimanga & Lelliot, 2014; Mavuru & Ramnarain, 2019).

Phase 5: During this phase we co-developed a model lesson that integrated local knowledge on the topic of food preservation using the scientific knowledge that was embedded in the presentations by the expert community members. The three teachers also reflected on their experiences of the workshops presented by expert community members. That is, the journal reflection acted as a learning tool to express their experiences on the workshops run by community members (Göker, 2016). Similarly to Nhase's (2019) study conducted in South Africa, the reflective space also helped us to collaboratively reflect on what we had learnt during the presentations by expert community members and most importantly, how to take the knowledge gained to our science classrooms in order to improve our practice.

Essentially, it could be argued that the research process in this study was informed by Chikamori, Tanimura and Ueno's (2019) Transformative Model of Education for Sustainable Development (TIMESD) framework, central to which is designing, implementing and improving IK integrated science lessons. To Chikamori et al. (2019), the TIMESD framework is composed of three learning sub-processes: 'knowing the present', 'past-present relationships' (focusing on the dependence of the present on the past) and the 'future-present'. These scholars refer to the process of studying the past-present relationships as *retroduction* and future-present relationships as *retrodiction* (see Figure 3.1 below).

In the context of my study, however, the specific topic (Mavhunga & Rollnick, 2013) was food preservation. The first sub-process was achieved through using semi-structured interviews and co-analysing curriculum documents. From this sub-process, I tried to find out teachers' experiences, understandings and their pedagogical insights on food preservation and how food preservation is presented in the curriculum documents. For the second sub-process, presentations on traditional ways of preserving foods were made by expert community members. Teachers were, therefore, afforded an opportunity to learn about the past, that is, traditional ways of preserving foods. Notwithstanding, through co-analysing the curriculum documents (the present) we were equipped with lenses to take the present to the past. On the other hand, the third sub-process was achieved through reflections and co-development of a model lesson that integrated local knowledge on food preservation (future). The research process is thus summarised below in Figure 3.1 adapted from Chikamori et al. (2019, p. 9).

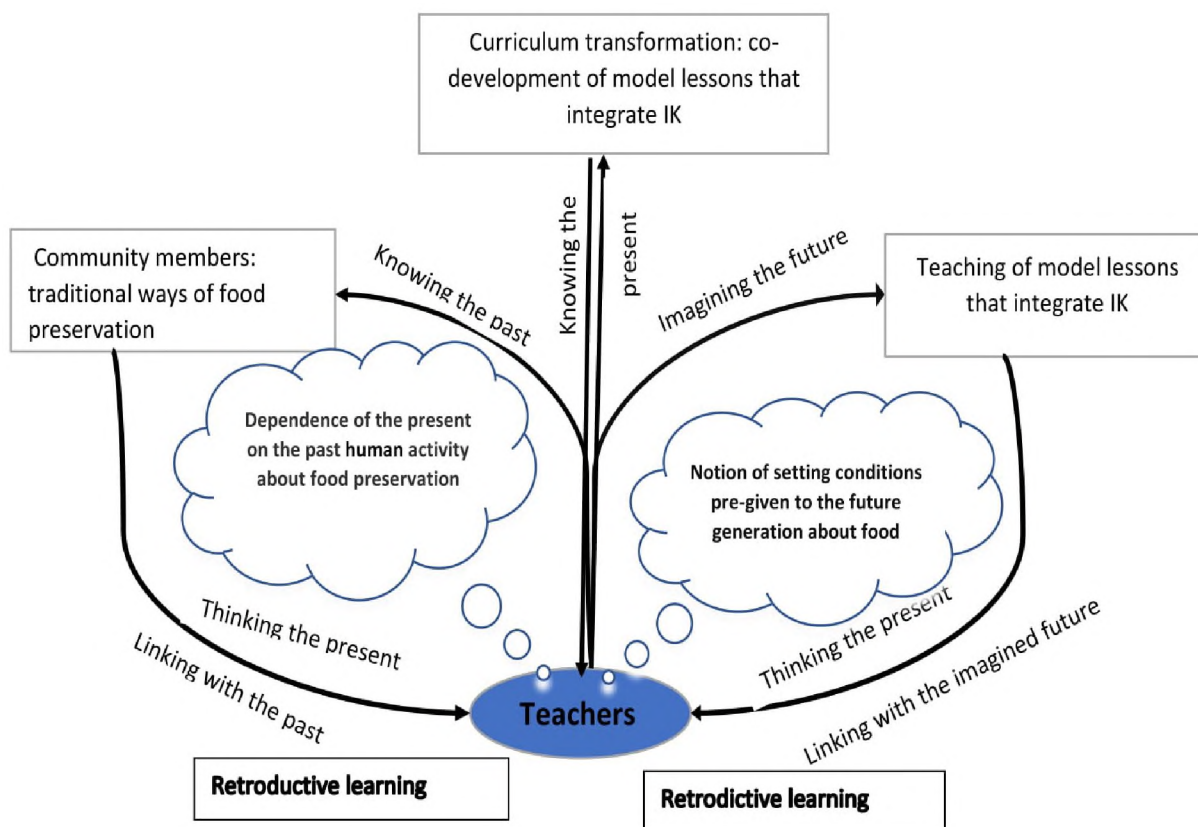


Figure 3.1: Shows the IK-science integration process in this study (adapted from Chikamori et al. (2019, p. 9))

It seems Chikamori et al.’s (2019) TMESD framework is plausible in IK-science curriculum research, since it clearly explains the processes involved on how local or indigenous knowledge could be integrated and enacted in science classrooms.

3.6 Research Site, Participants and Sampling

In the next sections I discuss the research site, participants and sampling. I begin this section with the research site.

3.6.1 Research site

This study was conducted at two different sites. Phases 1 and 5 of this study were carried out in a government school in the Oshana region as shown with the arrow (see Figure 3.2). This school is a rural school in the Onamutai circuit. This school offers Grade 0-9 and at the time of

this study had 554 learners of which 295 were male and 260 female. It had a staff complement of 26 teachers. Although this school offers Elementary Agricultural Science, however, it does not have a functioning garden. As a result, Agricultural Science is taught theoretically. Phases 3 and 4 were conducted at the community members' homes. This was done with the reasoning that some materials those community members used were fragile. I also believed that this would made the study more naturalistic in order to understand the situation from the participants' viewpoints (Bertram & Christiansen, 2015).



Figure 3.2: Shows the Namibian map with different regions

3.6.2 Research participants and sampling

The study was carried out with three Grade 6 Elementary Agricultural Science teachers and two community members. Teachers were from two different schools in the Oshana region. Two teachers taught Mathematics, Physical Science and Elementary Agriculture, one taught Life Science and Agricultural Science with experience ranging between five to 15 years. Two were not qualified to teach Agricultural Science and these teachers were, at the time of the study,

fully teaching Agricultural Science even though they were not college trained to teach it. As a result, the presentations by the community members helped these teachers to benefit from the study on how to link indigenous knowledge to classroom science. This also helped teachers to be more knowledgeable on how food is preserved culturally and be able to link this to their teaching practices. The workshop also helped all of us improve our subject content knowledge.

Sampling refers to the process of defining the population on which the researcher will focus (Cohen et al., 2018). These scholars affirm that sampling is the process used to select a given number of people (sample) from a population. Sampling involves making decisions about which people, settings, events or behaviours to include in the study (Bertram & Christiansen, 2015). Similarly, Maree (2016) asserts that sampling involves making the decision of who to include in the study. In my case, I used purposive sampling to identify participants based on their experience. In purposive sampling, the sample is chosen for a particular purpose (Cohen, et al., 2018).

Purposive sampling was used to select three Elementary Agricultural Science teachers and two community members. The three teachers were selected from two different schools in the Oshana region and had experience in teaching this subject. These teachers were chosen to find out their experiences and understandings towards the integration of local knowledge in their teaching. The community members were chosen because they are the custodians of indigenous knowledge and they were considered to be more knowledgeable others as proposed by Vygotsky (1978), as they are experts on indigenous knowledge.

3.7 Positionality

Positionality plays a role in conducting research. According to Moser (2008, p. 89), positionality refers to factors that “impact on the way we do our research and how the people we work with perceive us”. These factors include gender, race, ethnicity, religion, age, position and the power dynamics related to it. The issue of positionality was addressed to ensure that the participants did not feel forced to participate in the study. I was mindful of the potential power dynamics that could be at play during the research process. As an attempt to counteract these power dynamics, I established rapport and trust with these teachers through explaining that I will be doing this research *with* them rather than on them, as reiterated by Ngcoza and Southwood (2015). First, I explained to them the purpose of the study. Since I had a chance to

meet with them and build good relationships with them, they had the freedom to express themselves without being intimidated to do so. I also managed to talk to the community members who were going to demonstrate to us how food is preserved traditionally. All the participants, including the community members agreed to take part in the study and signed the consent form.

Additionally, by inviting the expert community members who are custodians of the cultural heritage on traditional ways of food preservation and who are regarded by Vygotsky (1978) as more knowledgeable others, I positioned myself as a co-learner in the study. Most importantly, we all benefited from learning how to integrate IK in food preservation by co-developing model lessons that integrated local knowledge.

3.8 Research Methodology

Research methodology is the identification of specific procedures or techniques to use in order to analyse the study (Creswell, 2014). It may be understood as the process of studying how research is done scientifically.

The data from this were collected in six different phases. Phase 1 was my baseline data where we analysed the documents to strengthen the context of my study. This was also done in order to build relationships with participants. Phases 2 to 5 were the main phases of this study and I used semi-structured interviews, workshop discussions, participatory observations and journal reflections as data generation techniques. I now discuss each of these below.

3.8.1 Semi-structured interviews

Bertram and Christiansen (2015) state that “an interview is a conversation between the researcher and the respondent” (p. 80). It is different from an everyday conversation, however, in that the researcher is the person who sets the agenda and asks the questions. Interviews enable participants to express themselves and helped me gain in-depth data from a small sample size. In this study, semi-structured interviews were used.

Cohen et al. (2018) define semi-structured interviews as a conversation between the researcher and respondent. Semi-structured interviews (see Appendix F) has a schedule of questions (mostly open ended) which can be explored in any order and the researcher is free to follow up

on responses in any way deemed appropriate (Bertram & Christiansen, 2015). In this study, I conducted individual interviews with three teachers which were voice recorded with their permission. The interviews were intended to help me to ascertain teachers' experiences, understandings and pedagogical insights into IK in food preservation. The purpose was to gain clarity on their understanding of IK. Further to this, the workshops and demonstrations on how food is preserved by community members also helped me to find out how these teachers interacted and learned in the social setting as is proposed by Vygotsky (1978).

The interview sessions took about 60 minutes and were conducted in English. All three teachers showed that they understood what indigenous knowledge is. However, they indicated that they found it difficult to integrate this knowledge in their science lessons. That is, they had never been taught to use such strategies or approaches. The interviews were transcribed verbatim so that data were not lost or distorted.

3.8.2 Workshop discussions

The workshop presentations were key to my study. Eun (2008) states that the best way to improve teaching and learning strategies, is to engage teachers in training such as workshops that will help them to improve their teaching strategies. In support, Shabani (2016) suggests that teachers should be involved in activities that help them improve their professional development. Similarly, the subject policy for Agricultural Science also states that teachers should have regular workshops in order to improve their subject matter knowledge (see Section 3.6.1).

As I said earlier, I conducted five workshops. The intention of the workshops was to:

- Analyse the Namibian National Curriculum, the Elementary Agricultural Science subject policy and share our experiences on how we teach the topic of food preservation;
- Build relationships and explain the rationale of the study to the participants;
- Strengthen the context of the study and co-analyse the curriculum documents;
- Allow the community members to share their cultural ways of preserving food with the teachers;

- Write down the science concepts merged from the presentations and reflect on the community members presentations; and
- Use the local knowledge presented by the community members to co-develop model lessons that integrated local knowledge on the topic of food preservation (see Appendix H).

Workshop discussion is a vital place for learning through social interactions (Vygotsky, 1978). It creates a learning environment because participants are afforded an opportunity to engage and participate in the activities (Babikwa, 2003; Sedláček & Sedova, 2017). More so, building on Vygotsky's seminal work, Sedláček and Sedova (2017) are in favour of learning through social interactions – this is because it enhances learning as participants are afforded an opportunity to develop their own interpretations, challenge their initial understanding and grow as critical thinkers.

There were two presentations on how food is preserved traditionally by the community members and these were done on different days. The local knowledge presented by community members was subsequently used to co-develop model lessons that integrated local knowledge. Two presentations by the community members were part of the five workshops that were conducted to capture the rich data from workshops (see Section 3.2).

This suggests that bringing a community expert to do a practical demonstration does not only involve parents in the education of their children, but contributes a sense of value to indigenous science so that learners may respect their culture (Cocks et al., 2012). According to the socio-cultural theory, language plays an essential role in the learning process. In line with this perspective, the Oshiwambo language was used as a tool to mediate learning during the presentations by community members. These workshops took place over a period of six days.

The workshops went well. I was impressed by one of my participants who called us and reminded us of our next workshop. All the participants managed to attend and teachers were happy to meet each other, and they shared jokes here and there. The interactions of teachers during the demonstrations made by the community members were good. This was demonstrated by the level of teacher participation. The teachers were interested in being part of the practical demonstrations and they were willing to ask questions and take notes of what the community members were explaining and demonstrating. The vernacular language was

used during the workshops' discussions. There was also evidence that the teachers had gained knowledge from the workshops during the development of a lesson plan and mind map of concepts (see Appendix H). I had an assistant researcher that captured and video recorded all the workshop proceedings with the permission of the participants. During these workshops, I was a participant observer.

3.8.3 Participatory observation

Observation can be classified either as non-participant or participant observations, depending on the role played by the observer. Ivankova (2015) defines observation as the process of observing and recording behaviours and interactions of people in natural settings to explore individuals' experiences in the study. Thus, Maxwell (2012) points out that to have a better understanding of your study, you should be a participant in your own study. This provides a powerful way of learning peoples' behaviours and provides an advantage to the researcher to collect data directly from the real-life lived experiences (Cohen et al., 2018).

According to Cohen et al. (2018), observation is the technique researchers use to generate data in a social situation and this technique resonates both with Vygotsky's socio-cultural theory and Shulman's (1986) pedagogical content knowledge (PCK). In this study I was a participant observer to gain some insight on how teachers learn in the social set up environment. The purpose of observation is to gain first-hand experience and data on a phenomenon (Bertram & Christiansen, 2015). This is a powerful personal data gathering strategy, and is not reliant on others' perceptions. It might give insights into aspects that could be difficult to access in other ways.

Cohen et al. (2018) assert that quality observations are more than just looking – they state that the researcher should closely monitor facts and practices of the target groups without attempting to change them. Thus, I observed how the elementary Agricultural Science teachers were interacting, participating and learning (or not) during the presentations made by the expert community members and observed what exactly was taking place. In addition, it afforded me an opportunity to dig deeper to find out things which may be hidden through enquiry (Creswell, 2016). Furthermore, the demonstrations on how the food is preserved traditionally done by the local experts, also helped me to gain insight into teachers' participation and understanding of the value of indigenous knowledge when teaching science.

Participatory observation is one of the data technique tools that are associated with an interpretive paradigm, thus I used these tools in order to answer my research questions. It was necessary for me to be a participant observer in order to see, hear, feel and observe what actually took place (Bertram & Christiansen, 2015). This also helped me to find out about social interactions as explained by Vygotsky (1978). I also observed the behaviours and attitudes during the community member presentations. This study was naturalistic as it occurred in natural contexts. The expert community members took us outside and showed how they preserved food. This helped me to get authentic data that reflected the experiences of the participants. Being a co-learner and participatory observer in this study, I had an opportunity to observe how participants were interacting and posed questions during the community members' presentations. However, being a participant observer was a bit challenging for me. I needed to divide my time well, so that I could both concentrate on observing and gathering rich data from the discussions.

3.8.4 Journal reflections

Reflections are widely used in many educational contexts and considered as important tools that create understanding (Göker, 2016). During reflections, teachers were given an opportunity to write down their thoughts and experiences and how intellectual involvement affected their interactions with what was being researched (Alvesson & Sköldberg, 2009). Furthermore, Göker (2016) posits that reflection plays a major role in teachers' professional development as it affords them an opportunity to address the problems encountered in order to change their teaching practices. All teachers wrote journal reflections (see appendix G) and they answered all the questions.

Table 3.1: Shows a summary of the data gathering techniques used in this study

Technique	Purpose: To find out	Research question
Semi-structured interview	Teachers' experiences', understanding and pedagogical insight on the use of local knowledge on food preservation.	1
Document analysis	The teachers' understanding of the curriculum documents. Strengthen the context of the study.	2

Participatory observation	How teachers interact, participated and learn during the presentation made by the community members. Scientific concepts merged from community members' presentations.	3
Journal reflections	Allow teachers to express themselves and how they think about the presentations. Use the local knowledge presented by the community member to develop a lesson plan that integrated local knowledge.	3

3.9 Data Analysis

Data analysis involves organising, explaining and reducing data for it to make sense (Cohen et al., 2018). Gay, Mills and Airasian (2006, p. 205) define data analysis as “the process of making sense of finding meaning in data, interpreting what has been seen and what has been said”. According to Cohen et al. (2018), early analysis reduces the problem of data overload by selecting out the significant features for future focus. In this study, I adopted a thematic approach to data analysis. That is, qualitative data were colour coded and analysed inductively-deductively by coming up with sub-themes. Thereafter, common sub-themes were grouped together to form themes (see Appendix I).

I first transcribed the semi-structured interviews, and then began the process of data analysis by means of a narrative which was written out as a story. From the narratives, I identified episodes. I then started to colour code the data. The aim in coding data was to identify episodes. Within these episodes, I identified themes and categories. These themes will be discussed later in relation to the literature, as well as the two theories, namely, socio-cultural theory and TSPCK. I adapted and modified Saldana's (2009, p. 12) model of data analysis as I was looking for similarities' in order to come up with themes and subthemes (see Figure 3.3 below).

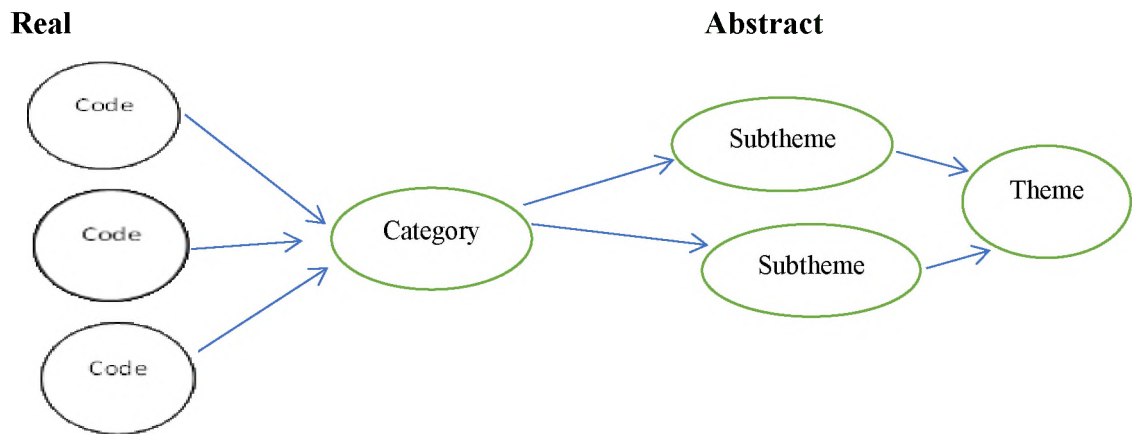


Figure 3.3: *Shows the model used in data analysis, to code, categorise, and reduce the categories to sub-themes and the sub-themes to themes*

I analysed the data generated from narrations about the teachers’ experiences and their understanding using the five components of TSPCK adapted from Mavhunga and Rollnick (2013). I used TSPCK to scrutinise how to make use of learners’ understanding, their knowledge of common misconceptions and gate-keeping concepts on curriculum that make the topic difficult to understand. Socio-cultural theory was used to analyse data that was generated through workshops. The socio-cultural perspective was used to analyse teachers’ experiences of learning through social interactions and how the participants engaged in social interactions during the presentations made by the community members. I analysed how the community members mediated learning and teaching using language and cultural tools. ZPD was used to see if there was a shift in the participants’ understandings through observation and reflection and during the development of the lesson plan. Moreover, all data were labelled with codes and themes.

3.10 Validity, Trustworthiness and Reliability

Shenton (2004) highlights that the researcher has to ensure that findings of the study are actual findings, not the impressions of the researcher. The researcher needs to make sure that the data gathering tools used are systematic, credible and transparent (Bertram & Christiansen, 2015). To Cohen et al. (2018, p. 245), “validity is an important key to effective research”. These scholars further state that “it concerns the nature of what is valid, as well as knowing if one has achieved an acceptable level of validity” (Cohen et al., 2018, p. 245). In this study, I used

multiple methods to gather data to strengthen the validity of the study (Maree, 2016). I gave the interview transcripts back to the three teachers to ensure that they reflected exactly what they had said. I also watched the videos together with the three teachers so that we could engage in discussions on what transpired during the presentations made by the two community members.

3.11 Ethical Considerations

In this section, I discuss various aspects pertaining to ethical considerations in this study.

3.11.1 Respect and dignity

The rights of the participants were addressed and respected in this study. Their welfare, anonymity and privacy were protected. During the signing of the informed consent letters, I reminded the participants and the two expert community members that their participation in the study was voluntary and thus they had the right to withdraw from it at any time. I was also mindful and respectful of the schedule of the participants, and ensured that the research activities were done at convenient places and times. I discussed that I would ensure anonymity in this study. The participants were informed that workshop presentations would be recorded and they were asked to give their consent for them to be recorded. I also highlighted that I would not share the information from this study with third parties without their permission. As this thesis was in the public domain, I was considerate of the data that I presented, to ensure that anything that I wrote in the thesis did not compromise the dignity of the participants.

3.11.2 Transparency and honesty

The aim and process of the study were explained to the participants in detail before they gave their consent to participate in the study. Letters of consent were written both in English and for the community members in Oshiwambo, to make sure that all the participants understood the content. Furthermore, permission to conduct this study was obtained from the directorate of education in the Oshana region, the school principal, the teachers and community members, and they all responded positively.

3.11.3 Accountability and responsibility

The study was conducted in accordance with the principles of the ethical policy and guidelines for educational research. That is, I did not misuse my position as a researcher. It was my responsibility as a researcher to create a conducive environment during the entire research process. My participants were treated equally taking into consideration their cultural, political and religious backgrounds. On top of that, I was responsible for safe keeping of all the data gathered. All research data (observation notes, interview notes, video tape) and equipment were kept in a safe and secured place. I was also in constant communication with my supervisors for their guidance.

3.11.4 Integrity and academic professionalism

This study is my own product, using my own ideas and where I used others' ideas, I correctly acknowledged and referenced them according to the referencing guidelines. Data were presented without fabrication.

3.12 Chapter Summary

In this chapter I described the research design and methodological orientations used in this study. I also outlined the research goal and questions of this study. The research site, participants, sampling and positionality are also discussed. I explained how the data were gathered and analysed. The issues of validity and trustworthiness were explained and ethical issues were considered and then discussed.

In the next chapter, I present, analyse and discuss the data generated from the semi-structured interviews and documentary analysis.

CHAPTER FOUR: SEMI-STRUCTURED INTERVIEWS AND WORKSHOP DISCUSSIONS

4.1 Introduction

In the previous chapter, I discussed the research design and methodology I employed in this study. I explained how data were generated to answer my research questions one and two of this study. Semi-structured interviews (SSI) and document analysis were used to generate data. Thus, in this chapter I present, analyse and discuss the data generated from semi-structured interviews and document analysis. The aim of the semi-structured interviews was to find out the teachers' experiences, understandings and pedagogical insights on the integration of indigenous knowledge in Agricultural Science lessons. On the other hand, document analysis aimed at finding out what Grade 6 Elementary Agriculture Science teachers can learn (or not) about food preservation through co-analysing curriculum documents. This was aimed at addressing these two research questions:

- What are Grade 6 Elementary Agricultural Science teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?
- What lessons can Grade 6 Elementary Agricultural Science teachers learn (or not) about food preservation through co-analysing curriculum documents?

First, I present, analyse and discuss data generated from semi-structured interviews followed by the data generated from document analysis. I begin this chapter with the presentation of teachers' profiles involved in this study. That is, their gender, teaching experience, qualifications and age group are presented.

Three teachers were interviewed individually and tape recorded with their permission. They were also given codes that are used throughout the thesis. The codes used are shown in Table

4.1. T1 to T3 represent participant teacher 1 to 3. The gender of each participant F and M at the end of code example T1M represents F (female) and M (male). SSI is the code for the semi-structured interviews. Themes were developed from sub-themes and presented in the table below (see Section 4.2). Participants were coded as teacher 1 male semi-structured interviews (T1MSSI), teacher 2 female semi-structured interviews (T2FSSI) and teacher 3 female semi-structured interviews (T3FSSI). This made it easy when presenting, interpreting and discussing the data obtained from the SSIs. This chapter is therefore outlined according to the themes developed from the data from T1SSI to T3SSI.

Table 4.1: Shows the biographical information of teachers

Biographical information	Category	Teachers' codes
Gender	Two females	T2, T3
	Male	T1
Teaching experience	8-15 years	T1, T2, T3
Qualification	BETD	T1, T2, T3
	ACE	T2, T3
	BEd honours	T1, T2
	MASTEP	T2
Age	35-40	T1, T2, T3

This research was conducted at Washa Combined School (pseudonym) in the Oshana region in the north part of Namibia. Three teachers participated in this study, that is, two females and a male. In terms of teaching experience, all teachers had the minimum requirement qualification to be a teacher in Namibia, which is a Basic Education Teacher Diploma (BETD); and two had an Advanced Certificate in Mathematics Education (ACE). The highest qualification was a BEd Honours in Science Education which was possessed by two of the participants. In addition, the age of the participants ranged between 35 and 40 years.

4.2 Development of Sub-Themes and Themes

Data generated from semi-structured interviews (SSI) were categorised according to the questions they were answering and the sub-themes that were developed. These sub-themes were subsequently combined into themes (see Appendix F). The participants' experiences, understandings and pedagogical insights on the local knowledge were not the same. As a result,

three themes were developed and data generated from the SSIs are presented under those themes. The themes are: Teachers’ understanding of the term local/indigenous knowledge; benefits of integration of IK when teaching food preservation in Agricultural Science; and hindrance of culture on the inclusion of IK in Agricultural Science lessons on food preservation.

Table 4.2: *Shows the themes and sub-themes merged from the semi-structured interview*

Themes	Sub-themes	Literature/theory
Teachers’ understanding of the term local/indigenous knowledge	Understanding of the term IK	Kibirige & van Rooyen (2006); Shizha (2007); Ogunniyi & Ogawa (2008); Mapara (2009); Mukwambo et al. (2014).
	IK as prior knowledge	
	Views on integration of IK	
	Engage learners and teachers	
Benefit of integration of IK when teaching food preservation in Agricultural Science	Enhance participation	Shizha (2007); Erinosh, (2013); Aluga & Kabwe (2016).
	Understanding of concepts	
	Interesting, culture, interaction	
Hindrance of culture on the inclusion of IK in Agricultural lessons on food preservation.	Cultural fears	Kleisler, Semali, & Shabani (2016).
	Gender and belief, lack of understanding	
	Multicultural classrooms	

In this section, I present the themes that emerged from the data in relation to the theory and literature. This allowed me during interpretation and discussion to combine the findings, theory and the literature. The constructs of socio-cultural theory were used during data interpretation and discussion. For instance, Vygotsky (1978) posits that social interactions play a critical role in cognitive development in relation to what is learned and when and how learning occurs. As reiterated by Mavuru and Ramnarain (2017), the learning of learners in social contexts is influenced by the environment where the learners come from and parents have to play a part in the learning of their children (Klein, 2011). I then present each theme in detail, beginning with the first theme: Teachers’ understanding and integration of indigenous knowledge.

4.2.1 Teachers’ understanding and integration of indigenous knowledge

The teachers involved in this study made an attempt to make a meaningful definition of indigenous knowledge from different perspectives and the contexts they found themselves in.

For instance, one teacher defined IK as a, *“knowledge local people have or they developed it amongst their community, they either use it for communication, socialising and so on”* (T2MSSI). This definition resonates with definitions by scholars such as Boven and Morohashi (2002), Kibirige and Van Rooyen (2006), Nyika (2017) and Rajase (1993). To elaborate for instance, Kibirige and Van Rooyen (2006) accentuate that IK is a legacy of knowledge and skills unique to a particular indigenous culture, involving wisdom that has been developed and passed on over generations by the use of a trial and error approach. This knowledge is passed from generation to generation verbally. This reflects that IK is community based knowledge that could be difficult to share with other communities.

T2F seemed to have a better understanding of what IK means, because she elaborated that a long time ago communication among indigenous people was only known to them, and that if the next village hit the drums, it either symbolised a death or a festival. She contributed that they still use IK for socialising and communicating. This is done through ululating and singing during celebrations, for example, weddings or welcoming of a newborn baby.

Kibirige and Van Rooyen (2006) further indicate that IK is locally derived from interactions between people and their environment and is not easily shared with members of another community. Mukwambo et al. (2014) define “IK as a micro-culture of a particular community, developed in response of the culture’s need to understand, predict, and influence its environment over a long periods of time and passed on from generation to generation” (p. 4). That is, IK is the knowledge that each community or culture has that differs from community to community. There is IK that all Bantu speaking people have in common and those that differ based on the culture, ethnics, and geographical location and so on. T3 revealed that IK is the *“knowledge that have been passed just in the house or community without a proper class teaching and that knowledge that is being shared is called community knowledge”* (T3FSSI). It seems that this teacher confined indigenous knowledge as being restricted to households and locally in the community.

According to Ogunniyi and Ogawa (2008), indigenous knowledge stands for an idea or system of thought peculiar to the so-called ‘native’ of a particular geographical location or socio-cultural environment. This implies that the knowledge was not borrowed from another community or if borrowed, such knowledge has become assimilated into the indigenous knowledge to suit their way of doing things. On the other hand, T1M reflected that IK is,

“knowledge we learn from the community and this knowledge can be passed from one generation to another generation, in short, knowledge of a particular society” (T1MSSI).

In my view, this teacher seems to have a clear understanding of what IK is and how it is passed from generation to generation. To this end, Nyika (2017) refers to indigenous knowledge (IK) as the knowledge gained by people as they live and work in their communities or society. This knowledge is linked to the norms and beliefs of certain cultures. T1MSSI referred to a *“particular society”*, referring to a community that lived together for a period of time and interacted with the environment around them for survival. For example, by looking for food and other necessities needed by the community, this allowed people to develop ways of preserving food, for them to be able to eat it after some time without the food being spoiled. The methods of preserving food were influenced by the cultural factors and the beliefs associated with the community.

Furthermore, this research revealed that all three teachers involved in this study seem to understand indigenous knowledge. They viewed IK as community based knowledge and as a mediating tool of the community. Their definitions are similar to Mapara’s (2009), who defines IK as the knowledge that is unique to a certain society. These teachers used similar terms to define it such as *“community, passed on, generation and local people”*. This resonates with Hays (n.d), who defines indigenous knowledge as a *“complete knowledge system with its own concepts of epistemology, philosophy and scientific and logical validity, which can only be learned and understood by means of pedagogy traditionally employed by these people themselves”* (p. 196).

All the participants understood what indigenous knowledge is, but to the question if they integrated IK in their teaching, they revealed that they do not or that they sometimes integrate IK in their lessons. For instance, T2FSSI responded that *“Mem! Shuuuu! Not really maybe once or not at all”*; T3FSSI said, *“Not really or let me say no I hardly do that”*; while T1MSSI stated that, *“sometime after Rhodes university introduce this concept to me when I was doing my honours and my master’s”*.

From the teachers’ responses it showed that they are not integrating IK when teaching food preservation. It is acknowledged, however, that integration of IK is influenced by what teachers were exposed to during their schooling days and when at institutions of higher learning

(Seehawer, 2018). One participant highlighted this during the interview and stated that he was exposed to the use of IK when he was doing his Bed Honours in Education with Rhodes University and that changed his beliefs about the integration of IK in science lessons. Thus, he was introduced to the integration of IK and thereafter he started integrating it in some of his lessons. He confessed, however, that he does not have adequate knowledge when it comes to traditional knowledge on how foods are preserved or on how to integrate IK.

The participant further reflected how the study influenced the way he views IK in his lessons. He further commented that the Ministry of Basic Education, Arts and Culture curriculum (2016) does not give an outline on how teachers must integrate IK, even though it allows teachers to use life experiences of learners and the knowledge from the surrounding environment. Furthermore, lack of understanding of IK from some of the subject supervisors of teachers, also influences teachers in not integrating IK in their teaching. For instance, T3FSSI indicated that she was told not to use indigenous language during her teaching. This is an indication that the supervisor has no understanding on the importance or benefits of indigenous language to teaching practices. IK is embedded in local language and the two cannot be separated. When indigenous/local people discover something, they will introduce the terminologies that describe the knowledge. Using local language could help teachers to be free and not confined to western science during science lessons. Thus, in the next section I look at the second theme.

4.2.2 Views on the integration of IK when teaching food preservation in Agricultural Science classrooms

The teachers involved in this study seemed to generally understand the benefits of integrating IK in teaching, even though they indicated some difficulties they are facing in integrating IK. For instance, they pointed out that when IK is integrated in the topic of food preservation it helps learners have a better understanding of scientific concepts. T2 thinks that if IK is integrated in teaching, that *“Learners will understand the concepts ... lessons will be more interesting and learners will link to what they know from home”* (T2FSSI).

According to literature, if IK is not included in science, learners will find it difficult to move between the micro culture of the family and school and this will negatively influence their success in science (Aikenhead & Jegede, 1999). Kibirige and van Rooyen (2006) acknowledge

that when IK is integrated in teaching science, it enhances participation because learners can experience or feel the connection between what they are learning and what they do at home.

T3FSSI added that if IK is considered in teaching practices learners will “*catch up the content of lessons very fast because you are already bringing something that they aware of*”. This participant believes that there is a connection between westernised science and indigenous knowledge. This was also found out by Mukwambo, Ngcoza and Chikunda (2014), who affirm that there is a dialectical relationship between IK and westernised science. That is, IK is embedded in westernised science and it can be used as prior knowledge to reduce challenges associated with westernised science (Roschelle, 1995). T3 made it clear that integration of IK helps learners to master the concepts and then they will not fail.

Teachers who participated in this study regarded IK as epistemological to teaching science particularly the topic of food preservation. To them, if IK is not integrated in science it will be difficult for learners to make connections between their IK and the westernised science. Nonetheless, T3 confessed that she does not integrate this knowledge in her teaching.

Seriously God should forgive me because I found out that this knowledge is needed, I was killing my learners' culture, I did do what I supposed to do. I found out that we only rushed to finish unknowingly that we left something. I hardly give time to my learners to express themselves, in fact I also didn't know what to do. (T3FSS1)

She however realised that she was hindering the learning process of learners. Nyika (2017) also found out that if IK is not integrated in science, there will be no basis for mutual understanding if learners are not able to link it to their everyday knowledge. Furthermore, T3 proceeded responding that:

If you neglecting them as I said I did, it will take time for learners to catch up the content. Seriously I should ask God to forgive me, just imagine this topic food preservation is more on what we do at home; I was supposed to ask learners how they preserve food at home or to demonstrate ... I have a feeling that it will be enjoyable. (T3FSSI)

From this excerpt, it could be deduced that T3 thinks that if she could integrate learners' indigenous knowledge in the lessons they might be enjoyable. The literature also reveals that learners are required to use their cultural background knowledge when constructing their science knowledge (Mavuru & Ramnarain, 2017). Ogunniyi (2007) indicates that learners are

loaded with science from their home backgrounds. In this regard, Nyika (2017) stresses that what learners learn from their homes or from their culture, can be used in the classroom as the foundation for learning new concepts. In addition, learners can feel the connection between what they are learning and what they do at home.

Teachers who participated in this study (T1MSSI, T2FSSI & T3FSSI) indicated the benefits of integrating indigenous knowledge in science (Agriculture) as:

- Learners will feel comfortable during the lessons;
- The participation in the class will be high;
- Learners will be able to pass this knowledge to others learners;
- Learners will not fail because they will master the concepts; and
- They will catch up the content of the lessons very quickly.

Similarly to what teachers in this research revealed, in his study conducted in Namibia, Shetunyenga (2019) illustrated the advantages of integrating IK in Agricultural Science lessons. For instance, he found that it related the concepts to what learners already knew and it made the lessons more interesting so that all learners paid more attention; the traditional knowledge learners learned was mostly from their parents, which made it easier for learners to understand and for teachers to bring real life examples into the classroom that learners knew from home. Furthermore, Ogunniyi (2012) points out that integration of IK creates a cooperative learning environment that enhances the learners' interactions. In his research, Shetunyenga (2019) exhorts that integration of IK in science classrooms plays a major role in learning, as it helps learners to learn from others who are from different backgrounds and they are able to relate their culture to others.

Similarly, researchers such as Nikodemus (2017) and Liveve (2017) accentuate that learners understanding improves when teachers integrate IK and the participation of learners during the lessons also improves. Manzini's (2000) study revealed that learners appreciate the teaching of IK and classroom observation suggested improved participation. In addition, T1M indicated that the participation in the class will be higher if IK is considered. Also, Hewson and Ogunniyi (2010) believe that the inclusion of IK in school science promotes the awareness of different viewpoints in learners' multicultural society and it can improve the low achievement rate in science.

One participant reflected that:

This is the knowledge that people have in the community and compare it to science lessons; there are many knowledge people know just from the community and unknowingly that is science. An example is distillation when people makes Ombike, this is science I suppose to teach our learners. (T3FSSI)

In light of this, Vygotsky (1978) indicates that social interactions allow people to share common knowledge within their community. T3 learnt the making of *Ombike* through interaction with elderly people who are the custodians of the knowledge and experts in making *Ombike*. Furthermore, socio-cultural theory is focused on the key role of the society in learning and on how knowledge is constructed in the dynamic interaction between people and their social environment (Vygotsky, 1978).

There is a need for science teachers to be aware of the knowledge that is applicable in science within the surrounding environment, to enhance learners' conceptual understanding and participation in the classroom. *“Teachers unknowingly rush to finish the syllabus without knowing that they left something that could make learners understand the content very well”* (T3FSSI). The participant further elucidated that she hardly gives any opportunities to the learners to relate what they know from home during her lessons, because time is limited to finish the syllabus that will be examined. Yet, many studies have concluded that the inclusion of IK in science promotes awareness, provides motivation and self-esteem. It creates cooperative learning that enhances the learners' interactions and results in advantageous learning outcomes (Ogunniyi, 2012). Teaching Agriculture with the integration of IK, has both positive and negative effects, as culture might dominate the way IK is perceived in the lesson.

4.2.3 Cultural hindrances on the inclusion of IK in Agricultural lessons on food preservation

One of the negative aspects that emerged on the inclusion of IK in science, was the lack of support that the teachers get from supervisors and advisory teachers. For instance, when visiting schools and finding teachers integrating IK in their lessons, the teachers will be criticised for not teaching the recommended curriculum to the learners.

One participant lamented that:

I could remember when my supervisor visited me and he told me that I was too much in Oshiwambo language because I was using local examples. From that day I neglected to integrate local knowledge and concentrated on what is in the textbook; in fact, focus on what my syllabus is stating. (T3FSSI)

This reveals that teachers might be willing to bring IK of learners to the classroom, but they are afraid of being criticised by their supervisors who might not be knowledgeable about the integration of IK in science classrooms. The teachers are willing to integrate IK but fear authority, and are afraid to be caught teaching something not stipulated in the syllabus. This teacher further said: *“I found that this knowledge is needed, I was killing my learners’ culture. I didn’t do what I was supposed to do”* (T3SSI). In support, Klein (2011) states that they have experienced better performance when there is integration of local knowledge from the communities and that it has reduced drop out of learners; this was attributed to the positive relations between schools and parents, when parents are brought into schools as parent teachers.

One challenge of integrating IK in science classrooms has been that indigenous knowledge cannot be examined and teachers fear they are wasting time on something that does not constitute anything during assessments (Simasiku, 2016; Nyika, 2017). For instance, T3F indicated that integration of IK can cause problems for learners who are in grades where their examinations are marked nationally, especially Grade 10 and 12. This teacher indicated that there are no common words for science across all cultures.

Teachers who participated in this study indicated that learners are not from the same culture and it will be difficult to integrate knowledge of all learners. T2 exhorted that *“teaching in multicultural classrooms will be a challenge because learners are not from the same culture”* (T2FSSI). This revealed that they find it difficult to integrate it in teaching and learning to make science more interesting to learners. They do not know whose IK they should use in the classroom, because IK is different from culture to culture. Kibirige and Van Rooyen (2006) have argued that IK is not easily shared among members from different cultural backgrounds, because some elements that facilitate dissemination within a culture, can cause a problem for dissemination across cultures. These teachers indicated that this poses a challenge to integrating IK, especially in the multicultural class.

However, Hewson and Ogunniyi (2010) are against this reasoning, as they believe that the inclusion of IK in school science promotes awareness of different viewpoints in learners' multicultural society and can improve the low achievement rate in science. In support, when I presented in my local language at the UNESCO⁴ workshop at Rhodes University, the participants were able to link my language and the materials used to theirs. This gave me the inspiration that teaching in multicultural classrooms would be effective, as learners would learn from others and know others' cultures. Beside the difficulties that teachers are experiencing in integration of IK in the science classroom, they are encouraged to identify the needs of their learners and design classroom tasks that bring in the element of indigenous knowledge that will help learners to connect with classroom science (Kibirige & van Rooyen, 2006). Banks (2006) also explicitly describes how teachers should teach in a multicultural classroom. He argues that teachers need to realise that learners learn in a different way and thus we need to teach in a different style that will benefit all learners in class.

Furthermore, T3 (FSSI) indicated that "*only some names not appearing in English*". From the participant response I found out that some indigenous words do not appear in the English vocabulary and these lack terminologies in indigenous language which might hinder the normal teaching of science concepts. Simasiku and Ngcoza (2019) argue that there are more terminologies in indigenous language that make it very complex to teach science using indigenous language. Also, Fang (2004) suggests that teachers should be careful whenever they code switch, so as not to change the meaning of concepts.

In support of this, one teacher stated: "*I am having fear if I teach what I know in my culture learners might laugh at me because they might have a different meaning of what I said*" (T2FSSI). Teachers are not knowledgeable about indigenous practices and fear that learners might be more knowledgeable than them. This fear can also be caused by lack of Oshiwambo words when translating the content to English (T3FSSI). In the next section I present, analyse and discuss data generated from document analysis.

⁴ UNESCO: United Nations Educational Scientific and Cultural Organization

4.3 Data Generated from Documents

In this study, together with my participants we co-analysed documents such as the broader Curriculum of Education (Namibia. MEAC, 2016), the National Subject Policy for Agricultural Science (Namibia. MoE, 2009) and Grade 5-7 Elementary Agricultural Science syllabus (Namibia. MEAC, 2014), in order to find meaning, gain understanding, and develop empirical knowledge about the topic of food preservation. Furthermore, by co-analysing the curriculum documents we had hoped that by the time we visited the expert community members, we would have a better sense of how we could integrate the local knowledge presented. I start with the orientation part which was aimed at building relationships and trust with the participants.

4.3.1 Orientation workshop

The orientation phase began with a greeting and welcoming remarks for the participants. I thanked them for their willingness to participate in the study. The teachers were then given an opportunity to introduce themselves.

Thereafter, I explained to them the aim and the rationale of the study. I further explained and negotiated all the phases and what would happen in each phase. I explained to them that after all the workshops were conducted, we would co-develop model lessons that integrated local knowledge. I also addressed all the ethical issues and informed them that they had a right to withdraw from taking part in the study and that participation was voluntary (see Appendix D).

To foster ownership in this study, participants were given an opportunity to plan and come up with the workshop schedule for the duration of the intervention. It was henceforth agreed that we should have our workshops on Friday afternoons (15h00 to not later than 17h00) so that our workshops did not interfere with the teaching programme. This is an indication that the participants showed an interest in taking part in this study. They did not regard time as one of the factors for not participating in the study. The participants also set up some rules, for example, to not be late and also to respect time.

That is, the teachers were happy and agreed to work together and respect one another. The way they were sharing stories and jokes was an indication to me that they were happy with participating in the study. I now present the findings from curriculum documents.

4.3.2 Workshop discussion

We analysed both the Namibian National Curriculum for Basic Education (Namibia. MEAC, 2016), National Subject Policy for Agricultural Science (Namibia. MoE, 2009) and Grade 5-7 Elementary Agricultural Science syllabus (Namibia. MEAC, 2014). The National Curriculum for Basic Education and the National Subject Policy for Agricultural Science were analysed to find out their requirements regarding the teaching of Agricultural Science. Even though teachers were asked to bring along the above mentioned documents, two participants did not possess the National Curriculum and the subject policy. One participant had only part of the syllabus of Grade 6 that she is teaching.

It was very interesting when we started to analyse the National Curriculum, the moment I mentioned that we would start with the National Curriculum, one participant interrupted and asked: “*What is the National Curriculum?*” (T3). I explained that the National Curriculum is the official document that gives guidelines on how teaching and learning should be conducted. T3 continued “*Oh ya don’t we have it? It seems like I have it somewhere*”. This participant showed that she has no clue what the curriculum is. I explained to the participant what the National Curriculum is. T3 continued asking about the differences between the National Curriculum, syllabus and scheme of work and what the link between the National Curriculum and syllabus was. T1 explained that the National Curriculum has sections, goals, and skills that are specific to a subject. He further explained that the syllabus is specific for each subject and it contains objectives and competencies. T3 further probed: “*Which one states that Agriculture should be optional?*”

T1 replied, “*The National Curriculum, this is the one that tells you what to do, how many lessons to be taught per week*”. He further gave the background on how the curriculum was set. He stated that it was aligned towards the *Vision 2030*. “*Was this curriculum revised?*” T3 asked. T1 responded that, “*Yes, it was revised and replaced the pilot curriculum that was introduced in 2010*”.

From these discussions, I found that we were learning what the National Curriculum is, as this teacher was asking questions and wanted to know more about the curriculum. It was clear that professional learning was taking place, as teachers were asking questions and learning from

each other. Vygotsky (1978) also posits that people's cognitive development occurs sequentially through social interactions on the social plane.

Teachers learnt that the curriculum and the subject policy state clearly that teaching and learning should start from what the learners already know. As a result, teachers should consider learners' prior knowledge. That is, their teaching should start by asking what learners know from the previous grade or from their homes and communities. For instance, when teaching the topic of food preservation, learners should link their indigenous knowledge to classroom science. This might move learners from context to content and vice versa.

Teachers also came to realise that it is their responsibility to organise their administrative duties and plan teaching and learning to meet the expectations of the national standards and performance indicators. Additionally, teachers had an opportunity to learn that Agricultural Science was introduced in schools in order to lay the foundation for the development of human resources as the basis for occupation or self-employment. In addition, teachers learnt that the aim of teaching Agricultural Science in schools is to provide learners' a scientific background and that teachers are required to produce much needed scientists and agriculturalists for the country.

As we analysed the curriculum documents, teachers came to learn that the number of lessons allocated to Agricultural Science per week is not enough to carry out hands-on practical activities. This is because the Elementary Agricultural syllabus requires teachers to teach skills on the correct use and storage of food and the handling of servicing of commonly needed tools and equipment used in producing crops and vegetables. Teachers also realised that they need to have resources to use in their teaching in order to accumulate knowledge and skills of applying basic concepts, such as observations and demonstration on how food is prevented from getting spoiled.

Furthermore, teachers learnt that the syllabus for Agricultural Science states that learners should discuss ways of preserving food such as milk, grain, meat, fish and others. It emerged that teachers realised that they only state ways of preserving food without letting learners discuss how they preserve it at home and do it practically. This gave an opportunity for teachers to reflect on their teaching practices. For instance, T2 indicated that she only teaches what is

stipulated in the syllabus without considering learners' prior everyday knowledge (Roschelle, 1995; Mavhunga & Rollnick, 2013).

We found that the National Curriculum states that Namibians should invest in agriculture and become a sustainable country advocating food self-efficiency, but unfortunately it does not promote this goal. It states that people should invest in agriculture, but however does not consider the allocated class time for this specific subject. How can we provide the knowledge to learners if time is not enough? We have realised that some teachers do not know what to integrate because they only concentrate on what is in the textbooks. It also depends on the way they were trained at colleges and universities because they normally use the weapon that they are trained with – and this weapon is the syllabus and textbooks only.

4.4 Chapter Summary

In this chapter, I presented, analysed and discussed the data generated from semi-structured interviews and document analysis. This was aimed at answering the first and second question of this study. The findings revealed that teachers understand what indigenous knowledge is. Furthermore, the teachers in this study demonstrated the understanding of integrating IK in their teaching, even though they pointed out that they face some challenges in integrating this knowledge in their classrooms. Moreover, teachers learnt from each other and shared information on what the curriculum and the subject policy expected from them. In the next chapter I analyse, present and discuss the data generated from participatory observation and reflections.

CHAPTER FIVE: PARTICIPATORY OBSERVATION AND REFLECTIONS

5.1 Introduction

The main goal of this study was to explore working *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in the topic of food preservation. In the previous chapter, I presented, analysed and discussed the data from semi-structured interviews and document analysis which were aimed at answering the first and second questions of this study. In this chapter, I thus present, analyse and discuss data generated from workshop discussions, participatory observations and reflections. Data generated from these data gathering techniques were aimed at addressing my research questions three:

In what ways did grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the community members?

The chapter begins with the profile of the two expert community members who were invited to demonstrate how the wild vegetable *Ombidi*⁵ and wild fruits *Eembe*⁶ and *Eeyandi*⁷ are preserved. The workshops were aimed at allowing the expert community members to share their cultural ways of preserving food and their indigenous knowledge with teachers. The knowledge from the presentations by the two expert community members was then used to co-develop the model lessons that integrated local knowledge.

Table 5.1 below shows the biographical information of the two expert community members who presented and demonstrated how food (vegetable and fruits) are preserved. The community members were given codes, for example, CM1 represents community member one

⁵ Ombidi is a traditional vegetable

⁶ Eembe are wild fruit called berries

⁷ Eeyandi are African ebony fruits

and CM2 represents community member two. These codes are used throughout the entire thesis.

Table 5.1: Shows biographical information of community members and their codes

Biographical Information	Category	Community Member
Age	65-70	CM1, CM2
Gender	Female	CM1, CM2
Cultural Background	Oshiwambo	CM1, CM2
Home Language: Dialect/Codes	Oshikwanyama	CM1
	Oshindonga	CM2
Highest standard passed	Standard 4	CM1
	Standard 5	CM2

From Table 5.1, it can be seen that the two expert community members are from the Aawambo ethnic group. However, they speak two dialects of Aawambo, namely, Oshindonga and Oshikwanyama⁸. As a result, their presentations were in these dialects. Both presentations took place at the two expert community members' places to show respect and to allow them the comfort of the environment they are used to. The ages of the expert community members ranged between 65 and 70 years. In terms of their qualifications, none of the community members hold teaching qualifications. CM1 passed Standard 4 and CM2 passed Standard 5; CM2 is more educated than CM1. The expert community members presented in this study were both female because they are the ones who perform the cultural practice of food preservation.

Following is the summary of the presentations made by the community members.

5.2 Summary of the Presentations made by Community Members

The two expert community members involved in this study presented knowledge and skills on how food is preserved traditionally. The first community member demonstrated how a traditional vegetable *Ombidi* is preserved, and the second community demonstrated how wild

⁸ These dialects are related to one another and the meaning of words is similar but sound different. For example, *Ombidi* is Oshikwanyama while in Oshindonga it is *Omboga*.

fruits *Eembe* and *Eenyandi* (berries and African Ebony) are preserved traditionally. As I said earlier, these presentations were made in the Oshiwambo dialects; CM1 demonstrated her presentation in Oshikwanyama, while CM2 demonstrated hers in Oshindonga. The presentations by the community members sought to address the following research question:

- In what ways did Grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the community members?

5.2.1 Presentation of *Ombidi* (wild vegetable) by community member 1 (CM1)

*Ombidi*⁹ is one of the favourite vegetables amongst the Oshiwambo speaking group in Namibia. This vegetable is harvested during rainy seasons and it grows naturally in the field where *Mahangu*¹⁰ is grown. *Ombidi* is harvested using traditional baskets as shown in Figure 5.1 below.



Figure 5.1: Shows the baskets used when Oshiwambo people harvest *Ombidi*

⁹ *Ombidi* is Pigweed or cleome gynandra.

¹⁰ *Mahangu* are pearl millets mostly grown in Namibia as a major source of food. The current drought in Namibia has heavily affecting ploughing of *Mahangu*, something which has in turn affected the availability of *Ombidi*.

Before her presentation, CM1 welcomed us all wholeheartedly and appreciated the opportunity she had to share her knowledge on how *Ombidi* is preserved. Each one of us had an opportunity to introduce ourselves, making us feel at home.

As an introduction to her presentation, she asked us to first identify the materials surrounding her and we were able to do so. Thereafter, she started to mention the materials one by one and asked us “*Omwati eyi iitowo ndishi*”? (You said these are all clay pots?). We all responded and said “*Yes*”. She smiled and said to us, “*Iyaa ayishe eyi iitowo, ashike pamito eyi oshitoo shimwe oshilipo nga ombiya yoku teleka shoo shikwa wo oshiyuma shokutuvikila omo hano hatutuvikile iinima yetu. Eshi ota mu keshi monamo me kafatulula lange.*” (Well, they are clay pots but however in this case one is a pot and one we use it as a store where we normally keep our things. You will find out during my presentation). It seems, CM1 used a constructivist approach in her introduction of her presentation. That is, even though she was not a qualified teacher, she elicited our prior knowledge in relation to the materials she used, resulting in participation during her presentation.

What also struck me was that before she started with her presentation she cautioned us to listen carefully so that we can take the message to our learners the way it is. She then said “*Ombidi ohayi pungulwa pamikalo dihapu, oshone handika ninga nena*” (*Ombidi* can be preserved in different ways, and this is what I will do today). “*Oha tuke Ombidi nomundjulu wushona hatu longifa oimbale yetu*” (We harvest our *Ombidi* and a bit of *Omundjulu*¹¹ with our traditional basket) and she showed us what the basket looks like. “*Shama wa mane kuka Ombidi tete kala ushi kutja owa kufamo oimbodi aishe eyi inayi pumbiwangashi edu*” (After you have collected or harvested *Ombidi* you first make sure you take out the unwanted things such as the soil). “*Osho una oku kala una omeva mawana opo wushiive oku yaula Ombidi opo edu likale koshi yoo yi kale yakaama*” (That is, you need to have enough water to wash it so the soil will sink while *Ombidi* will be at the top).

As she was explaining, we took some notes because we were going to use some of the information when co-designing lessons that integrated local or indigenous knowledge on food preservation. CM1 proceeded: “*Ombidi otoy yaula mumwe nokamundjulu toyi tula mombiya*

¹¹ *Omundjulu* herb called Portulaca

ndeke totula pediko” (Take out *Ombidi* with *Omundjulu* from water and put it in the cooking clay pot then you put it on fire). “*Shama yapi ohayi kala yitwiima, otoy kufapo nee*” (After it gets ready like dark brown you take it out). “*Why is Omundjulu is not the same as Ombidi?*” T1 asked. She explained that, “*Omundjulu oupu ohau tulwa mo ashike opo Ombidi yipyediva*” (*Omundjulu* is soft so they only mix it with *Ombidi* so that it will get ready fast). We looked at each another and we were so impressed and T2 said aloud “*Tashiti omundjulu owahu tulamwo opo omboga yipyediva mbala kandali ndishishi*” (*Omundjulu* is mixed with *Omboga* so that it gets ready fast! I didn’t know that). She continued, “*Meme ohetu lombwele alushe tutulemo omundjulu, okwali ndishi opo omboga yikale yina omulyo kamana*” (My mom only used to ask us to put *Omundjulu* but I thought that was intended to make *Ombidi* delicious).

CM1 replied, “*Omundjulu helps with the process of cooking*”. T1 asked: “*itandi dulu okuteleka ile ndilye omundjulu?*” (Can I not cook or eat *Omundjulu* alone?). CM1 smiled and said no: “*Omundjulu oupu wupu shama wewu teleke ohau ningi embombo, hano ta u yombotoka ito dulu okuwu pona shaashi owu todifa wo oha u olo diva. Ohauliwa ashike koingulu*” (*Omundjulu* is very soft and if you cooked it, it becomes like thick porridge, you won’t even dare to swallow it, it disgusting, it rotten so fast is just food for pigs).

CM1 continued: “*Shaa Ombidi yadi omundjene ove oto tameke nee oku yi longekida*” (After *Ombidi* is cooled down, you will start to preserve it). “*Dimbulukweni kutja ondemulombwela petameko eyooloko pokati keembiya mbali*” (Remember, I told you about two different pots, I will later explain after this process).

T3 took a deep breath, and said this is a qualified teacher! Nobody commented, but there was a surprised feeling. CM1 just smiled and continued with her presentation while the rest of the group were busy taking some notes. She stood up and asked us to listen carefully, because apparently she was about to go on to the last stage of the presentation. She then started: “*Eshi Ombidi yoye yapola, oto holoola nee kutja otoy tuvikile ngahelipi*” (As you have your cooled *Ombidi*, you then choose which way you want to preserve it). She explained: “*Tashi shi kulako omikalo doku tuvikila Ombidi*” (Following are the types of preserving *Ombidi*).

“Ngeenge owa hala evanda, oto kufa Ombidi nde toyi tu koshini ndee toyi me tolongifa eenyala, ndee to tula pondunda yonduda yeehoni” (First, if you want *Evanda*¹², you take your *Ombidi* and pound it and then mound it using your hands. Make a proper shape of your hand and place in or put it on top of the traditional hut).



Figure 5.2: Shows CM1 placing evanda on the roof of a traditional hut

“*Omukalo omutivali, oto kufa Ombidi kundja ashike mombiya ndele toyi kuku tike*” (The second method, you take *Ombidi* directly from the pot and then dry it). She further explained that in terms of which one will dry faster that, “*Evanda oha li kwata efimbo opo likukute. Evanda*” (It takes time to dry). For instance, “*Ohali kufa omafiku ane fiyo atano manga Ombidi eyi inayi tuwa ohayi kufa ashike efiku limwe ilo avali. Shaa ya ku kukuta otoy kufa nee nde toyi tuvikile nee nande omoshitoo*” (It takes four to five days while the one which is not pounded will only take one to two days. After it has dried, you take your dry *Ombidi* and then store it in either *oshitoo* (storing cray pot) or storing basket).

T1 asked, “*Omolvashike una okunyaneka Ombidi popanda yonduda kapeshi piipeleki?*” (Why do you have to dry it on the traditional hut why not at the corrugated iron?). CM1 replied, with confidence that

Pefimbo letu kakwali iipeleki, neenge owa ku kutike ombidi poipeleki, Ombidi otayikukuta unene diva molwaashi Oyipeleki ohayi pupyala unene yo Ombidi itayi

¹² *Evanda* preserved mounded *ombidi* in a form of a shape.

kala yina ounyenye molwaashi omeva ayeshe aapwiininamo. Etomeno opo tu nyaneke popada yeehooni, omolwaashi onduda oya longwa momwiidi owo haukwafele opo omeva maha pwiininemo ayeshe mOmbidi (There was no corrugated iron in our time. If you dry *Ombidi* on the zinc it will dry fast and it won't have taste because all the water in *Ombidi* will be evaporated. The reason we use our traditional huts is that is made up of grass and is very cool. As a result, not all the water evaporates but some water will remain in the *Ombidi*).

T3 shouted “*Goodness meaning what our grannies do is science?*” T1 said yes! From this discussion T1 suggested that the process of *Ombidi* could also be used during the topic of scientific processes, where we talk about filtration, floating and sinking. He further added that he could even use *Ombidi* in Mathematics. “*How?*” T3 asked. T2 answered: “*By using cooked Ombidi to make different shapes*”. T2 added that this could be used to explain the physical and chemical changes because she (CM1) had explained that *Ombidi* changes from green to brown then to dark or black.

After the discussions, CM1 took us back to what she had said earlier. She stood up and explained the difference between *Oshiitoo* (storing clay pot) and the clay pot used as a pot (see the pictures below). In my view, CM1 was using a learner centred approach in every step of her presentation and she tried to capture our attention and involve us in her demonstration.



Figure 5.3: Shows cooking clay pot and storing clay pot

CM1 further explained that “*Ombiya yedu oyiwa noku longifwa okuteleka. Oikulya ya telekwa mombiya yedu oiwa yidule e yi yatelekwa mombiya yoshitenda*” *Ombiya yedu ihayi pumbwa omundilo uhapu, ohayi kalanomundjene efimbo lile*” (Clay pot is good to use when cooking.

Food which is cooked in clay pots is delicious compared to the stainless pots. The clay pot does not require much firewood, it keeps the heat). We were all surprised by such a scientific explanation, but we wanted to know more about the science around CM1's demonstration. For instance, T1 asked, "*Omolwashike?*" (why?) and to our further surprise, CM1 said "*Ombiya yedu oyina omulung ushona owo hau kwafele opo omeya haapwininemo diva*" (Clay pot is not widely open and water does not evaporate easily). As indicated in Figure 5.3, the clay pot has a narrow opening that prevents more water from evaporating into the air. We then asked ourselves about the science behind this.

CM1 emphasised that:

Evanda ola fimana momufyuululwakalo wOshiwambo. Ongaa omu kainhu, alushe ouna nowa pumbwa oku kala una Evanda molwiyo loye pepata, ola talikako ongaa lina elao shosho hali yandwa kaatalelipo naava tavalekelwa (Evanda is very important in Oshiwambo tribe. As a lady you should always have at least one in your kitchen. It shows respect when you have visitors, before you give them other food you need to give them *Evanda* first).

In the Oshiwambo tribe, *Evanda* is regarded as luck, thus you find it at every event. CM1 further pointed out that:

Ombidi ohai longifwa ongaa oshihemba shouhaku, ongaa oshivelelwa ilo oshilandifomwa. Oshiholelwa, ngeenge okaana ka kwatwa kondjala ilo kena omunghululu (ombwela). Ombidi ohai longekindwa nee tai pewa omumu ou aninga oshihakanwa shomikifi ilo shondjala. Ombidi oya umbata iitungifi lutu ihapu (Ombidi can be used as a herb of medicine, relish and as sources of income. For instance, if a child is suffering from malnutrition, Ombidi will be prepared and be given to the affected person. It contains all the nutrients)

Furthermore, after the expert community member had finished explaining how *Ombidi*, *Evanda* and *Omboga* could be preserved, T3 further asked, "*Ombidi ohayi nyonauka nga?*" (Does *Ombidi* expire?). "*Ombidi ihayi nyonauka*" (Ombidi doesn't expire) CM1 responded. "*Omukalo ou hatuvikilwa ombidi oha u kwafele opo yi kale efimbo lile inaayi kwatwa keembakiteli*" (The way *Ombidi* is preserved it allows it to stay for long time without being spoiled because bacteria and germs will not attack *Ombidi*).

It seems that *Ombidi* used to be dried to such an extent that no water molecules were available within the *Ombidi*. The expert community member knew that by exposing *Ombidi* to the sunlight, it allows water to evaporate from the *Ombidi* into the air, a process known as osmosis.

This shows the power of indigenous knowledge within our local community. As she finished, she went to get the *Ombidi* which she had apparently preserved the previous year and she compared it with the one she preserved this year and asked us to taste it.

To our surprise, even though the expert community member was requested to demonstrate how *Ombidi* is preserved, she extended her presentation on how pumpkins are preserved. She also prepared traditional bread for us and pumpkin seeds. Those were enjoyable moments and we were able to ask questions on how she prepared them. CMI concluded her practical demonstration with a prayer in which she appealed to the Namibian teachers to recognise and respect their *culture*. With this finding, this community member showed intense interest and engagement with the study because she welcomed us with traditional bread and meals (see Figure 5.4 below).



Figure 5.4: Shows teachers enjoying the traditional food prepared by CMI

The way teachers were asking questions and the interaction during this demonstration, showed that learning was taking place. Teachers were taking notes and eager to know more about clay pots. T3 indicated that she really gained more knowledge on how to preserve *Ombidi* and on how she would be able to contextualise science lessons; especially with regards to preservation of food by using indigenous practices, for the learners to be able to connect the two different knowledges (classroom and home). This talks to crossing from home/community to border crossing to school and *vice versa* (Aikenhead & Jegede, 1999).

5.2.2 Preservation of wild fruits (*Eembe and Eenyandi*) (wild berries and African ebony)

This was the last presentation by an expert community member (CM2) on how wild fruits *Eembe* (wild berry) and *Eenyandi* (African ebony) are preserved. CM2 started her presentation in this way:

Eembe ngele dha pi, aantu ohaa kutha omalukateko opo ya wapaleke momuye. Pethimbo lyokulikola aankuluntu ohaa tumu aanona opo ya londe yo ya shiwe okushika ko oombe yoo yeli pevi taa toola. Ngele omuye oguli pehala lyandandala, ohatu kutha omalukateko ndele tatu gongele oombe ndele ta tu dhivala kolupale tuke dhi yaneke opo dhi kahe uule womasiku ga 3 nenge ga 4 (When *Eembe* (wild berry) are ready to be harvested people take their traditional broom (*Olukateko*) to clean the area of the berries tree where the berries will fall during the process of harvesting).

The elders instruct the young ones to climb on the berry plant to shake all the branches so that the berry fruits can fall on the cleaned area. During the process while the children are shaking, everybody else will then collect berries. If the berry plant is at a place which is not sandy, they use traditional brooms to gather the berry fruits together. Berries are dried on grounding platforms (*Oshipale*) for at least three to four days.

After CM2 explained the process of harvesting berries, she then listed materials needed in the process of storage and thereafter, demonstrated how berries (*Eembe*) are stored and preserved. She said that, “*Mbino tayishikula iinima mbjoka yapumbiwa pethimbo lyokusiikilila*” (The following materials are needed during the preservation process).

- *Omutoko* (wood ash);
- *Eengongo* (marula kennel);
- *Evilyoshiyanda* (clay soil); and
- *Omeya* (water).



Figure 5.5: Shows materials needed for preservation of berry fruits

A discussion was brought up about *Omutoko* (wood ash). I asked: “*Oshike naana shili momotoko?*” (What exactly is in the wood ash?). CM2 responded that, “*Omutoko ohagu keelele iinima oobakiteli*” (Wood ashes prevent bacteria). CM2 further added that, “*Ngele ouna oka pulu ndele totulapo omutoko ota ka si nenge kaaluke*” (Even if they have pimples, they apply wood ash on the pimple, and it disappears).

CM2 further presented on how *Eembe* are preserved, pointing out that the process of preserving berry fruit and African Ebony fruit (*Eenyandi*) are almost the same. She took us to the African Ebony fruit tree and began to harvest and collect *Eenyandi* and demonstrate how they are preserved.



Figure 5.6: Shows berries (*Eembe*) ready to be preserved and African Ebony fruit (*Eenyandi*)

CM2 pointed out that, “*Ngele oombe odha kukuta, oto dhi galagulile momutoko, ee todhi tula moshiyuma, eeto thiliko nevi lyoshaanda*” (When berries are dried, you mix them with *Omutoko* (wood ash) and put them in a clay pot, put marula kernel (*Eengongo*) after then plastering the clay pot).

She pointed out that for, “*Eembe opo dhi kale ethimbo inadhi yonuka oto tu lamo omutoko mbala*” (For *Eembe* to last long you should put *Omutoko* early for them to be soft). T1 asked for further explanation: “*Onda pumbwa oku tula mo omutoko mbala ngele dhakukuta?*” (Do I need to put or mix with *Omutoko* immediately after they have been dried?). CM2 responded and said: “*Eeno omutoko ohagu ningi eembe opo dhikale oompu, nongele ino owa mono kutya odha kukukta uunene dhitula pomutenya oha dhiningi oompu*” (Yes, *Omutoko* is to make *Eembe* soft or if you did not put them in the clay pot, if you want to eat them and they are hard, put them direct to sunlight, they will become soft).

T2 asked: “*Omolwashike ndina oku tulamo oongongo?*” (Why do you have to put dry Marula kernels?). CM2 emphasised that “*Evi ohalikala lya tuta opo nee omeya nga geli mevi kagiikwate noombe*” (The clay soil is moist since there is water in it to avoid the contact of water between *Eembe* and the clay soil, Marula kernels are acting as a waterproof sealer).



Figure 5.7: Shows the procedures of preserving berry fruits

T2 thanked God for the opportunity she had to learn how *Eembe* are preserved. She further commented that, “*I like berry fruits, but I did not know how they are preserved*”.

Table 5.2: Shows a summary of preserving vegetable (*Ombidi*) and wild fruits *Eembe* (wild berries) and *Eenyandi* (African Ebony fruit)

Traditional vegetable and fruits	Process of Preserving
Wild vegetable (<i>Ombidi</i>)	<ol style="list-style-type: none"> 1. Harvest, wash to remove sand, cook it, pound/mound it and dry. 2. Harvest, wash, cook and dry.
<i>Eembe</i> (wild berries)	Collect, dry them. Apply ash. Put them in the clay pot (<i>Oshitoo</i>), put marula kernels in, plaster with mud (mixture) of clay soil and water.
<i>Eenyandi</i> (African Ebony)	Collect them, dry and put them in.

It emerged from these practical demonstrations that all *Oshiwambo* tribe members eat *Ombidi*, *Eembe* and *Eenyandi*. *Ombidi* is used for various purposes, for example, as a relish, medicine and as a source of income. It is also regarded as traditional staple food, which is served first at traditional events, before the westernised food is served. It is believed to be very nutritious and gives you energy and also is very appetising, hence it is served first. In addition, wild fruit berries and *Eenyandi* are served as snacks (see Figure 5.8 for pictures of berries and African Ebony fruit).



Figure 5.8: Shows traditional snacks (*iikokotomwa*)

These fruits can also be used as a source of income by selling them or making the traditional liquor called *Ombike*. In these discussions, I learnt that wood ash (*Omutoko*) is valued for killing and preventing insects from spoiling the fruits. This is done in order to extend the shelf life of food while maintaining its nutritional value as much as possible and avoiding the growth

of unwanted micro-organisms (Reza Mozafari et al., 2008). Moreover, wood ash and mud are applied in the grain basket where berry fruits are stored to avoid insects entering.



Figure 5.9: Shows traditional basket where fruits are kept for later use

It was amazing to listen to the expert community members' presentations. Teachers' participation was stimulated by seeing their indigenous knowledge being applicable in science classrooms and it was easier for them to express themselves because they were speaking *Oshiwambo* (mother tongue). CM1 and CM2 involved teachers during their presentations by sending them out to prepare the termite hill sand, ash and to crush and collect African Ebony fruit (see picture below).



Figure 5.10: Shows teachers' engagement during the expert community members' presentations

During the presentations by the expert community members, I was impressed by the eager curiosity, as well as the participation of the teachers. Community members demonstrated

learning experiences in which teachers interacted with materials which could help them observe and understand the nature of science. This was also found by Woodley (2009), who stipulated that practical demonstrations engage learners (teachers in the context of this study) to help them develop skills, understand the process of scientific investigation and develop their understanding of scientific concepts. The whole process led me to believe that indigenous knowledge is a powerful tool for learning and teaching.

I observed that the cultural practical demonstrations by expert community members helped teachers make sense of the scientific knowledge that emerged from the presentation on how foods are preserved. It also stimulated and encouraged teachers to ask questions so that they could learn more from the expert community members. Furthermore, the process of practical demonstrations by CM1 and CM2 helped teachers to think critically and created discussions that would help them link and use this knowledge in their teaching practices. The presentations by expert community members enacted social unity, in which teachers interacted socially with the expert community members to learn from each other. The knowledge that teachers got from the community members contributed to teachers' pedagogical content knowledge on the topic of food preservation.

Even though these community members are not trained as teachers, their cultural practical demonstrations have transformed the cultural knowledge on food preservation using the Topic Specific Pedagogical Content Knowledge (TSPCK) components (Mavhunga et al, 2016). For instance, CM1 started her presentation by asking teachers to identify the cultural tools she used during her demonstration. The community members tried to find out teachers' prior knowledge. CM1 allowed teachers to share what they knew and identified the misconceptions of teachers about clay pots. In addition, CM1 presented things that were not requested; this talks to curricular saliency and conceptual teaching strategies in order for teachers to make sense of what they find difficult to teach. Moreover, the expert community members presented in such a way that their presentations carried meaning for teachers. Materials use during these presentations enhanced meaningful understanding of science concepts.

In the next section, I present sub-themes and themes that emerged from the participatory observations I did during community members' presentations and journal reflections written by the teachers.

From the expert community members' presentations and teachers' written reflections, I extracted some episodes and I then combined common sub-themes to form themes, in relation to theory or literature. Themes and sub-themes are showed in Table 5.2 below.

Table 5.3: Shows themes emerged from the data and supporting theory or literature

Themes	Literature/Theory
<p>Theme 1: Learning affordances</p> <p>Link to science, inclusion of IK, learning during presentations</p>	<p>Oloruntegbeo & Ikpe (2011); Kibirige & van Rooyen (2006); Mukwambo et al. (2014); Mhakure & Otulaja (2017); Mavuru & Ramnarain (2017); Nikodemus (2017).</p>
<p>Theme 2: Shift in learning</p> <p>Supporting teachers and drawing from everyday life</p>	<p>Eun (2008); Shabani (2016); Ogunniyi & Hewson (2008); Ogunniyi & Ogawa (2008); Southwood & Ngcoza (2019).</p>

Each theme is discussed below, in relation to literature and theory.

5.3 Themes

Two themes emerged from my data and I now discuss each of these themes below.

5.3.1 Learning affordances

The community members (CM1, CM2) shared and demonstrated the various ways of preserving food. Their presentations provided an opportunity for teachers to think and relate these presentations to their teaching practices. Additionally, teachers were able to come up with scientific concepts that emerged from expert community members' presentations.

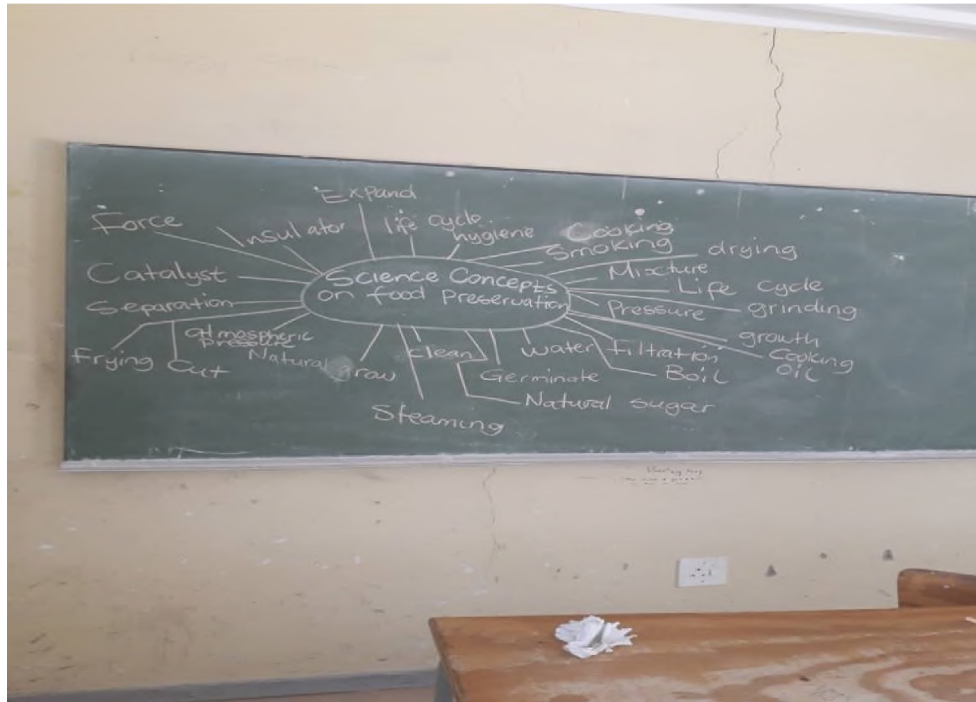


Figure 5.11: Shows some scientific concepts that emerged from the process of preserving food

During the presentations, I observed that the teachers were afforded an opportunity to think out of the box. This evidence came from the teachers' comments during the presentations:

I think the process of Ombidi can also be used during the topic of scientific processes where you speak about filtration, decanting, floating and sinking. (CM1PT2)

This can also be used to explain the concepts of physical and chemical changes because the meme (CM1) have explained that when Ombidi is ready it will change from green to a brownish colour. (CM1PT3)

From these excerpts, possible science topics were identified by teachers. This is an indication that learning took place during the expert community members' presentations. Worth noting, is that the community members' presentations did not only help these teachers to teach elementary Agricultural Science, but also to link to other science subjects like Mathematics, Physical Science and Natural Science. For example, T1 further reflected: "So this can be used to teach shapes. Meaning I can send learners to bring Ombidi then we mound shapes out of it" (CM1PT1).

During the presentations made by the expert community members (CM1, CM2), interactions, participation and learning were observed (Sedláček & Sedova, 2017). Notably, these community members tried to involve teachers during their presentations. For instance, CM1 tried to capture teachers' attention by telling them “*Pwiikineni nee nawa*” which is translated as listen carefully. She said this each time she was about to make an important point.

Similarly, CM2 also tried to involve the teachers by asking them to help during the process of preserving *Eembe* (berry fruits) and taking teachers out to collect or harvest African Ebony fruits (*Eenyandi*) before her demonstration (see below). This resonates with Vygotsky's (1978) socio-cultural theory, which indicates that learning takes place through social interactions with peers or with the more knowledgeable other.



Figure 5.12: Shows engagement of teachers during CM2's presentation

Learning was also observed when teachers were taking notes when the community members were presenting.

For instance, T1 reflected that:

I have learnt in-depth explanations of many issues for example why Eengongo (Marula kernel) is placed on top of berries before applying mud. Also why the clay pot cooks faster or keeps its temperature. (T1R)

This comment shows that there was a shift in learning. For example, during the semi-structured interviews, T1 indicated that he does not integrate IK in his lessons because he has no adequate knowledge on how food is preserved. As a result of the community members' presentation, he indicated that he learnt in-depth explanations surrounding the preservation of food

preservation. Also, T2 indicated, “*I learnt how to preserve traditional veggies and Eembe (berry fruits)*” (T2R).

This resonates with Aluga and Kambwe (2016), who encourage people to have knowledge of their indigenous ways of preserving food so that people can pass these cultural ways of preserving food, as well as their cultural heritage, to other generations to come.

These teachers also showed great interest in these presentations made by the expert community members. This finding resonates with Mavuru and Ramnarain’s (2017) argument that if learning is related to cultural settings, learners (teachers in the context of this study) will show interest and relate it to what they know. As the community members were presenting, teachers were able to relate the knowledge they got from them to what they have learnt and teach in science. For instance, when CM2 said they dry *Ombidi* on top of the traditional hut which is made from grass, teachers were able to relate this to good insulators.

Furthermore, CM1 explained that a clay pot is good to use when cooking. Food which is cooked in clay pots is delicious compared to the stainless steel pots. The clay pot does not require much firewood, and if it starts to boil, there is no need to put on more firewood because it takes time to cool down. The reaction towards this statement showed the teachers interest in knowing more. This community member demonstrated and proved to us that she is more knowledgeable. She showed her level of understanding of indigenous knowledge. From her explanations, she showed us that she cares for us in a spirit of mutual support. The way that teachers were asking questions and the interactions during this demonstration, showed that learning was taking place. Teachers were taking notes and were eager to know more about clay pots.

Again, during CM2’s presentation, teachers also asked questions, indicating that they were interested in learning something from the presenter. T1 and T3 asked the following questions:

Why do you put Marula kernel after you put berries in the clay pot? (CM2PT1)

Why do you mix Eembe with Omutoko? (CM2PT3)

CM2 showed her experience and understanding by responding that the Marula kernels are placed on top of the clay pot so as not to allow water in the mud to go through. My assumption was, that these Marula kernels act as waterproof sealers. CM2 also responded to T3, that ash is

mixed with *Eembe* for two reasons: To keep them soft and to avoid insects spoiling them. This resonates with Rodrigues (2019) that food by nature begins to be spoilt the moment it is harvested and is likely to be spoiled by post harvesters' microorganisms quickly. The process of mixing these fruits with wood ash (*Omutoko*), is thus to avoid these fruits spoiling and allowing them to last longer.

Learning was also observed when CM1 and teachers were sharing their experiences about *Eenyandi*. They shared that *Eenyandi* can be used to make traditional bread and can be used to make a traditional drink called *Omalodu*. This also resonates with Vygotsky's (1978) theory that proposes that learning in a social set up encourages sharing of insights among others. He believes that the community plays a central role in the process of making meaning through social interactions. Stears, Malcolm and Kowlas (2003), stress that individual knowledge is constructed socially and is mediated as a result of cultural experiences.

The materials used during these workshops were those that the teachers were familiar with. Thus, the participants were able to link and relate to the content of the subject they teach (Stears et al., 2003). As teachers were actively involved and participated during these presentations, they learnt new ideas to use during their teaching practices. Teachers were also able to link the local knowledge presented by community members to science knowledge. This is also emphasised by Aikenhead and Jegede (1999) that learners need to move from culture to science culture and vice versa.

Herein lies Vygotsky's (1978) SCT that learning occurs in the social set up when provided with cultural tools that mediate learning. During these practical demonstrations by the community members, there were various cultural tools such as *Oshitoo* (storing clay pot) and *Ombiya yedu* (clay pot for cooking), that made the teachers ask more questions about what they were seeing. Teachers were able to link the community members' explanations to science. As CM1 said: "*Ombiya yedu ihayi polo diva, yo inayipumbwa omeya vahapu nge toteleke*" (The clay pot for cooking takes time to cool and you don't need to use much water when cooking). Teachers were linking this to science, by saying that it means the clay pot is a fair conductor of heat and it acts like a steamer. This shows them participating and connecting the community members' knowledge to western science. It is also proposed by Oluruntegbe and Ikpe (2011) that home knowledge is important because it helps people to relate to and understand western science.

In her study conducted in South Africa, Kuhlana (2011) found that science is everywhere, and we are surrounded by science. CM2 explained that: “*Eembe nge ndakukuta unene ohadhi tulwa pomutenya*” (When berries are too hard or too dry, they put it directly in the sunlight so that they can soften). This shows that everything we do at home and in society has science embedded in it. This finding revealed that community members are also important and need to be involved in our teaching of science subjects. This was also found by Klein (2011), that if community members are included in teaching, it builds the relationship between the school and society. Participants in this study also showed how important community members are in their reflections on what they thought about the presentations made by the community members. For example, T1 reflected that: “*The presentations were effective and educative. The knowledge from the community members is needed to be documented and recognised*” (T2R).

This participant realised that community members are the custodians of the indigenous knowledge and they are rich resources of education. Also, T3 recognised the importance of community members and she reflected that: “*Community members have a lot of experience when it comes to food preservation and they have shown us different ways of preserving in their traditional/ indigenous way without food getting spoiled*” (T3R).

These two participants showed an appreciation of culture and of having community members as educational resources of indigenous knowledge.

The language used during these practical demonstrations of preserving food was Oshiwambo, and this facilitated teaching and learning during these presentations. Mavuru and Ramnarain (2019), as well as Msimanga and Lelliot (2014), found that using a home language for engagement facilitates conceptual understanding of science concepts. It gave teachers opportunities to think deeply and connect community members’ presentations to their daily teaching practices. For instance, when CM1 explained with confidence: “*Ombidi oha i yinyaleke pondunda yeehoni opo omeya aeshe vahapwiininemo*” (The reason we use our traditional hut is that it is made up of grass and is very cool; the water will not evaporate, some amount of water will remain in *Ombidi*). Teachers were able to link this explanation to good insulators and good conductors of heat.

According to Vygotsky’s (1978) SCT, human activities occur in a cultural context that is mediated by language. Language is the main tool that mediates thinking. This resonates very

well with Vygotsky (1978), where culture plays a vital role in how knowledge is acquired in the classroom setting and influences the way we acquire knowledge. As the community members were presenting in Oshiwambo, it gave teachers opportunities to think deeper and connect these presentations to their daily teaching practices on the topic of food presentation and to science as a subject at large. The NCBE (Namibia. MoE, 2016) also points out that language is the most important tool for thinking, the most important means of communication, and one of the most important aspects of identity.

The community members were happy for the opportunity they got to share their local knowledge on how food is preserved. This brings science from the classroom to the community and the community to the classroom.



Figure 5.13: Shows how seeds are preserved

One community member wanted to educate us on different aspects within the Oshiwambo culture. She emphasised why our cultural heritage is diminishing and being absorbed into westernised culture. The pictures above show oil from seeds that are used as medicine. The oil can also be used as hair moisturiser and can enhance hair growth. These seeds can also be served as snacks during the summer seasons. CM1 was so delighted to demonstrate and show her skills and knowledge that she has on indigenous food as being important to the health of human beings.

Even though the demonstration by community members took a long time, we did not feel it because it was educational and the social interaction with teachers made the time shorter. The community members showed us that they were eager to meet and help us acquire indigenous

knowledge, not only on what I asked them to demonstrate, but everything they thought we needed to know about the materials used during their presentations. CM2 pointed out that unripe African Ebony is used by men to strengthen their hunting bows because it is considered to be sticky.

5.3.2 Shift in learning

All three teachers reflected that:

The presentations by community member have changes my presentation in a sense that it encouraged me to draw examples and scenarios from our everyday practices. (T1R)

The presentation made me think critically on how I can use my indigenous knowledge to mediate learning of science especially food preservation. (T2R).

My introduction from now on will include more questions based on indigenous knowledge to test the learners understanding and inputs. (T3R)

From this evidence, teachers indicated that the presentations by community members had changed their teaching practice. All three indicated that from these presentations, their teaching strategies of teaching food preservation will definitely change. These findings resonate with Eun (2008) and Ngcoza and Southwood (2019), who found that engaging teachers in professional development activities could help them to change their teaching practices. CPD plays a major role in changing teachers' teaching by moving beyond "comprehension of the surface features of a new idea and innovation, to a deeper understanding of a topic" (Rout & Behera, 2014, p. 9). These scholars further explain that workshops are essential in professional development, as they create opportunities for teachers to interact with others (Vygotsky, 1978). Workshops are also seen to contribute positively towards professional development of teachers.

Also during the co-development of the lesson plans that integrated local knowledge, teachers were able to come up with different lesson plans from their previous lesson plan (see Appendix H for an example). The lesson plan was based on the five components of Topic Specific Pedagogical Content Knowledge (TSPCK). Teachers showed a shift in their ZPD. Teachers further developed awareness on how they handle the misconceptions learners might have on the topic of food preservation (Mavhunga & Rollnick, 2013).

As a result of the community members' presentations, the participants' viewed indigenous knowledge as:

- Visualisations;
- Sense making of science concepts;
- Eliciting prior knowledge of learners; and
- Something that facilitates learners' learning.

5.4 Chapter Summary

In this chapter, I analysed and discussed the data generated from participatory observation and reflection. These tools were used in order to answer question three in the study. I started this chapter with the profile of the community members and then discussed what emerged from the workshops presented by the community members. In the next chapter I present the summary of the findings, recommendations and conclusion.

CHAPTER SIX: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

6.1 Introduction

In the previous chapter, I presented, analysed and discussed the data generated from participatory observations and reflections. In this chapter, I present a summary of my findings and provide some recommendations thereof. I also suggest areas for future research. The limitations of this study and my personal reflections are also presented. The chapter ends with the overall conclusion of the study.

6.2 Overview of the Study

The main goal of this study was to work *with* Grade 6 Elementary Agricultural Science teachers on how to integrate local knowledge in the topic of food preservation. To achieve the goal, the following research questions were addressed.

1. What are Grade 6 Elementary Agricultural Science teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?
2. What lessons can Grade 6 Elementary Agricultural Science teachers learn (or not) about food preservation through co-analysing the curriculum documents?
3. In what ways did Grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the community members?

To answer the research questions, I used various data gathering techniques. For research question 1, for instance, semi-structured interviews were used to find out teachers' experiences, understandings and pedagogical insights on the use of local knowledge in the topic of food preservation. The semi-structured interviews afforded me an opportunity to get insightful data from three teachers who participated in this study. For research question 2, I used document

analysis to gather data. The data generated from research questions 1 and 2 were presented, analysed and discussed in Chapter Four in this thesis. Participatory observation and journal reflections were deemed essential data gathering techniques to answer research question 3 of this study in Chapter Five. I now discuss the summary of my findings below.

6.3 Summary of Findings

I present the summary of the findings in relation to each research question as illustrated below. I start with research question one as follows:

Research Question 1

What are Grade 6 Elementary Agricultural Science teachers' experiences, understandings and pedagogical insights on the use of local knowledge in food preservation?

This findings revealed that all three teachers involved in this study seemed to understand what local or indigenous knowledge (IK) is. For instance, they viewed IK as community based knowledge that is influenced by the local environment people live in. Furthermore, these teachers used similar terms such as “*community, passed on, generation and local people*” to define IK. Their definitions are similar to Mapara’s (2009) who defined IK as the knowledge that is unique to a certain society. These further resonate with Hays (2009), who defines indigenous knowledge as a “complete knowledge system with its own concepts of epistemology, philosophy and scientific and logical validity, which can only be learned and understood by means of pedagogy traditionally employed by these people themselves” (p. 196).

The study further found that teachers understand the benefits of integrating local/indigenous knowledge and they seemed to be positive about its inclusion in science lessons. That is, they regarded IK as a helper, for teachers to ensure that learners have a better conceptual understanding when teaching science, particularly on the topic of food preservation. To them, if IK is not integrated in science, it might be difficult for learners to make the connection between their IK and westernised science, what Aikenhead and Jegede (1999) refer to as ‘border crossing’. For instance, they pointed out that when IK is integrated in the topic of food preservation, it helps learners have a better understanding of the concepts. This coheres with Kibirige and van Rooyen (2006), who acknowledge that when IK is integrated in teaching science, it enriches science and enhances active participation (Sedláček & Sedova, 2017), since

learners can experience or feel the connection between what they are learning and what they do at home.

Contrarily, however, even though these teachers seemed to understand and know the benefits of the inclusion of local/indigenous knowledge, they revealed that they seldom or never integrate this knowledge when teaching food preservation. For instance, T2FSSI commented that: “*Mem! Shuuuu! Not really maybe once or not at all*”; T3FSSI: “*Not really or let me say no I hardly do that*”; and T1MSSI added that “*Sometimes, after Rhodes University introduced this concept to me when I was doing my honours and my master’s*”. From these teachers’ excerpts, it could be surmised that lack of understanding on how to integrate local/IK seemed to be a challenge. Understandably, also, these teachers seemed to be at different ZPDs (Stott, 2016; Vygotsky, 1978) in terms of their understanding of the integration of IK in science lessons.

Lack of interest in integrating local or IK in science lessons was further exacerbated by these teachers’ experiences. For instance, T3FSSI indicated that she was told not to use indigenous language during her teaching. This contradicts Vygotsky (1978), who posits that language plays a very important role in mediation of learning. Stopping teachers from using local language might hinder the potential to integrate IK. Following a similar line of argument as Msimanga and Lelliot (2014), Mavuru and Ramnarain (2019) reiterate that learners’ home language can be used as a resource for learning rather than being seen as a barrier.

Integration of IK is influenced by what the teachers were exposed to during their schooling days and when at institutions of higher learning. For example, T1MSSI highlighted that he was exposed to how to integrate IK in science lessons when he was doing his BEd Honours in Education with Rhodes University. As a result, that changed his beliefs about the integration of IK in science lessons and subsequently he started integrating it in some of his lessons. He confessed, however, that he does not have adequate knowledge when it comes to traditional knowledge on how foods are preserved or on how to integrate IK.

Research Question 2

What lessons can Grade 6 Elementary Agricultural Science teachers learn (or not) about food preservation through co-analysing curriculum documents?

As we were co-analysing curriculum documents, I found out that some teachers were not aware of what the National Curriculum is. For example, T3 asked: “*What is the difference between the National Curriculum and the syllabus?*” T1 elegantly explained that:

The National Curriculum has sections, goals, skills of specific that subject ... the syllabus is specific for each subject and it contains objectives and competencies.

As a result of co-analysing the curriculum documents, teachers learnt that the curriculum and the subject policy state clearly that teaching and learning should start from what the learners already know. Teachers should value the learners’ life experiences as the focal point of learning and teaching and teachers should therefore select learning content and methods on the basis of the learners’ needs within their immediate environment and community (Namibia. NCBE, 2016). That is, teachers should consider learners’ prior knowledge (Mavhunga & Rollnick, 2013; Roschelle, 1995). That is, their teaching should start by asking what learners know from the previous grade or from their homes and communities. For instance, when teaching the topic of food preservation, learners should link their local/indigenous knowledge, such as bringing *Ombidi* to school, to classroom science. Teachers learnt that the aim of teaching Agricultural Science in schools is to provide learners’ with a scientific background and that they are required to produce more needed scientists and agriculturalists for the country. Teachers learnt that they have a responsibility to organise their administrative duties and plan their teaching and learning to meet the expectations of the national standards as explained in figure 3.1. Additionally, teachers had an opportunity to learn that Agricultural Science was introduced in schools in order to lay the foundation for the development of human resources as the basis for occupation or self-employment.

In addition, teachers came to learn that the number of lessons allocated to Agricultural Science per week is not enough to carry out hands-on practical activities (Asheela, 2017). This is because the Elementary Agricultural Science syllabus requires teachers to teach skills on the correct use and storage of food and handling the servicing of commonly needed tools and equipment used in producing crops and vegetables. This revealed clearly that professional learning communities were taking place as teachers were asking questions and learning from each other (Brodie, 2016; Chauraya & Brodie, 2017). This workshop was a convenient platform for teachers; they shared their opinions and teaching experiences with respect to

teaching methods and learning processes. Vygotsky (1978) also posits that people's cognitive development occurs sequentially through social interactions on the social plane.

Research question 3

In what ways did Grade 6 Elementary Agricultural Science teachers interact, participate and learn (or not) during the presentations on traditional methods of food preservation made by the expert community members?

As I alluded to in the methodology chapter, the expert community members presented how food is preserved traditionally. During the workshops presented by two expert community members, I was a participant observer and observed how teachers interacted, participated and learned (or not) during the presentations. The community members shared and demonstrated the various ways of preserving food and their presentations provided an opportunity for teachers to think and relate these presentations to their teaching practices. These presentations also afforded teachers an opportunity to identify possible science topics that they could teach using some of the concepts that emerged from the expert community members' presentations. Similarly, they were able to relate the knowledge they got from the community members to what they teach in science. For instance, T2 commented that:

I think the process of Ombidi can also be used during the topic of scientific processes where you speak about filtration, decanting, floating and sinking. (T2FSSI)

From this excerpt, possible science topics were identified by teachers. The community members' presentations did not only help these teachers to teach Elementary Agricultural Science, but also to links to other science subjects like Life Science, Mathematics, Natural Science and Physical Science.

During their presentations, the expert community members tried to involve teachers during their presentations. For instance, CM1 tried to capture teachers' attention by telling them "pwiikineni nee nawa" (listen carefully). Also, CM2 tried to find out from teachers how traditional fruits are preserved during her demonstration. This coheres with Vygotsky's (1978) socio-cultural theory, which indicates that learning takes place through social interactions with peers or with the more knowledgeable other.

Comments made by teachers showed a shift in learning. For example, during the semi-structured interviews, T1 indicated that he does not integrate IK in his teaching because he has no adequate knowledge on how food is preserved. As a result of the community members' presentations, he indicated that he has now learnt in-depth explanations about the preservation of food. Also, T2 indicated that: "*I learnt how to preserve traditional veggies and Eembe (berry fruits)*" (T2R). This corroborates with Aluga and Kambwe (2016), who encourage people to have knowledge of their indigenous ways of preserving food so that people pass on cultural ways of preserving food, as well as their cultural heritage to other generations to come.

Teachers shared their experiences with community members on the importance of wild fruits such as berries and African Ebony. There was active participation and interaction from teachers during these presentations and discussions indicated that community members had an influence on the participants' interest in the use of IK in their teaching of food preservation. The materials used during these workshops were those that the teachers were familiar with. Thus, the participants were able to link and relate the content of their subjects they teach (Stears et al., 2003). This also parallels with Vygotsky's (1978) theory, that proposes that learning in a social set up encourages sharing of insights among others.

The local language used during these practical demonstrations of preserving food was Oshiwambo and it facilitated teaching and learning during these presentations as reiterated by Mavuru and Ramnarain (2019), as well as Msimanga and Lelliot (2014). For instance, it gave teachers an opportunity to think deeply and connect community members' presentations to their daily teaching practices. Teachers were able to translate concepts from Oshiwambo to English as the language of learning and teaching (LoLT). This is what Aikenhead and Jegede (1999) call cultural 'border crossing'. Cultural border crossing can serve science teachers, the 'pedagogical culture workers' who make the culture of science accessible to all their learners (ibid.). In light of this, CM1 reflected that "*Ombidi oha i nyalekwa pondunda yehoni opo omeya ameshe vahapwiininemo*" (The reason we use our traditional hut is that is made up of grass and is very cool, the water will not evaporate). Teachers were also able to link this explanation to good insulators and good conductors of heat. According to Vygotsky's (1978) socio-cultural theory, human activities occur in a cultural context that is mediated by language. That is, language is the main tool that mediates thinking. However, cultural artefacts contribute to the way things are done in the community.

The teachers involved in this study realised that community members are the custodians of the cultural heritage on food preservation. They thus realised that the knowledge from the community members needs to be documented so that it is not lost (Kibirige & van Rooyen, 2006).

Similarly, the community members indicated that they were happy to share their indigenous knowledge with the teachers. For instance, CM1 said '*Longeni uunona vetu omufwuululwakalo molwaashi luhapu ngee wevalombwele oha vati ashike omulongi wetu inetu longa ngaho*' (Teach our children about their culture, in many cases if you tell children to do something they always responding that our teacher did teach us that). The expert community members believed that their children (learners) trust their teachers. Thus, they have seen that teachers are the right people to teach IK to learners.

This study revealed that the cultural practical demonstrations by expert community members helped teachers to make sense of the scientific knowledge embedded in the traditional ways of preserving foods. It also stimulated teachers to ask questions from them to learn more about these traditional processes. The presentations by expert community members, therefore, acted as social unity, in which teachers interacted socially with the expert community members to learn from each other. The knowledge that teachers got from the community members contributed to their pedagogical content knowledge on the topic of food preservation, by developing a lesson plan that integrated indigenous knowledge. Teachers indicated that their indigenous pedagogical content knowledge (Mukwambo, 2012) with roots embedded in pedagogical content knowledge (Shulman, 1986) on the topic of food preservation, was changed by the presentations by community members.

The expert community members elicited the teachers' prior knowledge and presented beyond what they were requested to do. This talked to curriculum saliency. They conceptualised teaching strategies in order for teachers to make sense of what was difficult to understand.

The presentations by community members encouraged teachers:

- To draw examples and scenarios from their everyday practices;
- To think critically on how they could use their indigenous knowledge to mediate learning of science especially food preservation; and

- To include more questions based on indigenous knowledge to test the learners' understanding and inputs during the introduction, as well in the presentation of the lessons.

This corroborates with Eun (2008) and Ngcoza and Southwood (2019), who found that engaging teachers in professional development activities could help them change their teaching practices. The workshops by community members helped the teachers to gain deeper understanding on the topic of food preservation. As a result, a shift was observed in the teachers' ZPDs and they developed some awareness on how they handle the misconceptions learners might have on the topic of food preservation (Mavhunga & Rollnick, 2013).

6.4 Recommendations

Based on the findings, I recommend that teachers need to be capacitated on how to integrate IK in their teaching. That is, teachers should be involved in professional learning communities that will help them share the difficulties that they encounter during their teaching practices and come up with strategies to collaboratively overcome such difficulties. I recommend that an educational National Curriculum policy be introduced as a module during teacher training courses, for them to know what the National Curriculum entails. In-service training is needed for teachers to explore and learn new things. I recommend that there should be a community centre of knowledge that will provide teachers with skills and educate them about local or indigenous knowledge. Furthermore, science teachers should consider making use of community members in their teaching in order to help them or teach the cultural ways of preserving food for example. For instance, from the findings of this study there were many science concepts that emerged from the cultural or traditional ways of preserving food. Therefore, community members should be invited to share their cultural heritage, so that teachers can link the IK from community members to classroom science. Thus, teachers need to develop communities of practice and professional learning communities with expert community members.

There should be a good relationship between community members and schools in order to facilitate better partnerships because community members are the custodians of IK. They should be involved in running workshops in order for teachers to acquire indigenous knowledge.

6.5 Areas for Future Research

Further research in the field of Elementary Agricultural Science on how community members preserve mopane worms in the appropriate season could be useful to research. I further recommend that this research could be done and extended on the same topic, whereby teachers could teach the co-developed model lessons in their classrooms while they are observed. A further research could be done on the same topic, whereby the community members demonstrate to learners how they preserve food traditionally and allow them to connect IK to science. A further study could be conducted whereby community members are interviewed on what they think about the integration of indigenous knowledge in science classrooms.

6.6 Limitations to the Study

This case study was designed to work *with* three Elementary Agricultural Science teachers in the Oshana region. Therefore, since this sample was small, the study cannot be generalised to represent all Agricultural Science teachers in the Oshana region. Notwithstanding, some insights on the integration of local or indigenous knowledge have been highlighted in this study. Use of home language was a huge advantage (Mavuru & Ramnarain, 2019) in this study, as social interactions and participation were enhanced as espoused by Vygotsky (1979). However, I am mindful of the fact that in the process of translating from Oshiwambo to English, some meanings could have been distorted. To counteract this limitation, member checking was used whereby transcripts were given to the three research participants to ascertain if what was written was a true reflection of what was said and presented by the expert community members.

6.7 Personal Reflections

Towards the completion of my Honours Degree I developed an interest to do my Master's in Science Education, after I was introduced to the topic of integrating indigenous knowledge in science education. Being a wife and a mother to two young children ensured great memories on this journey. It was not easy leaving my four year old girl and two year old boy in the care of their father to pursue full time study.

My research journey was a bit challenging and at the same time quite a rewarding experience. For instance, it was a challenge to come up with research questions and the theory to be used in the study and how to analyse my data. Nonetheless, with the support of my two supervisors

and other scholars, I was helped to overcome these challenges. As a team, we all embraced the African Proverb that says: *“If you want to walk fast walk alone, if you want to walk far walk together”*.

As reflected in my findings, my research participants showed an interest in taking part in this study. Essentially, it could be argued that they made the study theirs by calling and reminding me about the next presentations. The wonderful presentations by expert community members really helped in learning different traditional ways of preserving foods, something I overlooked as a child, a learner at school and as a teacher. They proved that they are indeed more knowledgeable others as emphasised by Vygotsky (1978).

This study has thus contributed to my professional growth, not only on how to integrate indigenous knowledge in my teaching, but in other skills needed by teachers. For instance, this study has improved my computer skills. It has also equipped me with different skills that helped me change my teaching strategies and to keep in my mind that as teachers we have to learn from learners and then learners will learn from us.

I had such a wonderful experience and received knowledge from community members on how foods are preserved traditionally. These community members did not only teach me the indigenous knowledge, but also taught me the cultural heritage that I need to pass on to Namibian children. I also learnt how important these community members are to the growth of teachers on indigenous practices. Furthermore, I got an opportunity to do a practical demonstration on making *Oshikundu* at the United Nations Educational, Scientific and Cultural Organisation (UNESCO) workshop at Rhodes University. It was such a wonderful experience, as I felt so comfortable and proud using my indigenous language when I was presenting. Using my local language gave me the courage to explain everything without the limitation of language barriers.

The study made me realise the importance of prior knowledge in teaching and also made me reconsider tapping into what learners already know and involving them fully in the lessons when teaching. This was based on how the expert community members involved teachers in their practical demonstrations on preserving food. I learned that language is an important tool in teaching and learning (Msimanga & Lelliot, 2014; Mavuru & Ramnarain, 2019). The expert community members opened my eyes because I did not know that I could eventually teach

science using my indigenous knowledge. These workshop presentations by the community members were invaluable because various skills and knowledge were demonstrated.

6.8 Conclusions

The findings that answered the research questions are that teachers understand the insightful pedagogy on the inclusion of indigenous knowledge, but face challenges on how to integrate this knowledge in their teaching practices.

The professional activities the teachers were involved in, helped them to learn what the curriculum requires of them in terms of integration of local or indigenous knowledge. Furthermore, from the workshops presented by the expert community members, they had an opportunity to share experiences and skills on how to integrate local or indigenous knowledge. Essentially, the presentations by the expert community members improved teachers' zone of proximal development. The teachers also recognised that the expert community members were more knowledgeable, regardless of their educational backgrounds.

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Appendices

Appendix A: Ethical Clearance



Human Ethics subcommittee
Rhodes University Ethical Standards Committee
PO Box 94, Grahamstown, 6140, South Africa
t: +27 (0) 46 693 8055
f: +27 (0) 46 693 8822
e: ethics-committee@ru.ac.za
www.ru.ac.za/research/research/ethics
NHREC Registration no. REC-241114-048

13 September 2019

Sabina Hashondili

Review Reference: 2019-0777-883

Email: g17b8162@campus.ru.ac.za

Dear Sabina Hashondili

Re: Developing model lessons on food preservation that integrate indigenous knowledge

Principal Investigator: Prof Kenneth Ngcoza

Collaborators: Ms. Sabina Hashondili

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee.

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying when the annual report is due.

Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Sincerely

Prof Joanna Dames

Chair: Human Ethics sub-committee, RUESC- HE

Appendix B: Directorate Letter of Consent



REPUBLIC OF NAMIBIA

OSHANA REGIONAL COUNCIL
DIRECTORATE OF EDUCATION, ARTS AND CULTURE
ASPIRING TO EXCELLENCE IN EDUCATION FOR ALL

Tel: 065 - 229800/25
Fax: 065 - 229834

Private Bag 5518
Oshakati

Enquiries: Hileni M Amukana
Ref. 13/2/9/1

Ms. Sabina Hashondili
P. O. Box 3290
Ongwediva

Cell: 0812911661

SUBJECT: PERMISSION TO CONDUCT A RESEARCH IN OSHANA REGION

Your letter dated 10 September 2019 on the above caption bears reference.

Kindly be informed that permission is hereby granted to conduct research study at [redacted] School in Onamutai Circuit, Oshana Region.

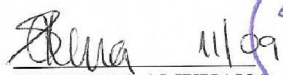
This permission is subject to the following strict conditions; (i) There should be minimal or no interruption on normal working schedule (ii) Ethical issues of confidentiality and anonymity should be respected and retained throughout this activity i.e. Voluntary participation, and consent from participants and (iii) the permission is valid for the entire academic years 2019/ 2020.

Both Parties should understand that this permission could be revoked without explanation at any time.

Furthermore, we humbly request you to share your research findings with the Directorate of Education, Arts and Culture, Oshana Region. You may contact Mr. G.S. Ndafenongo, the Deputy Director; Programs and Quality Assurance (PQA) for the provision of summary of your research findings.

We wish you the best in conducting your study.

Yours sincerely,

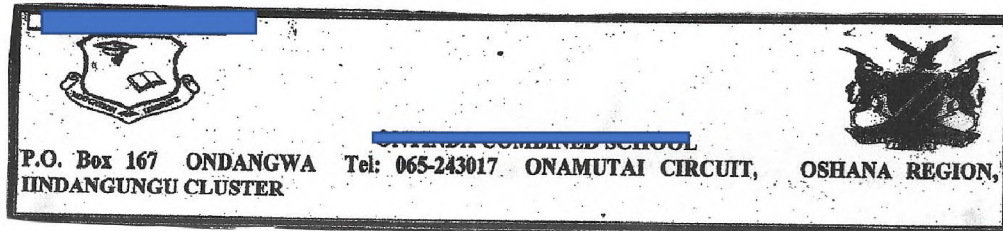

HILENI M. AMUKANA
REGIONAL DIRECTOR



Cc: Inspector of Education: Onamutai Circuit

All Official Correspondence must be addressed to the Regional Director

Appendix C: Principal Letter of Consent



Enquiry [redacted]
Email [redacted]
Tell : 065 243017

[redacted] Combined School
P O BOX 167
Ondangwa
10 September 2019

Dear Sir / Madam

Re: Permission granted to Ms Sabina Hashondili to do her research at [redacted] Combined School

This communiqué affirms that permission has been granted for Ms Sabina Hashondili to do her research at this institution.

Thanking you in advance

Yours sincerely


.....

[redacted]
The principal
MINISTRY OF EDUCATION
THE PRINCIPAL

12 SEP 2019

[redacted]
P.O. BOX 167 ONDANGWA

Appendix D: Teachers' Consent Letter

Rhodes University

P O Box 94 Grahamstown

Drotsky Road

31 July 2019

Dear Sir/ madam

Re: Participation in research on the integration of local or Indigenous Knowledge when teaching food preservation

I am Sabina Hashondili, a full-time student doing Master's in Science Education at Rhodes University, South Africa. I hereby humbly request your permission to be a research participant in my research project. I plan to conduct the study for about four weeks in August/September 2019.

I am inviting you to participate in this research by affording me time for an interview which may last for about 10 to 15 minutes with your permission, attend to six workshops (presentation by community members) which I also intend to videotape. The workshops may last for about 1 hour 30 minutes to 2 hours. All this will be done in order to address my overarching purpose of my study which is to explore working with grade 6 Elementary Agricultural Science teachers in co-developing model lessons that integrate local knowledge on food preservation.

The focus of the study will be on *food preservation* and it will be conducted in six phases. In the first phase, we will have an orientation workshop in which I will present overview of the study. Three community members will run three workshops on how food is preserved traditionally. In the last workshop we are going to reflect and co-develop model lessons that integrate the knowledge shared by the community members. The workshops may last for about 2 hours and they will be also videotaped with your permission.

The benefit is that the study as a whole is responding to the importance of integrating local knowledge in our teaching. The presentation by the community members might change our teaching practices and eventually improve our professional development.

Kindly be informed that your participation in this research study is completely voluntary and you can withdraw at any time you wish. I will ensure that your identity and views will be treated with high degree of confidentiality. Your identity will be anonymized, and pseudonyms will be used instead of your real name and the name of your school. It is recognised, however, that anonymity might be a challenge since we will be working together in this research project. Nonetheless, data that will be gathered will not be used for other purposes apart from this study. I hope my request will receive your favourable consideration.

Should you be interested, we could have a discussion to clarify any questions that you may have. Once you are satisfied, please complete the consent form below. By signing this consent letter you have agreed to participate in the study, audio recording interview and videotaped workshops that we are going to attend.

My contact details are: cell number-0813191876; email: hashondilis@gmail.com. I wish to work in an ethical manner and ethics approval has been obtained from Rhodes University ethics committee with reference number 0777. However, at any stage of this research should you feel uncomfortable or may have concerns, you are welcome to raise your concerns with Rhodes University by contacting Mr Siyanda Manqele at: ethics-committee@ru.ac.za or my supervisors Prof Kenneth M. Ngcoza at k.ngcoza@ru.ac.za and Ms Zukiswa Kuhlana, z.kuhlana@ru.ac.za.

I henceforth request you to indicate your choice by ticking [√] in the appropriate box below.

Agree Not agree Signature:

Your cooperation will be highly appreciated

Yours Sincerely



Sabina Hashondili

Appendix E: Letter to the Community Member 1 [English]

Rhodes University

Drotsky Road

Grahamstown

6139

31 July 2019

Dear Sir/Madam

Re: Participation in research on the integration of Indigenous Knowledge in science

My name is Sabina Hashondili, a full-time student at Rhodes University. I write to kindly request you to participate in my study. My research area is exploring working with grade 6 Elementary Agricultural teachers integrate indigenous knowledge in their class when teaching food preservation and develop model lessons that integrate IK in their teaching.

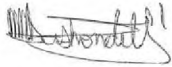
The study will involve an intervention comprising of three workshops from the community members of which you attend and run one workshop on how foods are preserved traditionally. Being someone knowledgeable about the practice of preserving food, I trust you that you can run a workshop for teachers on how to preserve wild fruits (*Eembe, eenyandi*) culturally.

Your participation in this research study will be highly appreciated and is completely voluntary which means that you can withdraw at any time if you wish to do so. The data collected in this study will only be used for academic purposes. The knowledge that you are going to share with us will be used to develop lessons that we (teachers) will use in our teaching with the permission from you. I also ask for your permission to take videos of the demonstrations so that I can be able to analyze the lessons after the workshops. Your identity, views or contributions will be treated with a high degree of confidentiality and anonymity.

I wish to work in an ethical manner and ethics approval has been obtained from Rhodes University ethics committee with reference number 0777. Should you require any further information, please do not hesitate to contact me at 0813191876 or my supervisors. Their contact details are as follows: Prof Kenneth M. Ngcoza (E-mail: k.ngcoza@ru.ac.za) and Ms Zukiswa Kuhlane (E-mail: z.kuhlane@ru.ac.za). I wish to work in an ethical manner. However, at any stage of this research should you feel uncomfortable or may have concerns, you are welcome to raise your concerns with Rhodes University by contacting Mr Siyanda Manqele at ethics-committee@ru.ac.za.

I henceforth request you to complete the consent form below as an indication that you agreed to participant in the study.

Yours sincerely



Sabina Hashondili

DECLARATION BY PARTICIPAN

I agree to participate in the research, and I understand that I am free to withdraw at any time.

Name.....

Signature.....

Contact number.....

Letter to the Community Member 2 [English]

Rhodes University

Drotsky Road

Grahamstown

6139

31 July 2019

Dear Sir/Madam

Re: Participation in research on the integration of Indigenous knowledge in science

My name is Sabina Hashondili, a full-time student at Rhodes University. I write to kindly request you to participate in my study. My research area is exploring working with Elementary Agriculture teachers integrate indigenous knowledge in their class when teaching food preservation and develop model lessons that integrate IK in their teaching.

The study will involve an intervention comprising of one workshop from the community members of which you attend and run one workshop on how food are preserved traditionally. Being someone knowledgeable about the practice of preserving food, I trust you that you can run a workshop to teachers on how to preserve vegetables (*ombidi*) culturally.

Your participation in this research study will be highly appreciated and is completely voluntary which means that you can withdraw at any time if you wish to do so. The data collected in this study will only be used for academic purposes. The knowledge that you are going to share with us will be used to develop lesson that we (teachers) will use in our teaching with the permission from you and shall not be released to anyone else without your consent. I also ask for your permission to take videos of the demonstrations so that I can be able to analyze the lessons after the workshops. Your identity, views or contributions will be treated with a high degree of confidentiality and anonymity.

I wish to work in an ethical manner and ethics approval has been obtained from Rhodes University ethics committee with reference number 0777. Should you require any further information, please do not hesitate to contact me on 0813191876 or my supervisor. Our contact details are as follows: Prof Kenneth Ngcoza (E-mail: K.Ngcoza@ru.ac.za) and Ms Zukiswa Kuhlane (E-mail: z.kuhlane@ru.ac.za). I wish to work in an ethical manner. However, at any stage of this research should you feel uncomfortable or may have concerns, you are welcome to raise your concerns with Rhodes University by contacting Siyanda Manqele at; ethics-committee@ru.ac.za.

I henceforth request you to complete the consent below as an indication that you agreed to participant in the study.

Yours sincerely



Sabina Hashondili

DECLARATION BY PARTICIPAN

I agree to participate in the research, and I understand that I am free to withdraw at any time.

Name.....

Signature.....

Contact number.....

Letter to the Community Members [Oshiwambo translation]

Rhodes University

Drostdy Road

Grahamstown

6139

31 July 2019

Omusimanekwa

Re: ekutho mbinga moshinyangadhalwa nkene omuthigululwakalo hagu kwa thele aalongi sikola opo yalonge aalongwa oku pungula iikulya mookaalasa mono muna uunona waza komihoko dhayooloka.

Ongame Sabina Hashondili ndili omwiilongi kouniversiti ya South Africa, nesimaneko enene ota ndi ku indile opo wuye wu kwadhele nokuningila aalongisikola omadheulo nkene iikulya hayipungulwa pomuthigululwakalo.

Oshinyangadalwa eshi oshili mee ndondo dili natu. onghatu omo ovey tokakala ashoke wakufa ombinga mushimwe, mokutu longa nkene iikulya haipungulwa pamuthigululwakalo.

Omufimanekwa, onde ku pumbwa neh opo uka kwafenge nounongo woye ekutu ulikile onghe oikulya hayipungulwa opo yishiwe okuliwa. embinga mohinya ngadalwa eshi okuliyamba, no to ndulu okulikufamo shama wuundite inopumbwa vali oku ku fa ombinga. Ekufombinga loye ota li ka la lili me holeko nakapena eshi handi kaulukila ina shindja kehalo loye.

Komauyelele awedwapo denga 0813191876 ilo Prof Kenneth Ngcoza (E-mail: K.Ngcoza@ru.ac.za) and Ms Zukiswa Kuhlana (E-mail: z.kuhlana@ru.ac.za).

Woye,



Sabina Hashondili

Appendix F: Thematic Approach

Explain code: T1-T3

GREEN: UNDERSTANDING ABOUT IK

RED: LACK OF UNDERSTANDING

PINK: LIMITED UNDERSTANDING

BLUE: EXAMPLE

MAROON: CULTURAL FEARS

INDUCTIVE-DEDUCTIVE ANALYSIS/THEMATIC APPROACH

<p>1. What do you understand by the term local knowledge?</p>	<p>T1M: local knowledge is the knowledge we learn from the community and this knowledge can be passed from one generation to another generation. In short is knowledge of particular society. [Kibirige & Van Rooyen, 2006]</p> <p>T2F: local knowledge is the knowledge local people have or they develop it among their community, they either use it either for communicating, socializing and so on.</p> <p>T3F: local and knowledge, is the knowledge that have been pass just in the house or community without a proper class teaching and that knowledge that been shared, I don't want to say is a straight knowledge but rather say is a community knowledge.</p>
<p>2. What are your views on the integration of local knowledge in science lessons especially in Agricultural in the topic of food preservation?</p> <p>Follow up do you integrate this knowledge in your teaching</p>	<p>T1 in my view its worthwhile to include IK in science lesson because this are the basic knowledge from home. [Kasanda et al., 2005; Kuhlana, 2011; Mavuru & Rollnick, 2013; Roschelle, 1995]</p> <p>T2: I think if we integrate local knowledge in our teaching especially in science, the lesson will be more interesting and learner will link to what they know. [Mavuru & Ramnarain, 2017; Olurentegbe & Ikpe, 2011; Vygotsky, 1978]</p> <p>T3: This is the knowledge that people have in the community and compare it to science lesson there are many knowledge people know just from the community and unknowingly that that is science example distillation when people making Ombike., this is science that I suppose to teach our learners.</p>

<p>Why?</p>	<p>T1FU: sometime after Rhodes university introduce this concept to me when I was doing my honours and my master. During my study I realised the need of integrating it but I have no adequate knowledge when it comes to this knowledge. The way we were brought up also affect us because there are some works that we don't do as man</p> <p>T2FU: Mem! Shuuuu! Not really maybe once or not at all because I am teaching learners that are not from my community or my tribe. I am ever having that fear If I teach what I know in my culture learners might laugh at me because they might have a different meaning of what I said. They might take it differently.</p> <p>T3FU: not really or let me say no I hardly do that more especially when I struggling with oshiwambo word to English seriously I don't. Currently I don't do that. Because one can do that but seriously I didn't know if it is needed. I could remember when my supervisor was invigilating me he told me that I was too much in oshiwambo. From that day I neglected to integrate local knowledge or local language and concentrate to what is the text book in fact I only focus on what my syllabus is stating.</p> <p>Seriously God should forgive me because I found out that this knowledge is needed, I was killing my learners' culture. I did do what I supposed to do. I found out that we only rushed to finish unknowingly that we left something. I hardly give time to my learners to express them self. in fact I also didn't know what to do.</p>
<p>3 What do you think what are the advantages of integrating local knowledge during science lessons especially when teaching food preservation?</p>	<p>T1: I realised that we teachers have been killing our learners. Integration of Ik in science it really helping learners knowledge act as a mirror how I wish we could know our indigenous knowledge and teach our learners or to integrate this knowledge in our teaching.</p> <p>Learners will free comfortable because what they will say they know is correct , The participation in the class will be high in the class</p> <p>learners will pass this knowledge to others</p>

	<p>T2: Ok... food preservation is to keep food so that we use for quiet long. Mhmm you know in the text book it stated that one process of preserving food is freezing, if we integrate local knowledge in the in the class I think learners will understand the concepts, learners will not fail because they will master the concept.</p> <p>T3: yes very much I have realised it now. Is really needed advantages is there because it might make the subject easier for the learners, because you are giving them something that they normally do. They normally do it excellent at home. They even catch up the content of lesson very fast because you are already bringing something that they aware of. Now if you neglecting them as I did I said, it will take time for learners to catch up the content. Seriously I should ask God to forgive me, just imagine this topic food preservation is more on what we do at home I was supposed to ask learners how they preserve food at home or to demonstrate is I have a feeling that it will be enjoyable. They might know more when it comes to how food is preserve, but my Head of Department also demoralised me. I have learnt now I will implement it to my teaching</p>
<p>4. What do you think what are the disadvantages of integrating local knowledge when teaching the topic of food preservation?</p>	<p>T1: sometime learners are not from the same culture it will be difficult to integrate or know all learners culture.</p> <p>T2: I think some learners will take it granted they will always want to teach them in Oshiwambo. I think again teaching in multicultural class will be a challenge because learners are from the same culture.</p> <p>T3: The disadvantages perhaps cannon be much since the advantages have overpower the whole thing is only some names not appearing in English. Referring you to grade 10 that is marked nationally it will be a problem. We are not from the same culture</p>

Categories	Sub-themes	Themes	THEORY LITERATURE: CONCEPTUAL/THEORETICAL FRAMEWORK
<p>T1M: local knowledge is the knowledge we learn from the community and this knowledge can be passed from one generation to another generation. In short is knowledge of particular society.</p> <p>T2F: local knowledge is the knowledge local people have or they develop it among their community, they either use it either for communicating, socializing and so on.</p> <p>T3F: local and knowledge, is the knowledge that have been pass just in the house or community without a proper class teaching and that knowledge that been shared, I don't want to say is a straight knowledge but rather say is a community knowledge.</p> <p>T1 in my view its worthwhile to include IK in science lesson because this are the basic knowledge from home</p> <p>T2:the lesson will be more interesting and learner will link to what they know</p> <p>T3: This is the knowledge that people have in the community and compare it to science lesson there are many knowledge people know just from the community</p> <p>T1: Learners will free comfortable because what they will say they know is correct , The participation in the class will be high in the class</p>		<p>Teachers' Understanding of the term indigenous knowledge</p> <p>Benefits of integration of IK when teaching food preservation in Agriculture</p>	<p>Kibirige and Van Rooyen (2006); Shizha (2007); Ogunniyi and Ogawa (2008); Mukwambo, Ngozo, and Chikunda</p>

<p>T2: I think learners will understand the concepts</p> <p>T3: They even catch up the content of lesson very fast because you are already bringing something that they aware of</p> <p>T1: sometime learners are not from the same culture it will be difficult to integrate or know all learners culture.</p> <p>T2: teaching in multicultural class will be a challenge because learners are from the same culture</p> <p>T3:.... We are not from the same culture</p>			
<p>T1.....but I have no adequate knowledge when it comes to this</p> <p>not really or let me say no I hardly do that more especially when I struggling with oshiwambo word to English seriously I don't. Currently I don't do that. Because one can do that but seriously I didn't know if it is needed. I could remember when my supervisor was invigilating me he told me that I was too much in oshiwambo. From that day I neglected to integrate local knowledge or local language and concentrate to what is the text book in fact I only focus on what my syllabus is stating.</p>		<p>Hindrance of culture on the inclusion of IK</p>	

Appendix G: Reflection by Teachers

<p>1. What have you learnt (or not) from the community members' presentation?</p>	<p>T1: I have learnt an in depth explanation of many issues for example why Eengongo is placed on top of the berries before applying mud. Also why the clay pots cooks faster or keep temperature.</p> <p>T2: I have learnt how to preserve traditional food like traditional veggie and seeds. I have also learnt how to cook seeds and worms and the traditional veggie</p> <p>T3: I have learnt that the community has a lot of experience when it comes to food preservation and they have shown us different way of preserving in their traditional/ indigenous way without food getting spoiled for a long time, good enough comparing to the modern techniques.</p>
<p>2. How will the presentation change your teaching?</p>	<p>T1: It changed my presentation in a sense that I am encouraged to draw examples and scenarios from our everyday practices and they will help learners to understand science better.</p> <p>T2: Explaining in indigenous knowledge helped to make learners understand. The presentation makes me think critically on how I can use my indigenous knowledge to mediate learning of science especially food presentation</p> <p>T3: I have realized that most of the things we taught learners are already having the pre knowledge or rather good understanding better than we thought of. My introduction from now on will include more questions to test the learners understanding and input</p>
<p>3. Is there a need to include IK in science? Explain</p>	<p>T1: Yes! These, IK and science somehow related or similar. Its only that IK does not have clear and defined concepts (scientific) but it is also science. If it is used it will facilitate learners' understanding.</p>

	<p>T2: Yes. Including IK in science does not mean you are not teaching in science. However, including IK helps learners to make sense of the science concept with what is around them</p> <p>T3: Yes. Since the learners have good knowledge back home, there is a need to include IK. For them to understand better and having including that (IK) learners will participate well. Yet learners will enjoy the teaching and learning whenever they are learning things that they do at home</p>
<p>4. What do you think about the presentation made by the community members?</p>	<p>T1: It was good and interesting due to the in-depth explanation given. Also it just interesting when you have concrete materials during the explanation</p> <p>T2: It is very effective and educative. It needs to be documented and recognized</p> <p>T3: Wonderful presentation. The community addressed well the steps how they do their process and they were able to answer to all the questions we asked them. It was good that during the presentation they showed us all the materials needed.</p>

Appendix H: Model Lesson

Elementary Agricultural science lesson plan

Grade 6

Date: 22-23 September 2019

Learning objective: Learners will appreciate the value of Agriculture in providing raw materials for other industries.

Basic Competence: Learners should discuss ways of preserving food as vegetables and fruits.

Introduction: Group learners in groups of six and ask learners to list 5 types of vegetables and 5 types of fruits they know from home.

Teachers Activities:	Learners Activities:
Hand flip chart to each group and ask learners to write down 5 types of vegetable and fruit.	Receive flip chart and list different fruits and vegetable.
Ask learners to discuss how the listed is preserved.	Discuss in groups how different vegetables and fruits are preserved.
Ask each group to present what they have discussed.	Each group present what they have discussed.
Ask learners to go ask parents how they preserve the vegetables and fruits listed in their groups.	Get information from parents or guardians. Compare what they have discussed from what they got from home.
Ask learners to present what they got from parents.	Do practical demonstration on how they preserve fruits and vegetables.
Monitor the group work discussions and demonstration	

Conclusion: Highlight the main point and give homework to learners to go find out how milk is preserved.