Exploring opportunities for integrating indigenous knowledge and practices into animal husbandry in Grade 10 Agricultural Science lessons

A thesis submitted in fulfilment of the requirements for the degree

Of

MASTER OF EDUCATION
(Science Education)

In the

Education Department

Rhodes University

By

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December 2018

DECLARATION OF ORIGINALITY

I ***Robert Simwanza Siseho*** declare that this thesis has not been submitted for a degree in any other University apart from Rhodes University and I declare that this thesis is my own work, written in my own words. Where I have used the words or ideas of other researchers I have acknowledged them by using complete references according to the Departmental guidelines.

Signature:  Date: 28 December 2018

ABSTRACT

The performance of learners in Agricultural Science at secondary schools in the Omaheke region of Namibia is worrisome. For some years performance in the subject has been below the national average, even though the region is known for its agricultural activities. My assumption is that this could be compounded by the fact that even though the Namibian curriculum encourages teachers to integrate local or indigenous knowledge (IK) in their lessons, it is not clear how this should be executed. It is against this background that this study set out to explore opportunities for integrating indigenous animal husbandry knowledge and practices into the animal husbandry section of Namibian Grade 10 Agricultural Science lessons.

This was a qualitative case study underpinned by the interpretive paradigm. The study first focused on finding out what practices and knowledge might be integrated into animal husbandry within Grade 10 Agricultural Science. Secondly, it aimed at finding strategies for integrating indigenous knowledge into Grade 10 Agricultural Science. Thirdly, using my experience of co-developing model lessons with two Grade 10 Agricultural Science teachers, it sought to identify what assistance teachers need to integrate IK. The fourth goal was to observe the lessons taught in order to find out how the two teachers mediated the lessons featuring IK.

Data were collected using interviews, workshop discussions, observations (videotaped lessons) and reflections. The data were validated through member checking and triangulation via various techniques. I used Vygotsky's (1978) sociocultural theory and Wenger's (1998) community of practice as a composite lens to analyse my data.

The findings showed that there is indigenous knowledge in animal husbandry of disease prevention and treatment, the feeding of livestock, castration, de-horning and parasite control. Strategies to integrate IK included inviting or visiting parents or farmers, using the learners' mother tongue and exploiting local resources. It emerged that teachers need help with teaching strategies, the development of worksheets, lesson planning and the use of technology. The mediation of the lessons included use of the chalkboard and a data projector, worksheets, the teacher assisting learners, and learners assisting one another.

The study recommends that teachers integrate IK into their lessons to contextualize learning, increase learners' participation in class and enhance their understanding of science. It also recommends that curriculum developers make it clear how IK should be integrated and assessed. The study further recommends that institutions of higher education should train teachers on how to integrate IK in the curriculum.

DEDICATION

The study is dedicated to my late father Siseho Ilukena and my mother Agnes Nzwana (Mukumbuta) Matengu for their wise words of encouragement. To my two late brothers, Simasiku Siseho and Ndana Siseho, for their assistance in helping me grow as an African man. To my two sisters Mwale Siseho and Mukumbuta Siseho for being there for me at all times. It is also dedicated to Elizabeth Muira for her encouragement. Thanks to all family members that supported me in this journey.

ACKNOWLEDGEMENTS

With God everything is possible. Therefore I thank God (Shakapanga) for guiding and protecting me during this journey.

I would like to thank my entire family for standing by my side during the two years of this study.

A special thanks also goes to the Director of Education in the region where the study was conducted for granting me permission to pursue my study there. He permitted me to go on study leave a number of times for my contact sessions.

I would also like to thank the school principals for granting me access to their schools and for all the support provided during the data collection process.

Prof Kenneth Ngcoza supervised my study for these two years; his encouragement cemented my sense of purpose and kept me going even in difficult times.

To Mr. Fredrick Simasiku, thank you for encouraging me to apply for a Master's degree in Education and for your encouragement throughout the course. Thank you for proofreading my proposal.

I would like to say a word of appreciation to my research participants for their cooperation during the stage of data collection. I called, texted them and visited whenever I needed more information and they never got tired of me.

It is a great pleasure for me to say a big thank you to the grade 10A learners of Gobabis High School (a pseudonym) for 2018. They played a big role and their cooperation was outstanding during the presentation of the model lessons.

Ms. Elizabeth Muira, your support and encouragement is appreciated. Your support gave me strength during my period of this study.

To my fellow students, we were a family, we supported one another. We travelled together to and from Grahamstown, South Africa. We stayed together during the finalization of our theses. Thanks for everything you have done for me. May the Lord bless you!

My warm appreciation goes to Ms. Zukiswa Kuhlane for the words of encouragements and for accommodating me in her house during the time I was finalizing this thesis in Grahamstown.

Mr. T. Mokhatu, thank you for standing in at work for me while I was on study leave a number of times. May God bless you!

I cannot forget the financial assistance I received in my first year of study from the Directorate of Education, Arts and Culture in Omaheke Region. Your support made a huge difference in my life.

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LIST OF ABBREVIATION AND/OR ACRONYMS

AKRSI – Alaska Rural System Initiative Project

AZD – Actual zone of development

CoP – Community of practice

EHDC – Rhodes Education Higher Degree Committee

FDM – Foot and Mouth Disease

ICT – Information communication technology

IK – Indigenous knowledge

LCE – Learner-Centred Education

NCBE – National Curriculum for Basic Education

NLCE – Namibian Learner-Centred Education

NMoEAC – Namibian Ministry of Education, Arts and Culture

PoPCL – Popular Participation in Curriculum and Instruction.

SCT – Sociocultural theory

USA – United States of America

WK – Western knowledge

ZPD – Zone of proximal development

CHAPTER 1: SITUATING THE STUDY

1.1 Introduction

This study aimed at exploring opportunities for integrating indigenous knowledge (IK) into the animal husbandry section of grade 10 Agricultural Science lessons in the Namibian curriculum. The study was triggered by the poor performance of learners in Agricultural Science in the Omaheke Region, despite the fact that most of these learners have an agricultural background.

This chapter looks at how African and other countries have attempted to integrate IK into their curricula. It also looks at the Namibian curriculum that encourages the integration of IK, but without making it clear how this should be done.

The chapter discusses the poor performance of learners in the subject Agricultural Science nationally (Namibia) and regionally (Omaheke), despite the fact that inhabitants of Omaheke practice agriculture on large scale. The 2016 report on the national examinations indicated that learners of Agriculture, Biology and Life Science were not doing well in those subjects in Namibia.

The research problem is thus the poor performance of learners in national examinations in Agricultural Science at secondary schools in the Omaheke region. The study thus explored the integration of IK into the subject as a possible part-solution to this problem.

I also discuss the significance of the study, which affords teachers some insight into how to integrate the indigenous knowledge and practice of animal husbandry into their lessons. The chapter goes on to address the limitations of the study (extends to only a few schools in the Omaheke region). Definitions of concepts used in the thesis are presented and an outline of the thesis is provided.

1.2 Context of the study

In some industrialized nations with minority indigenous populations, such as Australia, New Zealand, Canada and the United States of America (USA), indigenous knowledge (IK) has been recognized as a valuable teaching resource (Dziva, Mpofu & Kasure, 2011). It has been taught informally since time immemorial but not formally in these countries. Ogunniyi and Ogawa (2008) discuss the attempts to integrate IK in the South African and Japanese school curricula. They note

that Japan combines knowledge obtained from modern science and technology with local knowledge in relation to wind direction, fishing, weather changes and traditional animal detection devices.

Erinosho (2013) points out that there are countries that have successfully implemented an IK-inclusive curriculum, like Ethiopia's Popular Participation in Curriculum and Instruction (PoPCI) and Alaska's Alaska Rural System Initiative Project (AKRSI). Erinosho notes that the focus of PoPCI is to integrate the IK of the local community in Ethiopia into the formal school curriculum by teaming up the teachers with local experts.

Shizha (2013) responds to Erinosho's (2013) claim that after the Jomtein conference of 1990, Nigeria promised to include IK concepts across various disciplines, by pointing out that this does not seem to have been realized in schools. Shizha (2013) also notes that in Kenya the government continues to struggle to reconstruct the country's formal curriculum in order to include the multiple indigenous ways of knowing into the schooling system.

Kibirige and Van Rooyen (2006), and Dziva et al. (2011) add that indigenous knowledge is rich in areas such as farming methods and animal husbandry, medicine, natural resource management, engineering, mathematics, governance, social systems and activities, pest control, fishing, and food production and processing. Erinosho (2013) believes that indigenous people also have rich knowledge in areas like food preservation, metal production, textile processing and building, but even countries that have localized their examinations have not included it.

Thus while many countries have localized their examinations, such localization has not transformed the African school knowledge system, which still mimics the colonial one (Shizha, 2013). African countries continue to adopt Western ideas without contextualizing or adapting them. Shizha cautions that colonial schooling leads to loss of indigenous voices, self-identity and self-confidence. Students in Africa need more locally constructed and applicable knowledge that mirrors indigenous consciousness, and agriculture is rich in this.

All countries, internationally and regionally, depend on agriculture and their environment for survival. Human beings have practised agriculture for thousands of years, making use of their natural environment. From the time indigenous people started practising agriculture they have been developing indigenous knowledge, which could be included in the curriculum.

The Namibian curriculum for basic education encourages the inclusion of indigenous knowledge during teaching and learning, but does not make it clear how this should be done. For instance, it indicates that teachers should take a holistic view of the learner, valuing the learner's life experiences as the focal point of learning and teaching. Teachers should therefore select learning content and methods on the basis of learners' needs within their immediate environment and community (Namibia. Ministry of Education [MoE]. National Curriculum for Basic Education [NCBE], 2010).

The Namibian curriculum thus expects teachers to tap into the local people's knowledge as they teach the prescribed content of the syllabus in their various subjects. The Ministry of Education (Namibia. MoE. Learner-Centred Education, 2003) has emphasized that in learner-centred education there should be a balance between the prescribed knowledge on, for instance, animal husbandry, and the knowledge that the teachers and learners bring to classroom from their own experience and their environment. It is against this background that in this study I endeavoured to explore opportunities for integrating indigenous knowledge and practices into the animal husbandry section of grade 10 Agricultural Science, with the hope of improving learners' understanding of this subject and, ultimately, improving their academic performance.

In the Namibian national external examinations in 2015, it was reported that Grade 10 and Grade 12 learners did not do well in Agriculture, Life Sciences and Biology. This led to a three-day congress on these three subjects held from 30 August to 1 September 2016. At this congress, it was highlighted that the subjects, including Agricultural Science, were not receiving the necessary support. Additionally, the way the subject was being taught was not addressing the needs of Namibian society: it was too theoretical to address the social and economic needs of the country.

Since the majority of learners have an agricultural background in the Omaheke Region and therefore come to school with relevant prior knowledge, one wonders why they perform so poorly in Agricultural Science (Roschelle, 1995; Taylor, 1999). For instance, even before learners enter the schooling system they possess some knowledge about cattle, sheep, goat and poultry farming, which form the focal point of Agricultural Science. The region is known for its agricultural activities and is even called 'cattle country' for that reason.

Figure 1.2.1: Shows the border between Omaheke and Khomas Regions

Figure 1.2.2: Shows Gobabis' town entrance

The people generally seem to be proud of their engagement in agricultural activities. I believe that integrating local knowledge or indigenous knowledge into Agricultural Science lessons might help learners enjoy learning this subject and hence improve their performance. Effective learning science, in this case, Agricultural Science should take into consideration the cultural context (Erinosho, 2013). The scholar adds that integrating indigenous science has shown to improve understanding in science which then can improve achievement. Integrating of IK can help in conceptual attainment and improve learners' understanding of science (Kasanda et al., 2005).

The recent performance of learners in the Grade 10 final examinations in Agricultural Science in Omaheke is worrisome. It was below the national average in the years, 2014, 2015, 2016 and 2017 (in 2013 the performance was higher than the national average by 0.1%).

Table 1.2.1: The national and regional averages for Agricultural Science Grade 10

(Namibia. Ministry of Education, 2013, 2014, 2015, 2016a, 2017a)

Year	National	Regional
2013	55.2	55.3
2014	50.9	44.4
2015	52.6	45.1
2016	56.2	48
2017	58.5	49.1

The question is: Why are these results so poor, if the region's main focus is on farming? Do teachers consider the cultural capital or IK of the learners? If not, what cultural capital do learners bring to school, and how could such IK be integrated into the teaching of the subject? According to Robertson (2013), cultural capital is the knowledge, experience, attitudes and so on that learners bring to the classroom of which IK is part. These questions triggered my interest in exploring opportunities for integrating indigenous knowledge and practices into the animal husbandry section of Namibian Grade 10 Agricultural Science lessons in the Omaheke Region.

Interestingly, the performance of Grade 10 learners (Namibia. MoE, 2013, 2014 2015 & 2016b) shows that the most poorly answered question is on community-based natural resources management. Learners performed badly on the topic of cereal crops in 2013, slightly better in 2014 and fairly well in other years (Namibia. MoE, 2013, 2014, 2015 & 2016b). Learners also performed poorly on questions on disease, balanced rations and production rations, in the years in which these were examined (Namibia. MoE, 2013, 2014, 2015. 2016b). It is noteworthy, though, that every year there

are different sub-questions that learners struggle with, within the topic of beef cattle (Namibia. MoE, 2013, 2014, 2015 & 2016b).

Shizha (2007) suggests that there should be a relationship between school science and what happens in the learners' homes for 'border crossing' to be successful (Aikenhead & Jegede, 1999). Similarly, Erinosho (2013) points out that there is abundant evidence that science learners in general do not sufficiently comprehend the knowledge and skills essential for the subject, which results in memorization, regurgitation and the shallow learning of basic concepts and principles. He thus reasons that meaningful learning should be culturally bound and should grow out of social encounter. Concurring, Mavuru and Ramnarain (2017) emphasize the importance of taking into consideration learners' socio-cultural backgrounds in science lessons. Since the Omaheke region is invested in animal husbandry, in this study the focus will be on local or indigenous knowledge on the following topics: *animal health*, *feeding*, *handling*, *breeding* and *selection*. In the next section I reiterate some of the ground already covered in order to formulate a statement of the research problem.

1.3 Statement of the problem

The performance of learners in Agricultural Science at secondary school is of concern in the Omaheke region. For some years, the subject has been performed below the national average even though the region is known for its agricultural activities. My assumption is that this could be in part a result of the fact that even though the Namibian curriculum encourages teachers to integrate local or indigenous knowledge (IK) and practices within their lessons, it is not made clear how this should be done. This assumption resonates with Zinyeka, Onwu and Braun's (2016) argument that most school science curriculum statements have failed to stipulate clearly how IK should be integrated into the school curriculum. Shizha (2007) agrees that in the present context, even though the government seems to appreciate the need for learning to be culturally relevant (Mhakure & Otulaja, 2017), it is silent on how this should be carried out in practical situations.

The challenge, then, was to find appropriate examples of indigenous knowledge and practices that could be integrated into school science lessons and then develop the skills and methods for teachers to do so. The choice of the arena of indigenous knowledge and practice in animal husbandry seemed so obvious, given that animal husbandry has been practiced for thousands of years (Nkhwa, Dolamini, McLeod, Kasozi, Letaba, Monyane et al., 2009) and that there must thus be a wealth of knowledge and practices of relevance to a science class. According to Van Wyk (2008), cattle were

introduced to Africa between 200 BC and 700 AD, of which large herds cattle owned by Hereros of Namibia was reported by Jaoobus Coetze in 1760. Masuku's (2018) study confirms that even five-year-old children have complex knowledge about cattle. Further, the Omaheke region of Namibia where this study was conducted, practices animal husbandry on a wide scale.

1.4 Significance of the study

The study is of significance in that the Agricultural Science teachers who were involved in it were afforded an opportunity to learn how to integrate indigenous knowledge and practices regarding animal husbandry into their lessons, in order to contextualize science. Contextualization helps to make science feel less foreign to learners (Aikenhead & Jegede, 1999). More broadly, the study might contribute to future curriculum development by providing ideas on how to integrate IK. This could assist textbook authors, while teacher training institutions might also benefit, by learning some teaching strategies that could be used in presenting lessons with IK in them. The latter are relevant to me too, since I am an Agricultural Science Senior Education Officer, responsible for providing guidance, support and advice to teachers.

The study is also of importance to the extent that it contributes to the documentation of indigenous knowledge and practices in the field of animal husbandry. Kibirige and Van Rooyen (2006) bemoan the fact that IK is not documented. The documentation of IK is in fact vitally important, so that it is not distorted or lost, resulting in future generations not knowing it.

The integration of IK in lessons might improve the performance of learners in the subject by triggering their interest in the subject. This was indeed part of the goal of this study.

1.5 Goal and questions

The main goal of this study was to explore the opportunities for integrating indigenous knowledge and practices into the animal husbandry section of Grade 10 Agricultural Science lessons in the Namibian curriculum.

To achieve this goal, the study was guided by the following research question and sub-questions:

What opportunities are available for the integration of indigenous knowledge and practices into the animal husbandry section of Grade 10 Agricultural science lessons?

1. What indigenous practices and knowledge can be integrated into animal husbandry within Grade 10 Agricultural Science lessons?
2. What pedagogic strategies can be used to mediate the learning of lessons that include IK on animal husbandry in Grade 10 Agricultural Science lessons?
3. How can Grade 10 Agricultural Science teachers be supported in developing model lessons on animal husbandry that integrate indigenous knowledge and practices?
4. How do Grade 10 Agricultural Science teachers actually mediate learning when teaching lessons that integrate indigenous knowledge and practices on animal husbandry?

1.6 Theoretical framework

This study is informed by Vygotsky's (1978) sociocultural theory and Wenger's (1998) notion of the community of practice. Sociocultural theory sees learning as social, with learning taking place through social interaction among people (Nieto, 2007). The community of practice brings together people who have common interests to learn together (Wenger, 2000).

1.7 Definition of key concepts

In this study the key concepts used are defined as follows:

Agricultural Science is the science that is concerned with the rearing of animals and the growing of crops through the sustainable use of natural resources.

Animal health refers to the condition when animals are free from diseases, sickness and injuries which affect their performance.

Animal husbandry is the breeding and caring of animals for special purpose such as meat, eggs, wool and milk production (Chinwadzimba & Sithole, 1998).

Breeding is the pairing or mating of selected animals in order to produce offspring of a desired quality.

Feeding is the act of providing food and nourishment to animals or the act of consuming food.

Selection is the process of choosing the right or most suitable animal to be used for breeding purposes.

Indigenous knowledge is knowledge that people of a certain geographical location have, according to which they have lived and upon which their decisions are based. It is the knowledge which they pass from generation to generation orally, produced through trial and error and observation (Kibirige & Van Rooyen, 2006).

Mediation is the assistance that is provided to a person in order to reach a certain level which he alone cannot reach (Vygotsky, 1978).

Sociocultural theory of education: learning is social, we learn through interaction with others, through meaningful exchanges of ideas, concepts and actions (Nieto, 2007).

Zone of proximal development: The distance or gap between what a person is able to do alone without help and what s/he is able to do with the assistance of others who are knowledgeable (Vygotsky, 1978; Stott, 2016).

1.8 Thesis outline

This study is presented in six chapters:

Chapter 1

The first chapter presents the background of the study. There are statements of the research problem, the importance of the study, the research goal and questions, and theoretical framework. Definitions of key concepts and an outline of the thesis are also included in the chapter.

Chapter 2

The second chapter focuses on literature relevant to the study. This covers the Namibian curriculum for Basic Education, learner-centred education, animal husbandry, indigenous knowledge, the importance of IK in teaching (including teaching strategies), challenges of including IK in Agricultural Science lessons, professional development, sociocultural theory and communities of practice.

Chapter 3

The third chapter describes the methodology used, which is qualitative, within the interpretive research paradigm. The chapter discusses the research site and sampling, positionality, data gathering

techniques and rationale, data analysis, validation and trustworthiness, and ends with ethical considerations.

Chapter 4

This chapter presents analyses and discusses the data pertaining to research questions one and two. The data was collected from interviews with the four teachers taking part in the study.

Chapter 5

The fifth chapter presents analyses and discusses the data regarding research questions three and four. The data in this chapter was collected using a workshop, observations and reflections. The data was collected from two teachers.

Chapter 6

The sixth chapter presents a summary of the findings, draws conclusions and makes recommendations.

1.9 Concluding remarks

In this chapter I discussed the context of this study, the statement of the problem, its significance, the research goal and questions, the theoretical framework, the definitions of key concepts used in the thesis, the thesis out line and some concluding remarks.

In the next chapter, I discuss literature relevant to my study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The main goal of this study was to explore the opportunities for integrating indigenous knowledge and practices into the animal husbandry section of Grade 10 Agricultural Science lessons for the Namibian curriculum. In this chapter, I discuss literature relevant to various aspects of the study.

2.2 Curriculum for Basic Education

Namibia got its independence in 1990. Before independence education was a privilege mainly enjoyed by whites. Few blacks went to school, and most of those who went to school could not go far (Namibia. Ministry of Education and Culture [NMoEC], 1993). The school system separated people according to race, with a large percentage of resources being allotted to whites. The segregation of society made sure that blacks remained inferior to the white elite in terms of education, jobs, authority, influence and income.

After independence, Namibian education became a basic human right available to all the people (Namibia. MoEC, 1993; Namibia. Constitution of the Republic of Namibia, 2010). As a result, the Namibian Ministry of Education and Culture committed itself after independence to fostering culture as a unifying and nation-building force (Namibia. MoEC, 1993).

Culture is defined as a shared way of living, not a fossil from the past but a vibrant, dynamic, constantly changing complex of ideas and interactions (Namibia. Ministry of Education and Culture, 1993). The Ministry of Education and Culture encouraged and supported the development of culture and sought to integrate it into the education system. Language is an important aspect of culture.

In Namibia English is the official language and the teaching of English is given priority (Namibia. Ministry of Education and Culture, 1993; Namibia. MoEC, 2008; Namibia. MoEC, 2003). Nevertheless, language is a medium for cultural transmission and cultural identity; moreover, for pedagogical reasons it is ideal for children to study through their own language during the first years of schooling, when the basic skills of reading, writing and concept formation are developing.

The policy states that from grades 1-3 the medium of instruction is mother tongue or the predominant local language in the area; grade 4 is a transitional year from mother tongue to English, and from

grades 5-12 the medium of instruction is English. The policy cautions that if learning in the mother tongue stops at early of stages of schooling, it becomes difficult for learners to develop certain concepts, and this might affect the aim of the curriculum (Namibia. MoEC, 2003).

The Namibian Curriculum for Basic Education (Namibia. NCBE, 2010) aims to produce citizens who can use existing knowledge effectively and wisely and who can also create new knowledge. The NCBE further states that the term knowledge should include indigenous knowledge and local, national, international and global culture. As learning requires resources, the curriculum aims to use traditional, local knowledge, libraries and ICTs as sources of information. The curriculum statement notes that it is through reflecting on what one has experienced that understanding can develop, which can then be added to and modify one's previous knowledge. This means that prior knowledge is used as a stepping stone towards new knowledge.

The Namibian Ministry of Education (2010) adds that learners are situated in a natural and cultural environment with which they interact, which affects them and from which they construct their understanding. This suggests that their socio-cultural background knowledge forms a basis for the construction of new knowledge (Mavuru & Ramnarain, 2017). The Namibian Ministry of Education (2003) points out that when grouping knowledge it is important to consider the inclusion of the indigenous knowledge system, in terms of ways of knowing as well as content.

The Namibian Ministry of Education (2010) further notes that if learners are taught in such a way that the teaching builds on what is already known and has been experienced – in this instance, about animal husbandry – and the new knowledge is related to the reality around them, their learning will be meaningful. It also emphasizes that in learner-centred education there should be a balance between the prescribed knowledge (say, on animal husbandry) and the knowledge that the teachers and learners bring to classroom from their own experience and environment. The Namibian Ministry of Education (2010) sees the community as a source of knowledge which learners can use to carry out research and project work. This brings us to the learner-centred teaching strategy adopted by Namibia after independence.

Du Toit and Sguazzin (1995) claim that the goal of learner-centred education (LCE) is to bridge the gap between what learners learn in class and the real world. The main principle of LCE is that it uses the social context of the learner as the initial source of knowledge and relates new learning to this

context (Mavuru & Ramnarain, 2017). Dziva et al. (2011) maintain that for the LCE approach to be taken seriously it should include students' traditional cultural knowledge. Additionally, in learner-centred education learners are expected to use their own life experience in the classroom, relating it to what is being taught (Du Toit & Sguazzin, 1995). Namibian Learner Centred Education (2003) assumes that teachers have a holistic view of the learner, valuing the learner's life experience as the starting point for their studies. The document states that teachers should be able choose content and methods on the basis of the learners' needs, use local and natural resources as an alternative or supplement to ready-made study materials. The approach also demands a high degree of learner participation (Sedlacek & Sedova, 2017; Vygotsky, 1978).

Learning is viewed as an interactive, shared and productive process, in which teaching creates learning opportunities that make it possible for learners to explore different ways of knowing (Namibia. MoEC, 2003). The document adds that through communication with others, experimenting, playing and experiencing things, and by reflecting on them, the child learns, internalizing the outside world and activity. Since the immediate environment of the school and the community is seen as the primary resource for teaching and learning in learner-centred education, the community should be closely involved in the life of the school and the teaching of language, local history, culture and craft skills.

The document 'Learner-Centred Education' sees the Africanisation of the curriculum (Mukwambo, Ngcoza & Chikunda, 2014) as not only a question of including African languages, *ngoma* (drums or music), African history, geography and social knowledge, but also the highly sophisticated content of indigenous or local knowledge systems. The policy sees indigenous knowledge and skills to be important in areas such as plants for food, healing, material or dyes, agriculture, plants for fishing and indigenous technology, which includes metallurgy, architecture and medicine.

The NLCE argues that if the learners are taught well in a learner-centred way, they can be hard working, and there would be few discipline problems for the reason that the learning was meaningful, relevant and challenging, at the same time helping them to develop personal and social skills. Du Toit and Squazzin (1995) note that in a learner-centred classroom the teacher is seen as a coach or guide rather than an expert; learners should be encouraged to solve problems instead of being fed with information.

Kasanda, Lubben, Gaoseb, Kandjeo-Marenga, Kapenda and Campbell (2005) point out some basic strategies to be used in learner-centred teaching, like the use of relevant materials, which learners could be asked to collect, interpret and share. Kasanda et al. (2005) also claim that some learners are likely to have had relevant work experience that could be capitalized on for teaching a certain topic through being integrated into classroom practice. The scholars also advocate code switching in order to strengthen the authenticity of the context, while learners can be invited to take part in story or lesson development.

Thompson (2013) notes that this learning theory sees the teacher less as a transmitter of knowledge and more a person who guides, facilitates and encourages learners to formulate their ideas by questioning and challenging. Thompson also observes that although Namibia is officially committed to learner-centred education, the approach was beyond the capacity of a group of unqualified teachers in a rural part of Namibia as they lacked the necessary resources and theoretical understanding.

Thompson (2013) cautions that the implementation of any new pedagogy in any setting in education is subject to factors like individual circumstances, years of experience, status within school hierarchies, the size and type of classes. Thus Nyambe and Wilmot (2012) point out that despite the fact that in learner-centred education the pace of learning should be determined by individual learners, most teachers expect all their learners to progress at the same rate, regardless of their interest and ability. They further claim that the non-involvement of learners in the selection of content is a contradiction to the policy.

2.3 Agricultural Science and animal husbandry

According to Nkhwa, Dlamini, Mcleod, Kasozi, Letaba, Moonyane et al. (2009), Agricultural Science is an applied science that is concerned with the growing of crops, rearing of animals and the management of natural resources. Elliott, Stout and Dejardin (1992) posit that agriculture is an applied science because it takes scientific knowledge and puts it into practice or to work. They further point out that Agricultural Science makes use of knowledge acquired from subjects such as Biology, Physics and Chemistry.

Kaurimuje and Mayinoti (n.d.) divide Agricultural Science into crop and animal husbandry, horticulture, farm structures and machinery, and the economics of agriculture. This study focuses on

animal husbandry, exploring opportunities for including indigenous animal husbandry knowledge and practices into the animal husbandry section of the Namibian Grade 10 Agricultural Science lessons.

By way of example, Mapara (2009) claims that indigenous people have developed traditional ways of weather forecasting that help them to plan their activities at least two to three days in advance. Mapara (2009) informs us that indigenous people have a wealth of medical knowledge which can be used in animal husbandry. He cites the instance of the Shona people of Zimbabwe who use Mwengahonye (*Canthium huillense*) to treat and heal wounds that have become septic on both human beings and livestock. Mapara gives a second example of the aloe that is used by the Shona as a preventive medicine for protection against disease.

When it comes to indigenous knowledge in food preservation, the Shona preserve meat by drying it (Mapara, 2009). The Ndebele of Zimbabwe ferment milk to make what they call *amuse* (sour milk), which is called *amasi* in isiXhosa.

Animal husbandry

Elliot, Stout, Dejardin and Sithole (1991) view animal husbandry as a term for techniques and skills involved in looking after animals. For Chinwadzimba and Sithole (1998), animal husbandry is a special branch of agriculture dealing with the breeding of and caring for animals for a particular purpose, for example, meat and milk production. Similarly, Sisamu and Lourens (2009) define animal husbandry as keeping animals and taking care of them. Nkhuwa et al. (2009) point out that the animals typically husbanded by people include poultry, goats, sheep, pigs, cattle and horses.

Elliot et al (1985) maintains that people have over the years been safeguarding animals from natural phenomenona such as cold or heat, natural enemies (predators) and diseases, to enable them to thrive. They have selected the best animals for breeding purposes, to produce better products like meat, milk and eggs. Van der Westhuizen, Van Wyk and Botha (2007) note that people protected their animals from natural enemies through herding and keeping them in kraals at night.

Animal health

Nkhwa et al. (2009) and Masuku (2018) caution that animals should be healthy and free of suffering for them to be able to produce to their maximum potential. These scholars note that this requires provision of shelter, treatment of diseases, a balanced diet, isolation of sick animals and keeping their

environment clean. Jadeja, Odedra, Solanki and Baraiya (2006) argue that the treatment of animal diseases using different plants for different kinds of ailment is as old as man himself. They further posit that the continuing dependence of rural people on plant-based medicine is because they have limited access to modern medicine; it is cheaper, easily available and has no negative side effects. Amitendu, Arya, Tudu and Goswami (2004) agree that for rural peasants modern medicines are too expensive in comparison to traditional medicine; also, animals produce food and food produced using chemicals can have unpleasant side-effects when consumed. Kohler-Rollerson (2000) notes that indigenous people maintained adaptability to local disease by buying local bulls and rams when they migrated into a new area.

Nkhwa et al. (2009) suggest that the common ways of preventing disease are breeding disease-resistant animals, treating them with medication, surgery, modification of the environment through adequate nutrition, maintenance of hygiene, vaccination of animals and control of vectors. There are also numerous indigenous ways of treating ailments. Subrahmanyeswari and Chander (2013) give as practical examples the treating of wounds with devader tree oil; ridding animals of external parasites with a cloth dipped in petrol, red soil on their legs, or mixture of cow urine and cow dung ash which is settled for 48 hours and applied externally. Masuku (2018) adds that engine oil is used to control ticks by being applied to affected areas. Subrahmanyeswari and Chander (2013) describe de-worming using forest leaves, stem peels, mustard oil, a fermented mixture of butter milk and neem leaves; or controlling ticks in animals by rubbing Karoi grass on their skin. These scholars claim that for foot and mouth disease, rotten feet should be kept in mud or rubbed with phenyl; the paste of peach leaves is applied to lesions, while for mouth ulcers lemon and salt is used.

When it comes to the feeding of livestock, Thapa, Walker and Sinclair (1997) note that farmers in Nepal use trees as fodder and have acquired indigenous knowledge on the value of trees used for fodder. Thapa et al. (1997) claim that farmers are able to classify the fodder based on the nutritive value and palatability into posilo and kam posilo; posilo meaning high nutritive value and kam posilo low nutritive value. Lourens (2012) describes fodder as a crop grown to be fed to domesticated animals. She points out that fodder crops includes grasses like ryegrass, elephant grass and buffalo grass as well as legumes such as cowpeas, beans and clover, to name but a few. Masuku's (2018) study reveals that the indigenous people in Mpembeni in South Africa allow their cattle to forage (search for their own food) in the area and do not provide them with secondary substances.

Breeding of animals

For Van der Westhuizen et al. (2007), breeding is the process by which animals with desirable qualities are paired or mated with each other so that those characteristics can be passed on to their offspring. Kohler-Rollefson (2000) maintains that the aim of breeding is not only to produce quality products such as meat, milk, wool and eggs but also to have animals that have good mothering instincts, herdability, the ability to walk long distances, are loyal to the owner, and have the ability to survive natural calamities such as drought. Sisamu and Lourens (2009) and Urgessa, Duguma, Demeke and Tolamriam (2013) add that breeding is also a practice for improving animal resistance against diseases.

Kohler-Rollefson (2000) points out that in terms of the traditional breeding practices among the Raika community in Rajasthan, female animals were not allowed to be sold as they were regarded as capital. Capital refers to goods used to produce other goods. For instance, the exchange of animals for breeding purpose within the same community is encouraged as it serves to bring in fresh blood or upgrade the stock. This happens in countries like Lesotho and Zambia, where the term Mafisa (exchange of animals) is used.

Abara, Kabede and Gizaw (2014) record that indigenous people tend to use uncontrolled breeding or mating for the reason that in communal areas there is mixed herding and the sharing of male animals (bulls and rams). Msanga, Mwakilembe and Sendalo (2012) and Abara et al. (2014) explain that cows and bulls, rams and ewes from different herds are communally grazed and therefore random mating becomes unavoidable. Abara et al. (2014) are of the view that mixed herding minimizes the risk of inbreeding as the male animals are selected from the same herd in most cases.

Saha (2014) claims that in the Birbhum district of Western Bengal, local people have indigenous knowledge on how to diagnose animals on heat. This involves close observation and the detection of physiological and behavioural warning signs. They are also able to identify which animals are pregnant through a number of physical signs, and when an animal is approaching the parturition stage. After the birth, the placenta should fall away. If this is delayed longer than twenty-four hours the local people treat the animal with raw mango leaves in sufficient quantities to expel the placenta. Masuku (2018) found in her study that indigenous African people use *phehlacwathi* and *gobho* to remove whatever did not come out after delivery.

For cattle that cannot conceive, Saha (2014) notes that surplus bananas or banana leaves are given to them to aid conception, but only after the cow on heat had been brought to a bull once or twice for service and had not conceived.

Selection of livestock

Mashebe (2010) defines selection as the process of choosing the best animal for breeding. Kohler-Rollefson (2000) notes that most of the traditional selection efforts focus on male animals, which are usually chosen on the basis of their female relatives' performance, strength and external characteristics. Kohler-Rollefson reports that in Sudan cows that do not accept their calves are themselves rejected. Van Wyk (2002) suggests that for successful selection and breeding in animals to occur, one needs to understand the concepts *phenotype* and *genotype*. The term phenotype refers to the actual appearance of the organism, while genotype refers to the genetic makeup of the organism. Chalmers and Webb (2002) note that genotype determines the characteristics of the organism. Sisamu and Lourens (2009), Owen (1993), and Abara et al. (2014) explain that when selecting animals for breeding, one ought to take into account factors like fertility, conformation, size, lambing or calving interval, growth rate and progeny (offspring). Urgessa et al. (2013) add that coat colour and behaviour are also selection criteria.

Abara et al. (2014) state that animals not suitable for breeding purposes were castrated, which also improved their fattening potential. Indigenous methods of castration involve using local available materials such as wood, stones and hammers to crush the vas deferens.

2.4 Indigenous knowledge

Kibirige and Van Rooyen (2006) and Shizha (2013) view indigenous knowledge (IK) as a legacy of knowledge and skills that are unique to a particular local culture. These scholars add that IK involves wisdom that has been developed and passed on from generation to generation. That is, IK is gained through the interaction between people and their environment. Concurring with Kibirige and Van Rooyen (2006) and Shizha (2013), Mukwambo et al. (2014) insist that indigenous knowledge is knowledge produced in specific historical and cultural contexts.

To Ogunniyi and Ogawa (2008), the term indigenous knowledge represents an idea or system of thought that is usual for the inhabitants of a particular geographical location. Similarly, Mapara (2009) regards IK as a body of knowledge of the native people in a particular geographical location where

they have lived for a very long period of time. In other words, this knowledge originates from the native people; it is part and parcel of their lives. Agreeing, Shava, Zazu, Tidball and O'Donoghue (2009) and Klein (2011) see IK within communities as a source of sustenance.

Dziva et al. (2011) posit that IK covers technologies and practices that have been and are still used by the local people for existence, survival and for adaptation in various environments. They add that this knowledge is not static but evolves and changes as it develops. Additionally, it influences and is influenced by both internal and external situations and through interaction with other knowledge systems. Science in Africa (2014) refers to indigenous knowledge as knowledge distinctive of or unique to a given culture or society.

Saha (2014) views indigenous knowledge in the developmental context as any knowledge that is held collectively by the population, informing interpretations of the world. She notes that it is a culturally relative form of understanding, conditioned by sociocultural tradition and inculcated into the individual from birth, structuring how s/he interacts with his or her environment.

Klein (2011) defines IK as a large body of knowledge and skills developed outside the formal education system that enables communities to survive. It is transmitted orally and through demonstration, based on experience and not on theory, learned through repetition and constantly changing (Kibirige & van Rooyen, 2006).

Webb (2013) argues from a cultural perspective that education should view teaching in terms of cultural transmission, and learning as cultural acquisition. Webb defines culture as the norms, values, expectations, beliefs and conventional actions of a group. However, the social and cultural context of science, especially the local context, is largely overlooked in mainstream teaching (Stears, Malcolm & Kowlas, 2003). These scholars therefore urge teachers and curriculum developers to work collaboratively in developing written materials that are culturally appropriate. They propose that the curriculum should be structured so as first to take learners' everyday knowledge into account and use this to build more formalized structures. Thereafter the formal knowledge should be applied within the particular context in which the learners live.

According to Mapara (2009) and Shizha (2013), indigenous knowledge has many names, such as indigenous ways of knowing, traditional knowledge, local knowledge, peasants' knowledge, traditional environmental knowledge, indigenous technical knowledge, rural knowledge and ethno-

science. Erinosho (2013) views it as indigenous science at cultural or society level and Nyika (2017) adds that IK is sometimes called folk knowledge or people's knowledge. For the purpose of this study, the term indigenous knowledge (IK) and practice will be used.

As far as Africa is concerned, Vermeulen (2003) quotes a group of educationists gathered in Harare who said that what is taught in African schools is not relevant to the needs of the continent. Klein (2011) notes in this regard that in the education system in Namibia the dropout rate is often higher and success rate is lower among the indigenous people. He attributes this to the failure of the education system to address the specific needs and knowledge construction of indigenous people, in terms of both curriculum and teaching methodologies.

Vermeulen (2003) concludes that what is taught in Africa will continue to be irrelevant until we start considering the needs of the continent. Mukwambo et al. (2014) maintain that there is a need for a context-driven curriculum instead of the mere transplanting of ideas or policies from other countries. Stears et al. (2003) state that learners' conceptions in science depend on their previous experiences, which includes the ways in which they link formal science to their everyday lives. Stears et al. are of the view that culture serves as a contextual lens through which learners view and understand the world, and that this has direct influence on the learners' cognitive processes and understanding of science.

Shizha (2007) points that in recent years researchers have seriously examined the potential of using traditional ecological knowledge (TEK) in conjunction with Western science. Mavuru and Ramnarain (2017) claim that African people have their own science, knowledge and technology which they pass from generation to generation through word of mouth and cultural ritual. Shizha (2013) agrees that the purpose of education among the indigenous people was to transmit from one generation to next the accumulated wisdom and knowledge of the society or culture and to prepare young people for future membership and participation in that society. But in most modern African schools European education keeps on distorting, misappropriating and misrepresenting African realities. Schools are thus privileged sites for the reproduction of hegemonic knowledge (Shizha, 2013).

The Namibian Ministry of Education and Culture (1993) emphasizes that the starting point for learning lies in the existing knowledge, skills, interests and understanding derived from learners' previous experience in and out of school. The Namibian Ministry of Education (2003) confirms that

learners have a wealth of knowledge of Agricultural Science from home which teachers need to make use of to help them assimilate new information. Mukwambo et al. (2014) agree that indigenous knowledge in Agricultural Science can be used as prior everyday knowledge in classrooms to counteract the challenges created by Western science.

This is echoed by Kibirige and Van Rooyen (2006) and Roschelle (1995), who emphasize that when teaching Agricultural Science teachers should make learners' IK the point of departure for lessons and build on what they know. They thus recommend that teachers should identify and plan lessons that bring in some aspects of local knowledge. Ogunniyi and Ogawa (2008) conclude that instead of trying to make School Science replace indigenous knowledge (if that were possible), learners need to be taught how to use the two knowledge systems together where possible, and need to be clear which of the two is appropriate on a particular occasion. Like Kibirige and Van Rooyen (2006), they see these two systems of knowledge as complementary rather than mutually exclusive.

However, Ogunniyi and Ogawa (2008) rightly argue that providing knowledge to educators is not enough: they also need to be taught how to use or integrate this knowledge in a classroom situation.

Farrant (2005) suggests that strategies that can be used to introduce IK on animal husbandry in Agricultural Science include games, riddles and acting. Ogunniyi and Ogawa (2008) add that organizing field trips, and visiting museums or elderly people in the community are among the ways of mediating indigenous knowledge in Agricultural Science. Another strategy to use when teaching lessons that include IK would be to explain IK in Western terms, thus linking the two, while making clear at which points they are incompatible (Mhakure & Otulaja, 2017).

Ludwane, Mashozhera, Mhlekwa, Nuntsu, Speckman and Seehawer (2015) suggest teaching strategies like observation, experiential learning, investigation, deliberation, and encouraging learners to go ask questions at home. The teacher can give examples of both IK and WK and encourage learners to discuss their relative advantages and disadvantages, using their mother tongue if necessary. Erinosho (2013) emphasizes the importance of contextualization in extending school science outside of the classroom to connect with existing knowledge in the immediate locality. This should include indigenous proverbs, folktales, songs, legends and myths (Mapara, 2009).

The Namibian Ministry of Education (2010) cautions that teaching that does not build on existing knowledge limits the learners' thinking to the extent that they may not see the connection between the world outside and what is taught in Agricultural Science at school. Mavuru and Ramnarain (2017) argue that failure to address learners' social and cultural beliefs could result in their continuing to harbour misconceptions that could be damaging to their conceptual understanding in science.

According to Mukwambo et al. (2014), scientific knowledge as defined by Western science is embedded in most indigenous practices. They are therefore of the view that IK can be used as prior knowledge in classrooms during lesson presentations. The scholars further claim that the circulation of scientific knowledge within the context of such practices has a vast potential for fostering inclusivity. Mukwambo et al. (2014) argue that learning becomes effective when participants' cultural resources are engaged in the teaching and learning scenario.

Cocks, Alexander, and Dold (2012) believe that the inclusion of IK into the mainstream curriculum can promote the conservation of natural resources as well as the cultural revitalization of the local people. It is well documented that when indigenous communities lose their cultural heritage in form of customs, values and indigenous knowledge, the youth can become a lost generation and engage in antisocial behaviour. Cocks et al. (2012) also observe that children who are between worlds, separated from their parents' culture by the precepts of Western education, can become socially disoriented. Shizha (2013) agrees that schools should be cultural spaces and centres that provide strategies for regaining African cultural identity to counteract the threat of cultural loss.

According to Cocks et al. (2012), although there is some acknowledgement of indigenous knowledge in the curriculum, most adults who have access to this knowledge feel that the teaching of their children should be left in the hands of the teachers and the schools alone. The Western-based curriculum leaves little room for the learning of local knowledge with the families. Cocks et al. (2012) regret the fact that formal schooling is often promoted and supported at the expense of indigenous knowledge and experience, for the reason that it is seen as the doorway to employment and development.

Shizha (2013) argues that in sub-Saharan Africa, curriculum content and pedagogy continue to teach students a foreign culture and world-view, moreover in a foreign language that inhibits self-

expression. Klein (2011) notes that among the San in Namibia there is a high school drop-out rate, which can be attributed to stark language and cultural differences between home and school. Language is an important component in integrating indigenous science into the school science curriculum (Shizha, 2007). Shizha notes that when indigenous languages are incorporated into the science curriculum they help students understand scientific principles and concepts, and link Western science to indigenous ways of knowing. Language thus plays a vital role in facilitating border crossing among students (Aikenhead & Jegede, 1999). To Aikenhead and Jegede, border crossing means the movement of students from their everyday culture into the culture of school science.

Dziva et al. (2011) observe that languages of European origin are used as the medium of instruction in African schools while the vernaculars are sidelined. Shizha goes so far as to maintain that the language of instruction in most African schools is the main obstacle to cognitive development and learning outcomes. He gives the example of a study in Kenya that found that when English was dominating instruction, learners were not able to put into practice or apply what they had learnt in practical situations in their communities. When students use a language they can make little sense of and struggle to be heard and understood, learning will become a battle and ultimately boring. If language becomes a barrier to self-expression and building self-confidence in the classroom, the student will not acquire the appropriate attitudes and skills to lead their communities towards sustainable development (Shizha, 2007).

IK promotes the conceptual development of learners in the science classroom as this cultural knowledge often serves the formal curriculum concepts well (Cronje, De Beer & Ankiewicz, 2015) This is supported by Mukwambo et al. (2014), who claim that scientific knowledge as defined by Western science is embedded in most indigenous practices. There is an unfortunate tendency to position IK in opposition to science or Western knowledge as if IK there is no science in IK or no IK in science (Kibirige & Van Rooyen, 2006).

Making science relevant to the students should involve not only teaching culturally relevant contexts but also using appropriate teaching approaches and models that are culturally responsive (Dziva et al., (2011). Webb (2013) also advocates adopting culturally relevant pedagogical practices, while Stears et al. (2003) reason that a culturally sensitive pedagogy will actively reflect and clearly stipulate

culturally specific knowledge, behaviour, attitudes and skills. Webb (2013) urges teachers to make science more relevant and accessible to learners by acknowledging their cultural belief and values.

Cronje et al. (2015) believe that by including IK in the science classroom the social identity of learners is acknowledged, learning is turned into a positive experience and the attitude of learners towards science will change. Including indigenous knowledge in lessons, for example, on animal husbandry can increase the understanding of scientific concepts and help the learners to see the applicability of the subject content they are learning (Erinosho, 2013).

Some scholars have made counter-arguments against the inclusion of local or indigenous knowledge in science lessons (Cobern & Loving, 2001; Hodson, 2009; Hortshemke & Schafer, 2007). For instance, Cobern and Loving (2001) and Hodson (2009) caution against the danger of including everything under the banner of science. Similarly, others warn against the romanticizing of IK (Mukwambo et al., 2014). Briggs (2005) and Klein (2011) remark that the romanticization of indigenous knowledge can result in attempts to adopt it as the new hegemonic knowledge system in replacement of Western knowledge. This is likely to be unhelpful to development (Klein, 2011).

2.5 Challenges of integrating IK in Agricultural science lessons

Agea, Lugangwe, Obua and Kambungu (2008) claim that one of the problems attaching to the integration of indigenous knowledge in Agricultural Science is that it is not documented. Kibirige and Van Rooyen (2006) note that teachers who need to acquire IK are dependent on the willingness of those who have it to pass it on to them. The problem is that indigenous knowledge is not easily shared between members of different communities.

Ogunniyi and Ogawa (2008) observe that even though local knowledge features valuable wisdom and knowledge acquired over many years by South Africans, the majority of them do not know much about IK or how to include it in their school curriculum. With that in mind, Kreisler and Semali (2001) feel that teachers need to be trained to recognize indigenous knowledge and avoid neglecting it, denying it or even denigrating it when it appears as part of a learner's response. These scholars argue that if teachers ignore the prior knowledge or IK of the learners on, say, animal husbandry, they lose opportunities for effective teaching.

Agea et al. (2008) point out that the perception of young people is that IK is outmoded compared to Western science. The result is that they are unwilling to learn indigenous knowledge. Webb (2013)

adds that school learners frequently reject the integration of African studies, holding the view that it is irrelevant, exotic, backward and culturally alienating. For that reason he warns against the assumption that anything under the label IK should automatically be accepted and embraced.

Mukwambo et al. (2014) note that IK includes people's beliefs. Some of these are purely mythical: they hold no truth or cannot be justified. These scholars also point out that the logic of some indigenous practices is not clear, meaning that these practices are not amenable to scientific explanation.

Klein (2011) notes that formal education systems themselves fail to meet the specific needs and knowledge constructions of indigenous people both in terms of curricula and teaching methodologies. Shizha (2007) claims that colleges that train teachers do not incorporate IK in the curriculum and pedagogical practice. To disregard the possibility of cultural fusion in the science programme in teacher education is to deny teachers the skills and techniques for successfully including indigenous science in the formal school curriculum.

Webb (2013) argues that any learner with a pre-existing world-view that is not in harmony with the scientific perspective will find it more difficult to learn science, for the reason that it might not make sense to them in terms of their underlying assumptions and values. For this reason teachers need professional development.

2.6 Professional development

Professional development consists of ongoing activities aimed at improving teaching and learning and general staff development, offered by organizations, schools and regional offices of education (Chikamori, Ono & Rogan, 2013; Editorial Projects in Education Research Center, 2011). Eun (2008) defines professional development as those processes and activities that are designed to enhance the professional knowledge, skills and attitudes of educators so that they might in turn improve the learning of learners. Suzuki (2012) agrees that the aim of professional development for teachers is to help them to understand and support learners' learning. Dean (1991) states that the pace of change and the burgeoning of knowledge are the reason for people to keep on learning afresh at intervals throughout their lives. She adds that even though teachers have received initial training, it is not enough to keep up with the demands of education.

Eun (2008) highlights some principles that lead to improved learner learning and also serve to guide the professional learning of teachers. He adds that Vygotsky's (1978) sociocultural theory is built on the social origins and cultural mechanisms of development, which means that individual mental functioning arises from social interaction. Sociocultural theory advocates that it is only by interaction with the material world and with other humans that people can develop knowledge of reality.

Shabani (2016) notes that a group zone of proximal development (ZPD) is greater than an individual ZPD, which means that members of a group working together to accomplish a task can do so better than an individual working alone. Eun (2008) and Shabani (2016) emphasize that for interaction to lead to development it must be structured or planned in an activity with a clear purpose, as according to Vygotsky (1987) not all interaction leads to development.

Professional development activities can include lectures, workshops, study groups, and mentoring and coaching novices and veteran teachers (Dean, 1991; Garet, Porter, Desimone, Birman & Yoon, 2001). In this study, professional development took the form of workshops in which the participating teachers and I collaboratively developed and planned model lessons that involved the integration of IK. It also included observation , in which the interaction comprised the providing the observed teacher with feedback to improve his teaching, while we learned things from the classroom interaction that are not apparent when one is immersed in one's own teaching (Eun, 2008; Shabani, 2016). In this case the ZPD of both parties is transformed (Eun, 2008).

The model lessons including IK that I and the other teacher observed sought to be culturally responsive (Mhakure & Otulaja, 2017; Mavuru & Ramnarain, 2017). Mavuru and Ramnarain (2017) note that for learners to see the relevance of what is taught in school beyond the school there is a need for a culturally relevant pedagogy that engages learners in ways that allows for the maintenance of cultural identity alongside academic success. For pedagogy to be culturally responsive it should make use of the cultural knowledge, prior experiences, and frame of reference of the learners to make the learning encounter more relevant to and effective for them (Mavuru & Ramnarain, 2017).

Shabani (2016) warns that professional development is not a once-off event but a continuous process that is time consuming and involves some trial and error. In this study ongoing attempts were made

to find IK on animal husbandry and to determine the best ways of integrating it in science lessons. After the professional development workshopping we tested the newly gained skills and ideas in a classroom setting and reflected upon this (Shabani, 2016).

Sociocultural theory was ideal as a lens for analyzing the data in this study, linking words, phrases and statements to ZPD and mediation. The study also made use of the theory of community of practice, by observing how the participant talked about their practice.

2.7 Theoretical framework

In this study, I used Vygotsky's (1978) sociocultural theory as a theoretical framework. Within this framework I focused on two key concepts, *mediation of learning* and *the zone of proximal development* (ZPD). The study is also informed by Wenger's (1998) work focusing on concepts of identity, practice, meaning, community and interaction.

The two theories complement one another in that socio-cultural theory sees learning as social and interactive: we learn through interactions with others, through the meaningful exchange of ideas, concepts and perspectives (Nieto, 2007). On the other hand, the community of practice brings individuals together to enable this interaction. Communities of practice are groups of people (educators) who share a common concern or passion for teaching. They improve their teaching and deepen their knowledge through working together regularly.

2.7.1 Sociocultural theory

To Vygotsky (1978), social interaction and language play a fundamental role during the learning process. Socio-cultural theory (SCT) underscores the notion that science is a human activity carried out within a socio-cultural context (Lemke, 2001; Mavuru & Ramnarain, 2017). Teemant (2005) points out that SCT is founded on the premise that learning is social and that it is through social contact with teachers and peers who are knowledgeable that learners get the assistance they need in their zone of proximal development (ZPD), in order to take part in culturally meaningful tasks. In this instance, I worked together with two teachers on how best to identify, obtain and include IK in Agricultural Science lessons, and then taught the lessons.

On the subject of the ZPD, Stott (2016) highlights that Vygotsky used the Russian word *obuchenie* to refer to both teaching and learning. Thus the interaction among the participants during collaboration should result in the teacher learning from the learners and learners learning from the teacher. In this study I learnt from the participants, the participants learnt from one another and the participants learnt from me, in a mutual and symbiotic process. In short, the ZPD of all the participants was transformed (Eun, 2008).

Kozulin, Gindis, Ageyev and Miller (2003) point out that a central concept in SCT is mediation. Turuk (2008) agrees with Vygotsky (1978) that mediation is the part played by important people in the lives of learners, in helping them with their learning by choosing, shaping and presenting learning experiences to them. Vygotsky (1978) thus argues that much important learning occurs through learners' interaction with a skillful tutor. In this study, I worked together with two Agricultural Science teachers on how best to integrate IK into grade 10 lessons on animal husbandry. More learning occurred through our working together and sharing our knowledge than would otherwise have been the case.

Nieto (2007) and Eun (2008) note that Vygotsky actually identified three kinds of mediators: material tools, psychological or symbolic tools, and other human beings. Nieto (2007) explains psychological tools as those that mediate the psychological processes of human beings: e.g. primitive people count their fingers and through the tying of knots while modern man has transformed them into symbolic tools. Lantolf (1994) adds that Vygotsky (1978) believes that human mental activities are always mediated by symbolic resources, for example, devices, algebraic symbols, diagrams, graphs and language. It was obvious that as we worked to help each other, language was used and what we were discussing was written down as a symbolic representation of our thoughts.

Gibbons (2003) emphasizes that human activities and mental functioning are facilitated by tools, cultural practices and artifacts, with language being the most widespread. He further claims that the ZPD is where change takes place in a socially mediated instruction. Turuk (2008) adds that mediation involves helping a person to move to the next level of knowledgeable understanding.

For Vygotsky, the ZPD is the difference between what a person is able to do alone and what the person is able to achieve while acting with the support of somebody else or with cultural artifacts. Lantolf (2000) argues that the ZPD should be conceived of as a joint opportunity for individuals to develop

their mental capability. He points out that many scholars are calling for a broader view of ZPD, rather than limiting it to expert/novice interaction, claiming that people working together are able to co-construct context by combining expertise as a result of working together as a group. Stott (2016) supports this, claiming that there is potential for learning through the ZPD activated by working in peer groups.

Stott (2016) adds that the ZPD has a two-way character: each partner has knowledge and skills, but needs the contributions of the other participants in order to progress. In this research, I believe that my ZPD and those of the teachers developed as a result of our social interaction and use of cultural artifacts.

Shabani, Khatib and Ebadi (2010) claim that a teacher's ZPD can be affected by collaborative peers and mentors who provide encouragement, support and guidance. A teacher's ZPD is also influenced by mediatory artifacts such as handouts, worksheets, video and the internet. The decisions that a teacher takes in class are also affected by outside forces like social, economic, political and educational policies (Shabani et al., 2010). Thus as we embarked on teaching model lessons on animal husbandry the choice of what was to be taught was guided by the prescriptions of the Namibian syllabus.

2.7.2 Communities of practice

The study is also informed by the concept of the community of practice (CoP) Wenger, 1998). According to Wenger (2000), communities of practice in this context refers to groups of educators who share a common concern or passion for teaching. They learn how to teach better and they deepen their knowledge through working together regularly. In this study, the participating teachers and I worked together to see how best we could integrate indigenous knowledge into the teaching of the animal husbandry section of Agricultural Science.

The CoP consisted of secondary school Agricultural Science teachers and myself. Central to our CoP was to share ideas on how best we could improve teaching practice in the subject, given the challenges faced by teachers such the lack of resources, skills and knowledge.

Wenger (2001) claims that schools and districts are increasingly faced with knowledge challenges, which leads to the need for teacher-to-teacher professional development. This is supported by the Namibian Ministry of Education (2003), which acknowledges that in Namibia teachers must still deal

with a backlog of knowledge, absence of reference materials and the fact that there is little or no culture of reading. The results of schools in the Omaheke region confirm this (see Section 1.2). In this study, we had hoped that by forming a community of practice we would increase our knowledge in terms of subject content and pedagogy. Wenger (1998) notes that learning in a community of practice is not only for novice teachers, but can be formed by anyone from beginners to those with considerable experience; or one member of an organization can be part of a community of practice somewhere, and the experience gained from that community of practice can be shared in the organization they serve. Snyder and Briggs (2003) point out that such practitioners (teachers) come together to resolve the problems they face, share ideas about their endeavours, formulate standards and build up relationships with their peers. They further note that communities of practice are useful ways of building and disseminating capabilities, for the reason that they deal with the real situations faced daily by the organizations concerned.

Smith (2003) notes that the social capital found or created in communities of practice results in changes in behaviour as members share their knowledge with others, which in turn influences the organization positively. Wenger, Dermott and Snyder (2002) highlight some of the activities that can take place in communities of practice, such as group discussion, one-on-one conversation, reading to find out more information, and listening to people with expertise. Communities of practice have characteristics that distinguish them from other groups: the domain of interest is shared, the community is engaged in joint activities and discussion to help one another, and the members share a professional practice – in this case, teaching.

Snyder and Briggs (2003) observe that members of the community of practice take part willingly, which drives them to search for knowledge or share the knowledge they have. For a CoP to succeed, it should produce sufficient excitement and value to attract members to come and take part. Since participation is voluntary, if the activities are not relevant and attractive people will not come (Wenger, Dermott & Snyder, 2002).

According to Wenger (1998), social learning theory must integrate the components that are necessary to characterize social participation. Wenger (1998) identified four learning components: meaning, practice, identity and community. A fifth was identified by Graven (2003): confidence, the change that results from acquiring great skills or knowledge.

Figure 2.5.2.1: Wenger's (1998, p. 5) explanation of the four learning components of CoP

Wenger (1998) claims that meaning results from our ways of talking, our changing ability to express ourselves individually and collectively, so as to experience our life and the world as meaningful. Practice is a way of talking about shared a past and social resources framework, and a viewpoint that can sustain joint engagement in action. The term community refers to a way of talking about the social configurations in which our enterprises are defined as worth pursuing and in which our participation is recognized as competence. Lastly, by identity Wenger intends a way of talking about how learning changes who we are and creates personal histories of becoming in the context of the communities. The statements of the participants in this study were linked to those concepts.

2.8 Concluding remarks

In this chapter, I discussed the Namibian curriculum for Basic Education. Indigenous knowledge was discussed, especially in relation to the Agricultural Science topic of animal husbandry (covering animal health, feeding, breeding and selection of livestock). The challenges of including IK in Agricultural Science lessons were described. The notion of professional development and the theoretical framework for this study – namely, sociocultural theory and the community of practice – were also discussed.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The main goal of this study was to explore the opportunities for integrating indigenous knowledge and practices into the animal husbandry section of Grade 10 Agricultural Science lessons. This chapter discusses the research design, research goals and questions, research site and participants, sampling, positionality, data generating techniques, data analysis, validation and trustworthiness, and relevant ethical considerations.

3.2 Research design

This study is informed by the interpretivist paradigm. The interpretivist paradigm seeks to describe and understand the phenomenon under investigation through the meaning that people give to it (Bertram & Christiansen, 2015; Maree, 2014). This paradigm suggests that there is no single reality, but rather multiple realities that differ from time to time and from place to place (Maree, 2014). The interpretation is made for the reason of understanding human agency, behaviours, attitudes, beliefs and perceptions (Bertram & Christiansen, 2015) on animal husbandry in the context of this study. The data that were collected were analysed inductively and findings were discussed in relations to the themes that emerged (Maree, 2014). Additionally, Bertram and Christiasen (2015) note that this paradigm has a detailed description and the conclusion is drawn only from the respondents that took part in the study. The paradigm is suited to this study because it provides for taking IK seriously alongside Western science. It acknowledges that there might be various yet valid ways of knowing and doing things. Within the interpretive paradigm, a qualitative case study approach was adopted.

3.3 Qualitative case study

Leedy and Ormrod (2012) state that qualitative research aims at exploring a phenomenon in its natural setting and in its full complexity, resulting in detailed understanding. According to Creswell (2012), in a case study a single case or several cases are studied in depth for a certain period of time. A case study is a deep or focused exploration of a bounded system in its real-world context (Creswell, 2012; Maree, 2014).

One advantage of a case study is that it encourages the use of several different techniques to obtain the necessary information, ranging from personal observation to interviews (Salkind, 2014).

Secondly, a case study focuses on a single individual or thing, for example, a school district, which enables close examination and scrutiny, and collection of detailed data. Salkind (2014) warns that the case study method can be a time-consuming way of doing research.

My case in this study consisted of two Agricultural Science teachers, my unit of analysis was their attempt to integrate indigenous practices and knowledge into animal husbandry within grade 10 Agricultural Science lessons. This involved exploring pedagogic and mediating strategies for achieving this.

3.4 Research goal and questions

The main goal of this study was to explore the opportunities for integrating indigenous knowledge and practices into the animal husbandry section of Grade 10 Agricultural Science lessons in Namibian classrooms.

To achieve this goal, the study was guided by the following research questions:

1. What indigenous practices and knowledge can be integrated into animal husbandry within Grade 10 Agricultural Science lessons?
2. What pedagogic strategies can be used to teach lessons that integrate IK on animal husbandry in Grade 10 Agricultural Science lessons?
3. How can Grade 10 Agricultural Science teachers be supported in developing model lessons that integrate indigenous knowledge and practices on animal husbandry?
4. How do Grade 10 Agricultural Science teachers mediate learning when teaching lessons that integrate indigenous knowledge and practices on animal husbandry?

3.5 Research site, participants and sampling

The study was conducted in the Omaheke Region of Namibia. Omaheke Region is situated east of Windhoek and is about 84731 km^2 (Stols, 2012) and most of the area is given over to livestock farming (see Map below).

Figure 3.5.1: Shows Omaheke Region in Namibia

Omaheke region has a total of 44 schools (primary and secondary). Of these, nine are public (government) secondary schools and two are combined schools. Nine of these eleven schools offered Agricultural Science at grade 10 level, and of these, three were involved in this study, namely, Gobabis High School, Kulu Secondary School and San Secondary School (these are all pseudonyms). Gobabis High school is an urban school, San Secondary School a rural school, while Kulu secondary School is a semi-urban school. The schools were selected according to location and the availability of teachers to participate in the research.

In this study, the participants were four Grade 10 Agricultural Science teachers from three schools. These teachers were selected for interview on the basis of their having taught the subject for five or more years. Not all teachers teaching in the region are originally from the region, but in this case two of them were. I made sure of this because I wanted to tap into the local IK in the region. The other criterion was the teachers' interest in taking part in the research.

From the four teachers that I interviewed, I purposively selected two teachers to co-develop and co-plan model lessons with them. They were selected because of their good performance in the subject,

their willingness and the fact that theirs was the only school with two Agricultural Science teachers. Additionally, the school was nearby and convenient to get to, given that the region is vast. Sampling entails selecting participants with a specific purpose that the researcher has in mind (Maree, 2014; Bertram & Christiansen, 2015). My intention was to observe the two teachers while they taught the model lessons.

3.6 Positionality

I am Senior Education Officer in the Ministry of Education, Arts and Culture and I am responsible for supporting, monitoring and evaluating teachers' work. During our first meeting with the teachers involved in this study, I stated clearly I came as a researcher and not as a Senior Education Officer. Although Mr. John (pseudonym) said "*but you are still an Education Officer*", over time and during the process of data collection trust developed, and the participants relaxed and spoke freely. Whenever we met I was consistently friendly and only spoke about the research.

The other issue was to inform them that I was exploring indigenous knowledge and practices in a region in which I had not grown up and was a relative stranger. They were thus in a position of having or being able to obtain IK to share with me.

I was not there to evaluate, guide or support them, but to learn *with* them (Ngcoza & Southwood, 2015). Their participation was voluntary and they were free to withdraw any time if they so wished, without consequences. The participants were asked to choose their own time for being interviewed. There were agreed-upon times for activities (like lesson planning), but one teacher never turned up. To show respect to them, I called them or drove to the school to ask if we could reschedule the activity for another date.

3.7 Data generation techniques

In this study, data sets were generated using semi-structured interviews, workshop discussions, observations and reflections.

3.7.1 Semi-structured interviews

Leedy and Ormrod (2012) claim that an interview can produce useful information such as facts, feelings, motives, present and past behaviour, and unconscious reasons for actions or feelings. Maree (2014, p. 86) thus defines an interview as a "two-way discussion whereby the interviewer asks the participants questions with the aim of collecting data and to learn about the ideas, beliefs, views,

opinions and behaviours of the participants". In this study, interviews were used to generate data to answer research questions 1 and 2 (see Section 3.5).

Bertram and Christiansen (2015) point out that the advantages of semi-structured interviews are that a researcher can make questions clearer to the respondent and can ask follow-up questions to get further information. A possible disadvantage with any interview process is that unequal power relations can influence the exchange. In my situation, it was a matter of impressing upon the respondents that I was not an expert in local practice and knowledge and that they should therefore feel free to express themselves. They were also informed that I was not there as a Senior Education Officer, but instead as a researcher who was willing to learn *from* and *with* them.

The semi-structured interviews were pilot-tested with MEd students and with other Agricultural Science teachers before the commencement of the interviews themselves. The interviews took place at various times and on various dates, as the teachers were at different places and not always available. Even the two that were at the same school were interviewed on different dates due to their busy schedules. The interviews took place from February to March 2018 over a period of seven weeks. With the permission of the participants, the interviews were audio-recorded.

Four participants were interviewed, one female and three males. Two of the three male teachers were from the same school, Gobabis High School. The other male and female were from two different schools located about 50 kilometers outside Gobabis. The female teacher was from Kulu Secondary School, where she was interviewed in her classroom. Mwaka (pseudonym) held a Basic Education Teacher's Diploma in Agriculture and Life Science, an Advanced Certificate in Education in Geography, and Bachelor of Education Honours in Management. She had taught for eight years and at the time of the study she was 31 years old.

The other male teacher, from San Secondary School, asked to be interviewed when he came to town so was interviewed after working hours in my office. OUR (pseudonym) held a National Diploma in Agriculture and a Postgraduate Diploma in Education. He had taught for fourteen years and was aged 39. The interview with OUR lasted for 25 minutes. The two teachers from Gobabis High were interviewed at their school. The first to be interviewed, Tooki, was interviewed in the staffroom. The interview lasted for 42 minutes. Tooki had a National Diploma in Agriculture, a Postgraduate

Diploma in Education and a Bachelor's degree in Agricultural Management. He was 39 and had taught for 12 years.

John was interviewed in his classroom after school hours. John had a Basic Education Teacher's Diploma specializing in Agriculture and Life Science and an Advanced Certificate in Education specializing in learner support. He had taught for nine years and at the time of this study his age was 33.

I used semi-structured interviews to find out what indigenous knowledge and practices might be incorporated into animal husbandry in Grade 10 Agricultural Science, and to ascertain which strategies could be used when teaching in this way. In this case, the teachers answered questions about indigenous knowledge and practices in a rural area not familiar to me. The questions covered areas such as animal health, breeding, selection and feeding, as well as teaching strategies for incorporating indigenous knowledge.

All the interviews with the four participants were recorded using a tape-recorder and a cell phone. Since we were from different ethnic groups, the only language in which we could understand each other was English, so the interviews were conducted in that language. The interviews were transcribed thereafter verbatim.

3.7.2 Workshop discussions and reflections

After the interviews, I formed a community of practice (CoP) with the two teachers from Gobabis High School (Lave & Wenger, 1991; Wenger, 1998) (see Section 2.5.5). The aim was to collaboratively explore the opportunity for integrating indigenous knowledge and practices into animal husbandry lessons.

The data obtained from the interviews was used to inform the co-development and co-planning of model lessons. The syllabus for Grade 10 Agriculture was used to select the topics on which the lessons were based.

The two teachers and I identified aspects of IK that could be integrated into Agricultural Science topics on animal husbandry. Topics such as animal health (focusing on diseases and parasites), feeding, handling, breeding and selection were identified for inclusion. We also debated pedagogic strategies and together developed lessons including IK on the following topics: animal diseases,

parasites, feeding, breeding and selection. After discussing the resources needed to present the lessons, I was asked to bring my laptop for a PowerPoint presentation, while the teachers would bring subject-related materials and a projector from the school.

The topics were divided between the two teachers and lessons were co-planned. They were then presented to my supervisor, Professor Kenneth Ngcoza, for advice and comment, as a result of which certain adjustments were made.

During the workshops, the two teachers promised that they were going to bring to class some traditional materials such as wood ash, which they stated was used for various purposes like the control of parasites and diseases. In the event, the ash was not produced, and – apart from the camel thorn pods – the teachers relied on pictures in the PowerPoint presentation. After presentation of the lessons integrating IK, there was reflection on how the teachers mediated learning in these lessons. As the teachers were too busy, we could not find the time to meet for stimulated recall interviews. Questions were formulated and the videotaped lessons together with the questions were given to the teachers to watch and answer on their own.

From the exchange of ideas during the workshop it emerged that their biggest problem was the time factor. Most times when we met they had other programmes that they had to attend to afterwards. The participants were of the opinion that the IK program should be extended to Agricultural Science course work, so that we could work together to develop practical activities for the subject. For example, John commented that:

> "*Oh, sir why can't we do the same for practicals for grade 12 Agriculture, this a nice thing instead of you as a teachers you struggle alone to do those practicals*" (John).

3.7.3 Observations

Maree (2014) defines observation as an orderly process of recording the behavioural patterns of participants, objects and happenings, without questioning or communicating with them. In this case, the lessons on animal husbandry including IK were observed. Bertram and Christiansen (2015) note that observation involves the researcher going to the site where the phenomenon is happening and observing what is actually happening there. These scholars advise that observation can be structured or unstructured.

In structured observation, an observer uses a structured schedule with different predetermined categories, while in unstructured observation there is no check-list. Instead, the researcher writes a free description of what is being observed (Bertram & Christiansen, 2015). In this study, unstructured observation was used, with my observation data being augmented by my responses to videotapes of the lessons. The participants agreed to be recorded before this was done (Salkind, 2014). The focus of the observation was on mediation by the teachers, rather than on the learners.

I observed the two teachers teach four co-planned model lessons. The teachers participated on either side of the camera: when one was presenting the other observed and video recorded, while I was observing and video recording too. The lesson presentations and observations took place on three different days. The first presentation was done by Tooki. Since John could not turn up, we asked a learner from another class group to do the recording. Tooki's lesson lasted for about one hour and ten minutes, well beyond his planned of 45 minutes. His second period lasted for 40 minutes. In contrast, John's first period lasted for 30 minutes, while the second took 48 minutes. The period normally lasts 45 minutes, but our lessons were experimental and varied depending on how the lesson was prepared and mediated.

The presentations and observations were all done in the afternoon starting at 3 o'clock. This was necessary to get both teachers into the same classroom at the same time for presentations, without their having to leave a class unattended. In direct observation the research allows the normal activity in the environment to proceed without the interruption (Salkind, 2014). During the process of observation, I allowed everything to follow without questioning anything. In addition to the observations, I wrote some reflections. The two teachers were also requested to record their reflections on the research process.

The lessons were presented well and there was a good learner turnout. As John also reflected:

> *"The inclusion of indigenous knowledge in the lesson …. made the lesson interesting as learners were happy to know things in their language."*(John)

Table 3.6.3.1: Data gathering techniques used in the study

Stages	Methods to be used to gather data	Data sources	Purpose of the data	Research questions
Stage 1	Semi-structured interviews	Four selected Grade 10 Agricultural Science teachers	Indigenous practices and knowledge that can be incorporated in animal husbandry within Grade 10 Agricultural Science lessons Pedagogic strategies that can be used to teach lessons that incorporate IK on animal husbandry	1, 2
Stage 2	Discussions during co-development and co-planning of model lessons	Two selected Agricultural Science teachers	Support teachers need when developing model lessons that integrate IK	3
Stage 3	Observe teachers teaching model lessons incorporating IK on animal husbandry Reflections	Two selected teachers Selected teacher, critical friend and myself	Mediation of learning of Agricultural Science teachers teach lessons that incorporate IK on animal husbandry	4

3.8 Data analysis

Cohen, Manion and Morrison (2011) point out that qualitative data analysis involves organizing, accounting for and explaining the data. In short, data analysis entails making sense of data in terms of participants' definitions of the situation, noting patterns, themes, categories and regularities. The qualitative data generated in this study was analyzed inductively by grouping it into categories. Similar categories were then grouped together to form themes. The themes were linked to socio-cultural concepts like ZPD, social interaction, mediation and community of practice, and concepts of identity, practice, meaning and community.

Walker and Myrick (2006) assert that coding in qualitative research is one way of exploring pieces of information in the data, and looking for similarities and differences within these pieces in order to

categorize label them. To do this, I adapted and modified Saldana's (2009) model of data analysis, as reproduced below.

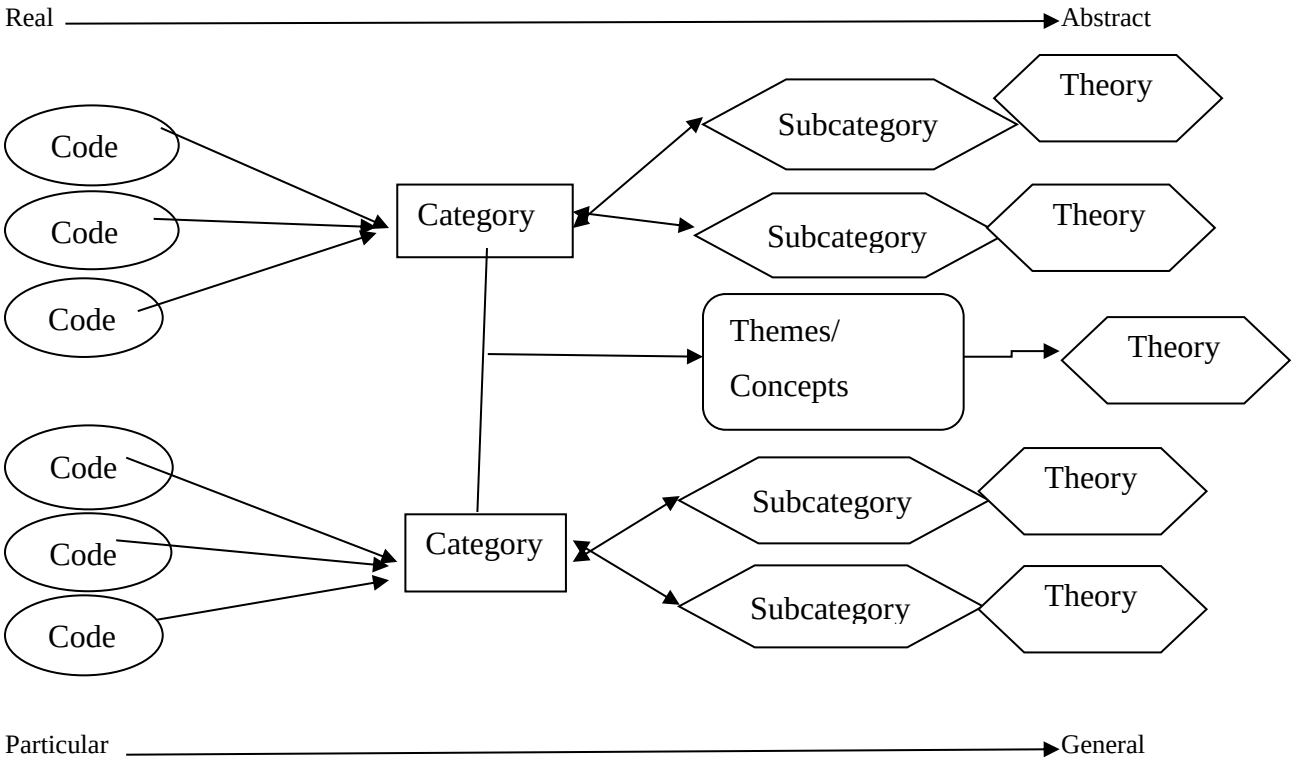


Figure 3.7.1: Saldana's (2009, p. 12) theory model for qualitative inquiry

This model was used in data analysis, to code, categorize, and reduce the categories to sub-themes and the sub-themes to themes.

3.9 Validation and Trustworthiness

Bertram and Christiansen (2015) claim that using audio-recording devices to record verbal interviews is more accurate than taking notes. Thus in this study the interviews were tape-recorded and later transcribed verbatim so that no data was lost.

Bertram and Christiansen (2015) also note that to enhance credibility, two researchers can observe the same situation and discuss their observations. Having two observers and recorders during the model lessons enabled triangulation to occur during data collection.

Creswell (2012) recommends member checking with participants when doing research. The interview transcripts were therefore given to the interviewees to check that what was written was a true

reflection of what they had said during their interview. Member checking is another form of triangulation (Creswell, 2012; Maree, 2014).

John, Mwaka, Tooki and OUR confirmed that the transcriptions were accurate. OUR had collected the local names of plants in Otjiherero together with their botanical names. I conducted an informal external audit with one of the Master's students to check the names of plants in Otjiherero that learners mentioned, which he said were correct.

Three types of data gathering techniques, namely, interviews, observation and reflections were used and this lead to trustworthiness of data (Maree, 2014). The thick transcripts and descriptions on IK on animal husbandry, strategies that could be used when integrating IK and assistance that teachers need when developing lessons that integrate IK were given back to the research participants for them to double check their own conclusions from the data presented (Leedy & Ormrod, 2012).

Some answers that teachers provided during interviews could also be found in the answers that learners provided during lesson observations of the model lessons (Bertram & Christansen, 2015).

3.10 Ethical considerations

According to Bertram and Christiansen (2015), ethics in this context refers to questions of right and wrong in research. Creswell (2012) points out that the need to pay attention to ethical issues was necessitated by the inhumane treatment of research participants in the past. Governments have introduced legislation and reports governing good ethical practice, and it is expected that educational researchers should be able to foresee ethical issues that might arise during the course of the research (Creswell, 2012).

Leedy and Ormrod (2012) distinguish the following ethical issues: protection from harm, informed consent, right to privacy, and honesty with professional colleagues. The Rhodes Higher Degree Committee makes use of these concepts:

Respect and dignity

Maree (2014) notes that it is important to make sure that the results and findings of the study are kept confidential, as well as the identity of the participants. This includes the letters of consent, getting permission to interview participants, and destroying audiotapes that were used. The study was not begun until the Rhodes Education High Degrees Committee (EHDC) gave its approval on the 5th

December 2017. Thereafter, permission to conduct the study with the teachers in the region was requested and granted in December 2017 by the Regional Director of Education, Art and Culture. Permission to conduct the study was requested from the principals of the schools in January 2018. A meeting was held with the teachers to explain the nature of research, its purpose, and their role in the research. The teachers were informed that their participation should be voluntary and that they had the right to withdraw at any time they might wish to do so. Salkind (2014) emphasizes that nobody should ever be forced to take part in a study.

Despite the fact that I was not researching with or on the learners, informed consent was requested from them too as they would be in the class in which the lessons were modelled. The parents signed letters on their behalf. Pseudonyms were used for participating teachers. During the interview the participants were asked to give pseudonyms which they preferred me to use in the thesis, so names like Tooki (something precious), John, OUR and Mwaka (meaning Year) were given.

The privacy of participants was respected. Salkind (2014) suggests that the researcher must maintain the anonymity of participants in such a way that there is no way anyone apart from the principal investigator can match the results of the experiment or study with the participants associated with those results. I made sure in my report writing and speech that no one could find out how a certain participant responded to a question or behaved. Permission to do the audio and video recording was requested and granted by the participants before the recordings were done (Salkind, 2014).

The data collected and list of corresponding names were kept confidential, in a secure place under lock and key (Salkind, 2014). Since we were working on indigenous knowledge, it was important to ensure that the culture of the people was respected during the study.

Transparency and honesty

The research context was analyzed for potential risks, and its possible benefits were discussed with participants (sharing planning skills, presentation skills, and so on). The process of the research was explained to the participants at the beginning. Findings that were obtained were reported as such without misrepresentation or the intention to mislead. The data was not changed in order to support a particular conclusion. The transcribed data was member-checked to ensure that it was a true representation of participants' views. The researcher was unfailingly courteous to the participants.

Accountability and responsibility

During the period of research and afterwards, I acted in such a way that my actions could not harm the participants in any way. I made sure that I got informed consent from all the stakeholders before the process of data collection commenced. There was no conflict of interest in the study, and when participants were not ready on the date agreed upon, the activities were simply rescheduled to another date that suited the respondents.

Integrity, academic professionalism, researcher positionality

Where I have used other people's ideas in this study, I acknowledge this. I tried to ensure that my perceptions and assumptions did not influence the research process. I was polite to all the participants and urged them to participate freely.

Bertram and Christiansen (2015) state that the interpretivist paradigm's trustworthiness is rooted in its detailed data descriptions which are genuine, reflecting the experiences of the respondents. When there were areas that were not clear regarding the data collected, the participant concerned was consulted for more explanation.

The benefits of taking part in this research were explained; for example, learning how to include IK in our lessons to contextualize them through sharing teaching strategies in teaching lessons that incorporate IK. The participants were also learning how to conduct research, since full information about the research was passed to the participants throughout the process.

During this study measures were taken to make sure that the participants were not physically or emotionally harmed. They were also informed that if any risk associated with participation in this research arose, they would be informed in time about it for them to make an informed decision.

The possibility of misrepresenting words or conduct of the participants was minimized by giving them access to the transcribed data for member checking.

3.11 Concluding remarks

In this chapter, I discussed the research design, the goal of the study, the site where the research was carried out, the identity of the participants and how they were sampled, and my own positionality as

an educational officer and a researcher. There was description of how the data was generated, measures to ensure its validity and trustworthiness and, lastly, relevant ethical considerations.

In the next chapter, I present, analyze and discuss the data generated by the interviews.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

In the previous chapter, I presented the research design and methodology underpinning this thesis. In this chapter, I present, analyse and discuss the data generated from the semi-structured interviews I conducted in order to answer the following research questions:

- What indigenous practices and knowledge can be integrated into animal husbandry within Grade 10 Agricultural Science lessons?
- What pedagogic strategies can be used to teach lessons that integrate IK into animal husbandry in Grade 10 Agricultural Science lessons?

The data generated from the four teachers were categorized; similar categories were then combined into sub-themes and similar sub-themes into themes (see Appendix O). The themes were then linked to the literature and theory presented in Table 4.1.1 below.

Table 4.1.1: Shows themes emerging from interviews

Theme	**Supporting literature/Theory**
Participants' understanding of IK	Kibirige and Van Rooyen (2006); Mavuru and Ramnarain (2017); Shizha (2013).
Indigenous knowledge on diseases treatment and prevention	Masuku (2018); Jadeja, Odedra, Solanki and Baraiya (2006); Subrahmanyeswari and Chander (2013); Mapara (2009)
Indigenous knowledge on parasite control in animals	Masuku (2018); Subrahmanyeswari and Chander (2013)
Indigenous knowledge used to solve birth difficulties and afterbirth	Saha (2014); Masuku, 2018

Indigenous knowledge on the feeding of livestock	Masuku (2018); Thapa, Walker and Sinclair (1997)
Handling activities of dehorning and castration of animals	Abara, Kabede and Gizaw (2014)
Indigenous Knowledge on breeding and selection of breeding stock	Abara, Kabede and Gizaw (2014); Kohler-Rollefson (2000) Msanga, Mwakilembe and Sendalo (2012); Kohler-Urgessa et al. (2013)
Reasons for inclusion of indigenous knowledge	Mukwambo, Ngcoza and Chikunda (2014); Mavuru and Ramnarain (2017); Namibia. Ministry of Education (2010) Kibirige and Van Rooyen (2006); Cronje, Beer and Ankiewicz (2015); Erinosho (2013)
Teaching strategies on the integration of IK in lessons	Ministry of Education and Culture (1993); Klein (2011); Ogunniyi and Ogawa (2008); Mhakure and Otulaja (2017); Ludwane, Mashozhera, Mhlekwa, Nuntsu, Speckman and Seehawer (2015); Erinosho (2013); Vygotsky (1978); Kibirige and Van Rooyen (2006); Namibia. Ministry of Education (2010); Shizha (2007); Du Toit and Sguazzin (1995) Kasanda, Lubben, Gaoseb, Kandjeo-Marenga, Kapenda and Campbell (2005)

As I explored the integration of indigenous knowledge (IK) into the animal husbandry section of the grade 10 Agricultural Science Namibian curriculum, my focus was to find out which indigenous

knowledge and practices could be integrated into the lessons. I also wanted to understand the pedagogic strategies used when presenting lessons that integrate IK.

I first present data on IK and practices that can be integrated into the animal husbandry section for grade 10 Agricultural Science.

4.2 Indigenous knowledge in animal husbandry

Following from the interviews the subsequent themes emerged, namely, Teachers' understanding of indigenous knowledge, Indigenous knowledge of diseases treatment and prevention, Indigenous knowledge on parasite control in animals, Indigenous knowledge available to solve birth difficulties and afterbirth, Indigenous knowledge on the feeding of livestock, Handling activities of dehorning and castration of animals, Indigenous knowledge on breeding and selection of breeding livestock, Reasons for the inclusion indigenous knowledge, Strategies to use when integrating indigenous knowledge, Lack of recognition of IK during assessment, Documentation of unrecorded or unwritten knowledge for future access.

4.2.1 Teachers' understanding of indigenous knowledge

The teachers involved in this study viewed indigenous knowledge as the skills and practice that the local people possess and produced for themselves over time. Regarding the traditional knowledge the local people have specifically on animals, Tooki and John commented that.

> *"Indigenous knowledge means those are skills or practices that people were using in the past" (Tooki).*
>
> *"... well I think indigenous knowledge refers to knowledge that come from the local people around or knowledge on how people have been doing things in the past" (John)* (See appendix J).

From these excerpts, it appears that the two teachers have an understanding that this knowledge comprises skills and practice which the local people possess.

These findings corroborate with Kibirige and Van Rooyen's (2006) and Shizha's (2013) views that indigenous knowledge (IK) is a legacy of knowledge and skills that are unique to a particular local culture. Additionally, IK involves wisdom that has been developed and passed on from generation to generation.

However, these teachers expressed their concerns that this knowledge is not documented. Instead, it is passed on from generation to generation orally. In their opinion there is a danger of losing this knowledge if it is not formally documented. For instance, Tooki commented that "*Those are information that are not documented. Those are skills we get from our people through oral communication"*. Concurring, OUR added that "*… what has now moved from generation to generation is the one that we are currently using"*.

4.2.2 Indigenous knowledge on disease treatment and prevention

This theme covers the prevention and the treatment of disease.

4.2.2.1 Prevention of diseases

When an animal is sick, it is isolated from the rest of the animals said Tooki. The reason for isolation being to prevent the disease from being passed on to the animals that are not sick. This means that local people understand that infected animals can pass the disease on if the disease is contagious. To this end, Tooki stated that "*They were using and is still used methods like they were isolating sick animals from others. Whereby this will prevent further spread of diseases"* (See Appendix N).

In her study conducted in South Africa, Masuku's (2018) findings revealed that animals that are sick were isolated for observation among the indigenous people of Mpembeni in KwaZulu- Natal.

4.2.2.2 Animal disease treatment

The teachers involved in this study indicated that local people use the roots of certain plants to treat common animal diseases, for example, it emerged that the Omaheke residents used wood ash to treat diseases. The indigenous people treat diseases like Tetanus, Brucellosis, wounds, Lumpy skin, Pasteurellosis (Okapirauka in Otjiherero), eye problems, constipation, warts, and diarrhea. They prepare medicine mainly from plants and other locally available resources. For example, OUR stated that diarrhea can be treated using *Acacia mellifera* which is prepared by crushing roots with a stone, boiling them in water and then cooling them before giving the mixture to the animal to drink. This stops diarrhea in animals. In another example, Mwaka stated that indigenous people treat constipation in animals by using sunlight soap dissolved in water and then giving it to animals to drink. For treatment of diseases such as Brucellosis, ash and herbs were used. After the interviews I attempted to find out what they call Brucellosis in Otjiherero after the learners during the presentation referred to it as Okuhuhura. Tooki said it is call "Momutjese uazondana ozondema" OUR said "*Omutjise wo*

ku hukurisa" I asked OUR whether the learners' answer was correct and he confirmed that their phrase was also correct.

Ash is used to treat foot and mouth disease (FMD). Tooki commented that "*They also use to treat brucellosis in cattle by using wood ash and by using some herb roots"*. Agreeing, John mentioned that for FMD "*For example the animal that is having foot and mouth disease they used to normally put ash on the wound itself"* (See appendix J).

Subrahmanyeswari and Chander (2013) claim that indigenous people treat foot and mouth disease by keeping the infected foot in mud or phenyl is applied to the foot and a paste of peach leaves is applied on lesions. For mouth ulcers lemon and salt is used. This confirms that indigenous people in Namibia have extensive knowledge on how to treat this disease.

The data shows that there are many diseases that indigenous people can treat traditionally like Okapirauka, Brucellosis, Foot and mouth disease, warts and so on. The findings resonate with Ogunniyi and Ogawa (2008) and Mapara (2009) informing us that indigenous people have a wealth of medical knowledge which can be used in animal husbandry. Jadeja et al. (2006) argue that treatment of diseases using different plants for different kinds of ailments for animals is an ancient tradition.

Table 4.2.1: Shows indigenous treatment ways on animal diseases

Teacher	**Diseases**	**Treatment**	**Preparation**	**Reason**
Tooki	Control of common diseases: Tetanus and Brucellosis	Using wood ash, using some herbs roots. Use of otjimbuku and omuthauna :	Leaves are crushed mixed with water and given to the animal to drink	To cure the diseases
John John	Foot and mouth disease(FMD) Lumpy skin disease	Used traditional herbs to treat diseases. Put ash on wounds Use of the bark of baobab tree	Pull off the hard part and boil the remaining part then you apply the boiled water on the body	

Mwaka	Eye problems	Use of tobacco and ash (done among Ovaherero)	Crush the tobacco finely and mix it with ash then you put it in the eye of the animal	To cure the problem
Mwaka	Constipation	Use of sunlight soap	Crash the sunlight soup and mix it with water and give to the animal to drink	Helps with constipation
Mwaka	Sharp teeth afterbirth	Use of charcoal to smooth the teeth	Use the charcoal to smooth the teeth	So that when suckling it is not sensitive to the teeth
OUR	Animal with diarrhea	Use of *Acacia mellifera*	Crash the roots or cut it when fresh crush a little bit with stone, boil it and let it cool a bit and give to the calf to drink	It stops diarrhoea
OUR	Treatment of wounds	Use of *Boscia albitrunca*	Crush the leaves of albitrunca and apply the powder to the wound	Help to heal fast, helps with clotting and to keep the flies away from the wound.
OUR	Treatment of pasteurellosis (okapirauka in Otjiherero)		Cut the tip of the ears and tip of the tail	So that the blood can come out
OUR	Treatment of Orflor warts on the kid	Copper wire	Tie on the ears or make a small hole in the neck of a kid and tie the wire round the wart	The wart will instantly disappear

The above table shows that indigenous people in Omaheke region have acquired IK in various ways to enable the treatment of disease.

4.2.3 Indigenous knowledge on parasite control in animals

Parasites affect the well-being of livestock. The indigenous knowledge shown by the data reveals that the use of ash controls the external parasites by applying dry ash to the affected areas of the animal. The ash can be applied in the form of a solution by mixing it with water. The ash can be applied where

the animals live to control parasites. The data also points out that herbs and certain plants can be used to control parasites.

> Tooki "*Apart from that the use of wood ash can be applied on animals to prevent both internal and external parasites… some herbs from certain plants … application of ash in the house of animals to control external parasites".*
>
> John supported this by saying "*If it is also having ticks they used to use ash to apply there targeting areas where ticks hide that is one way"*

These excerpts show that ash is commonly used in parasite control. Subrahmanyeswari and Chander (2013) suggest that for the external parasites the use of cow urine and black ash, cloth dipped in petrol, red soil on legs, a mixture of cow urine and cow dung ash which is settled for 48 hours is applied externally. Masuku (2018) adds that engine oil is used to control ticks when applied on the affected area of the animal.

These scholars confirm that wood ash is commonly used to control parasites but there are other indigenous methods that can be used.

4.2.4 Indigenous knowledge to solve birth difficulties and the afterbirth

The data revealed that indigenous knowledge and skills exist that can be used when the cow is having difficulties in giving birth. If the calf is not in the right position, it emerged that indigenous people know how to turn the calf into the right position in order to rescue both the mother and calf. People still use trees like Camel thorn and Mopani when the animal has complications from giving birth to treat the animal. For instance, Tooki commented that:

> "*You could also assist, … you find the situation may be instead of the head passing first between the legs you might find it will come out first the hindquarter, in that instance you will find that it will be very difficult to give birth so they were also having those skills on how to turn the calf in the right position"* (Tooki) (See Appendix J).

When it comes to the afterbirth (placenta), the data illustrates that if the placenta is not passed within a few hours after giving birth it suggests there might be a problem and so assistance needs to be provided. The data showed that in this situation indigenous people use a bottle and a piece of the placenta is rolled on the bottle to aid its expulsion. Additionally, these teachers indicated that an animal can be given a wood ash solution (wood ash dissolved in water) to drink in order to remove the placenta. Once the placenta (after birth) they can treat the birth canal to prevent infection, which

can be done by mixing ash with water or soap with water and put in the uterus of the animal as Tooki lamented that

> *"There are also instance when the afterbirth take time to come out, so what you do you use the hand and the bottle, you put hand in and then you put the bottle and you turn so that it come out. Sometimes you mix water with ash or water with soap to help the afterbirth to come out. Put the hand in on the placenta turn the bottle (show signs of rolling the placenta on the bottle and pulls down). They mix the water with ash and give to the animal to drink… from the information I got to act as antibiotic"* (Tooki).

This indicates that the indigenous people know that the afterbirth should come out within a short period of time after giving birth. In her study conducted in Birbhum in India, Saha (2014) claimed local people treated the animal with raw mango leaves in order to expel the placenta. Similarly, Masuku (2018) found in her study that indigenous people use *phehlacwathi* and *gobho* to remove the whole afterbirth that did not come out after delivery.

4.2.5 Indigenous knowledge on the feeding of livestock

On this theme, the data revealed that three participants indicated that indigenous people do not provide food for animals, instead the animals depend on grazing natural vegetation for food. In some instances, John and OUR also indicated that there are times they cut grasses for sick animals or when they cannot walk long distances when they are still young. OUR gave some names of the plants which they use to cut for the animals during drought such as *Grawia flava, Terminalia seriela* (Omusiaseta) and *Boscia albitrunca (Omunguindi).* Mwaka, John and OUR pointed out that:

> *"most farmers let their animal graze on grass, shrubs, tree or any available food that can be provided, that is sufficient enough to provide the animal with all their nutrients"* (Mwaka).

> *"The used to let the animals on the natural grass and sometime you can cut the grass and bring it to the calves at home, but the bigger animals they rely on their own"* (John).

> "*They use extensive grazing management, during drought time … use Grawia flava ... and we also have a little bit of Terminalia seriela (Omusiaseta). Very thin animals that cannot go far, we, we keep them in kraal and then we go out and then you cut those Grawia flava as well as Boscia albitrunca, … bring to the animals so that they can eat. If where I am staying there is no good grazing I will move to the next area where there is better grazing"* (OUR).

Even though food is not provided for the animals, the data shows that they have knowledgedo understand how to care for sick animals and calves that cannot walk long distances. Masuku's (2018) study revealed that among the indigenous people in Mpembeni in South Africa cattle forage (search for their own food) in the area and they are not provided with supplements. The findings support

Masuku (2018) as the local people's livestock depend on the natural vegetation for grazing and they are not provided with food as the three participating teachers indicated. The provision of food is done on a small scale for calves and for the animals that cannot walk long distances.

Tooki who spoke about the provision of food for animals noted that the seed pods of certain plants like the Camel thorn are collected. Those are prepared by crushing them and then mixing them with crashed maize and salt before they are fed to animals. The use of pods shows that the indigenous people have gained IK on the value of the trees, they have learnt how to prepare them as supplements to provide protein. Is this not worthy learning?

There are salt pans in the region where the study was conducted and it is common practice for the community to move animals to the salt pans to lick the salt which provides minerals. When animals get feed it was in order to improve their nutrition as during droughts it is hard for animals to depend on grasses. Tooki stated that:

> "*were using some plants like the pods of certain plants, also crushed mealie meal that they harvested and mix with the pods of certain plants like the Camel thorn. Moving animals to salt pan is still common"* (Tooki).

The data show that IK led to the crushing of pods and maize to improve the digestion of food in animals. Taking the animals to the salt pan also shows an awareness that salt provides minerals that are needed by the animal for the normal functioning of the body.

Thapa et al. (1997) note that farmers in Nepal use trees as fodder and have acquired indigenous knowledge on the value of which trees to use for fodder.

OUR noted that the people practice extensive grazing, if there is no grass in the area where one is staying then they move to the next place with better grazing. However, this practice has become difficult because of settled agriculture. To move to another place requires permission from the owner of the place you want to move to.

Table 4.2.2.1: Shows IK on animal feeding

Name	Feeds	Preparation	Reason
Tooki	Pods of plants Maize	Crush them and mix them with salt Pods are collected to be used as feed during drought season. Crushed mealies (maize) are harvested and mixed with pods of certain plants like Camel thorn	They were looking at ways of improving animal nutrition and not to only depend on grasses To maintain animals during drought. The pods are a source of protein.
John/OUR/ Mwaka	Natural grasses	They let the animals graze on the natural pasture (do not provide food) sometime cut grass and bring home to calves and animal that cannot go far	

4.2.6 Handling activities of dehorning and castration of animals

The data showed that the indigenous people remove the cows' horns using a knife while the calf is still young. They do this at an early age because the horns or the bud is still soft. The reasons given for dehorning the cows was that when milking the cow, it is easier to approach a cow without horns. This prevents human injuries by cows as Tooki indicated that *"The female animals used to be dehorned using knives by cutting the horns."* He further commented that *"It was easy to handle or to approach those animals without horns. Apart from that it was the sign they looked nice. The other reason they take less space especially when they are feeding."*

The castration of male animals was first done with knives and stones. When using a knife the scrotum was cut open and the testicles were removed and the salt or herbs were put in to prevent infection and help healing. *Ziziphus mucronata* (*OMukaru*) the leaves and roots are cut and left to dry, they are then crushed and mixed with ash. This .helps the wound to dry faster

Using stones involved the testicles being smashed until they were completely destroyed. To castrate now they use different tools like burdizzo, castrator and a rubber ring. They do castration for various reasons like controlling unwanted breeding. It is also a sign of wealth as when animals are castrated they fatten up.

To this end, OUR and John commented that:

> "*castrate the, the horses, cattle with knives the blood process, whereby we cut the … open and remove the testicles."* (OUR)
>
> *"they were castrating using stones. How they were doing it. The stone were put underneath, then you put the testis on it. Take the other one and you smash the testis until they are completely destroyed"* (John).

Abara et al. (2014) state that animals that were not suitable for breeding purposes were castrated which also improved their fattening potential. These scholars further add the methods of castration were the use of the local available materials like wood, stones and hammers to crush the vas deferens.

The literature confirms the findings that indigenous people know how to castrate animals. The findings of Abara et al. (2014) show an understanding of the effect of castration on the animal. Does this make our indigenous knowledge less important than Western knowledge? Is this not important to be known?

Table 4.2.3: Shows indigenous knowledge of the castration of animals

Name	**Castration**	**Procedure**	**Reason**
Tooki	Castration using knife,in our days **now they use tools like burdizzo, castrator with rubber ring (J,T)**	Cut through the scrotum and remove the testes. OUR: use *ziziphus mucronata* leaves and roots crush them and mix them with ash and then apply on the cut.	To control unwanted breeding. Sign of wealth as castrated animals look nice and became fat

John	Castration using stones	Put stone underneath, put the testes on it. use the other stone to smash until completely destroyed	
Tooki	Castration using knife in our days **now the use more tools like burdizzo, castrator with rubber ring (J,T)**	Cut through the scrotum and remove the testes. OUR: use *ziziphus mucronata* leaves and roots crush them and mix them with ash and then apply on the cut.	To control unwanted breeding. Sign of wealth as castrated animals look nice and become fat
John	Castration using stones	Put stone underneath, put the testes on it. use the other stone to smash until completely destroyed	

The fact the testicles of the animal are targeted during castration is an indication that they understand that the removal of the testicles affects the fertility of the animal. The treatment of the wound after removal of the testicles is an indication that they understand that infection can occur if the wound is not treated.

4.2.7 Indigenous knowledge on breeding and selection of breeding livestock

It emerged from the data that indigenous people use uncontrolled breeding in that bulls or rams from neighbouring plots service their cows or ewes. There is a form of inbreeding where they select the bull from within the same herd. The data also revealed that some indigenous people nowadays buy bulls elsewhere to combat this. According to John and Mwaka, indigenous people used to borrow male animals if they did not have any as a breeding practice and they commented that:

> *"It was an open area where they were staying a bull from another farmer will just cross all. You have your cow a bull from another farmer is coming to mate with your cows"* (John).

> "*there is a practice called mafisa in silozi where the farmer exchange their animals, maybe it can be a bull. You borrow a bull to come spread its characteristics in you kraal. Or to mate with you cows. Or you can take you cow to the kraal with the characteristics that you want"* (Mwaka) (See appendix J).

These excerpts show that indigenous people use uncontrolled breeding or mating because in communal areas there is mixed herding and sharing of male animals as highlighted by Abara et al. (2014) and Msanga et al. (2012).

> *"based on extension services we have improved we buy now breeding stock from outside. Traditionally we use to look among calves which one is better quality"* (OUR) (See Appendix J).

The data shows that not all farmers still practice inbreeding.

When it comes to selective breeding, data shows that selection is based on size of testicles in bulls, udder development in cows, size of the body and body shape.

Kohler-Rollefson (2000) notes that most of the traditional selection efforts focus on male animals which are usually chosen on the basis of their female relatives' performance, strength and external characteristic. Dziva et al. (2011) posit that knowledge is not static but evolves and changes as it develops as confirmed by the fact that bulls are now being bought in order to improve the herd.

4.3 Reasons for the inclusion indigenous knowledge

Tooki indicated that the reason IK should be included was to pass the information or knowledge on to the next generation. Additionally, this prior knowledge helps the learners to progress from the known to the unknown and this improves understanding as stated by John and Mwaka. It helps learners to use their home space to ask questions as the parents will know some of the content they need which then assists the learners Mwaka noted. The data also indicate that IK provides an immediate remedy, basic solution or alternative solution to the problems that are faced by people as pointed out by OUR. Lastly the findings further reveal that the integration of IK can improve the participation of learners in class as John stated.

Erinosho (2013) records that including indigenous knowledge in lessons for example on animal husbandry can increase understanding of scientific concepts taught in school and increase excitement in interaction with the local resources. Concurring, Mavuru and Ramnarain (2017) argue that failure to address learners' sociocultural beliefs could result in learners continuing to harbour misconceptions that could be damaging to their conceptual understanding in science.

4.4 Strategies to use when integrating indigenous knowledge

The key strategy in this case involves finding out what is known by the learners on the topic. The data reveals that the teacher can use resources to make learning interesting as stated by Tooki. Learners can also be taken out in the field for demonstration and explanations by elders or old farmers as Mwaka and John echoed. One can make use of interviews and questionnaires on certain topics in order to gather information and invite parents to discuss specific topics John added. The data also shows that one can teach in the vernacular which aids understanding as indicated by Tooki and OUR.

These findings resonate with Kibirige and Van Rooyen (2006) and Roschelle (1995) who claim that IK should be the starting point and then the teacher should build on what the learner know. Kasanda et al. (2005) claim that the context based approach has the advantage of increasing the learners' participation in class.

Ogunniyi and Ogawa (2008) add that organizing field trips, visiting museums and visiting elderly people in the community are some of the ways of learning and teaching indigenous knowledge in Agricultural Science, particularly animal husbandry in the case of this study. Mukwambo et al. (2014) believe that when the community members partake in the education of their children the curriculum becomes relevant to their lives and that of the learners.

Teaching in the vernacular supports Gibbons' (2003) claim that human activities and mental functioning are facilitated by tools, cultural practices and artifacts, with language being the most widespread. Shizha (2007) claims that language is an important component for integrating indigenous science into the school science curriculum.

4.5 Lack of recognition of IK during assessment

The indigenous knowledge that learners have is often not recognised when it to assessment. Tooki and John commented that

> *"I have seen many learners know knowledge on IK and skills but when it comes to marking assessment you might find that a specific will ask that how do you control diseases. Some of these learners because they know a certain concept or they know what they normally use. Sometimes they might include that one as the answer. As the markers we sometimes penalize those learners. Although the answer what they give is what they do at home*" (Tooki) (See Appendix J).

> "*the problem is that it will be included but when it comes to grade 10 level, marking thereof, some of this knowledge are not accepted"* (John) (See Appendix J).

The data show that that the teachers devalue the indigenous knowledge or do not accept IK when assessing; they do not treat it as equal to the Western knowledge Ogunniyi and Ogawa (2008) state that even though the local knowledge shows the valuable wisdom and knowledge that has been acquired over many years by the majority of the locals there is no strategy on how to include IK in the curriculum.

Kreisler and Semali (2001) recommend that teachers need to be trained to recognize indigenous knowledge to avoid neglecting it, denying it or even denigrating it when it appears as part of the learners' response. In support, Shizha (2007) adds that colleges that train teachers do not integrate indigenous knowledge in the curriculum and pedagogical practices. Essentially in my view, these scholars argue that disregarding cultural fusion in the science program in teacher education denies teachers the skills and the techniques for successfully including indigenous science in the formal school curriculum.

4.6 Documentation of unrecorded or unwritten knowledge for future access

The teachers in this study felt that there is a need to start documenting indigenous knowledge, while we still have people who possess it. For instance OUR commented that:

> *"while we have this grandfathers and grandmothers around people should move out and gather more information, because those guys they sit with knowledge that is not recorded anywhere, not written down but they sit with that knowledge, so once we go out and gather that knowledge and document it or put it in book for so that future generation could also have access to it"* (OUR) (See Appendix J).

The data tells us that the elders in the community have acquired knowledge which needs to be shared and written down. If this knowledge is recorded, this will help the next generation to access it and would help the teacher to value indigenous knowledge

4.7 Concluding remarks

In this chapter, I presented, analyzed and discussed my collected data on the teachers' understating of indigenous knowledge on animal husbandry. The strategies that can be used when integrating IK into lessons were also highlighted. In the next chapter, I present the data obtained from workshops, observation and reflections.

CHAPTER FIVE: DATA PRESENTATION, ANALYSIS AND DISCUSSION

5.1 Introduction

In the previous chapter, I highlighted data from my semi-structured interviews in order to answer my research questions one and two. In this chapter, I thus present data from workshop discussions, observations and reflections. The data generated from these techniques will answer my research questions three and four which are:

- How can grade 10 Agricultural Science teachers be supported in developing model lessons that integrate indigenous knowledge and practices on husbandry?
- How do grade 10 Agricultural Science teachers mediate learning when teaching lessons that integrate indigenous knowledge and practices on animal husbandry?

The data generated from the workshop discussions; observation and reflection were colour coded to form categories. Thereafter, similar categories were combined into sub-themes and similar sub-themes into themes (see appendix Q). Below I show the themes linked to the literature and theory.

Table 5.1.1: Shows themes emerging from workshop, observations and reflections

Theme	**Literature/Theory**
Assistance or support teachers need	Dean, 1991; Wenger, Dermott and Snyder, 2002; Eun, 2008; Shabani, 2016; Teemant, 2005
Integration of indigenous knowledge and mediation	
Mediation during the lesson	Lantolf, 1994; Nieto, 2007; SCT, mediation: Lantolf, 1994; Ludwane, Mashozhera, Mhlekwa, Ntusu, Speckman and Seehawer, 2015; Turuk, 2008
Effect of the inclusion of IK on lesson delivery.	Namibia. Ministry of Education, 2010; Mavuru and Ramnarain, 2017; Stears, Malcolm, Kowlas, 2003; Kibirige and Van Rooyen, 2006; Klein, 2011; Shihza, 2007; Erinosho, 2013; Mukwambo, Ngcoza and Chikunda, 2014; Kasanda et al., 2005
Description of the experience of including IK in lessons	Namibia. Ministry of Education, 2003; KIbirige and Van Rooyen, 2006; Namibia. Ministry of Education and Culture, 1993; Gibbons, 2003; SCT ; Agea et al., 2008; Webb, 2013;

	Mavuru and Ramnarain, 2017; Mukwambo, Ngcoza and Chikunda, 2014
Suggested improvement on short-comings of the lessons presented	Kibirige and Van Rooyen, 2006; Shabani, Khatib and Ebadi, 2010, Scott, 2016
Learning during presentations and workshop	Shabani, 2016; Dean, 1991; Eun, 2008; Mavuru and Ramnarain, 2017; Lantolf, 1994; Wenger, Dermott, Snyder, 2002, Wenger, 1998; Eun, 2008; Nieto, 2007
Effect of presentation on the participants' ways of doing things	Cronje, Beer and Ankiewicz, 2015; Mukwambo, Ngcoza and Chikunda, 2014; Kasanda et al., 2005; Erinosho, 2013; Nieto, 2007; Teemant, 2005; Graven, 2003; Wenger, 1998; Shihza, 2007; Klein, 2011

I now discuss each of these themes below.

5.2 Discussion of themes

In this chapter two themes emerged which are: the support that teachers need and the integration of indigenous knowledge and mediation. The integration of indigenous knowledge covers mediation during lessons, the effects of integration of IK, the experience of integration of IK, suggestions for improvement in lessons and the effects of the presentation on participants. I now discuss each of them in turn.

5.2.1 Theme 1: Assistance or support teachers need

The data shows that teachers can support workshop discussions during brainstorming and the co-development of the lessons. During this stage there was a sharing of ideas on the strategies to use when integrating IK in lessons. This covered the introduction, teaching materials, lesson development and assessment. Help also came in the form of an assistant to the presenter who was able to explain some of the concepts more clearly.

The aim of the workshop was in line with Suzuki's (2012) claim that the purpose of professional development is to help teachers in ultimately understanding and supporting learners' learning. Although the two teachers who were involved in the workshop and the development of model lessons were experienced and trained, Dean (1991) cautions that initial training is not enough to meet the demands of education. That is, there is a need for teachers to keep on learning from one another. Teemant (2005) notes that through contact with knowledgeable peers knowledge is reinforced.

Concurring, Eun (2008) notes that there should be interaction among people while Shabani (2016) makes a claim that a group zone of proximal development is greater that individual ZPD.

5.2.2 Theme 2: Integration of IK and mediation

Mediation during the lesson

For this theme, data was generated through four observed lessons. The videotaped lessons were transcribed and the details were written down. The data shows that mediation was done in the following ways.

In the first lesson on feeding, the teacher used questions to elicit learners' prior knowledge. For example, Tooki asked, "*why do farmers feed animals?* "This question required learners to think of various reasons why animals are provided with food. He also used the chalkboard as a resource to write down the learners' responses (see Figure 5.2.1 below).

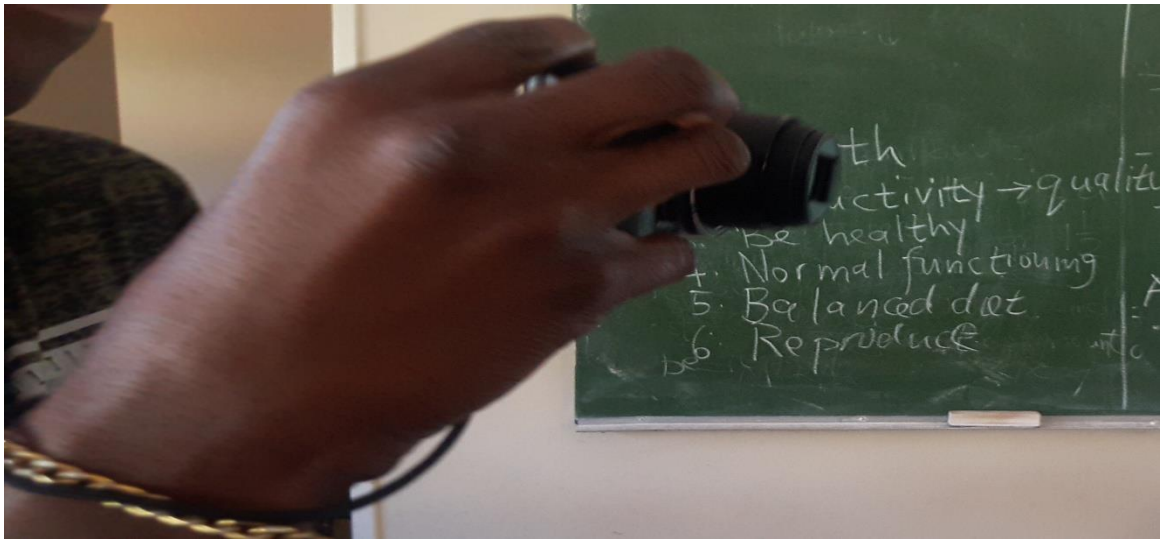


Figure 5.2.2.1: Shows the learners' responses consolidated on the chalkboard

Thereafter, the teacher provided learners with some worksheets so that they could record their answers. The worksheets guided the learners, for example, learners were asked to list the traditional (local) feeds farmers use to feed their animals and how these are prepared and the reason for feeding them these products. The pictures of feeds were displayed for the learners to identify and they supplied their cultural beliefs about feeding. For example one group of learner said: "*To help with growth. People believe that when you are feeding animals they will be able to come back home and get used to it."*

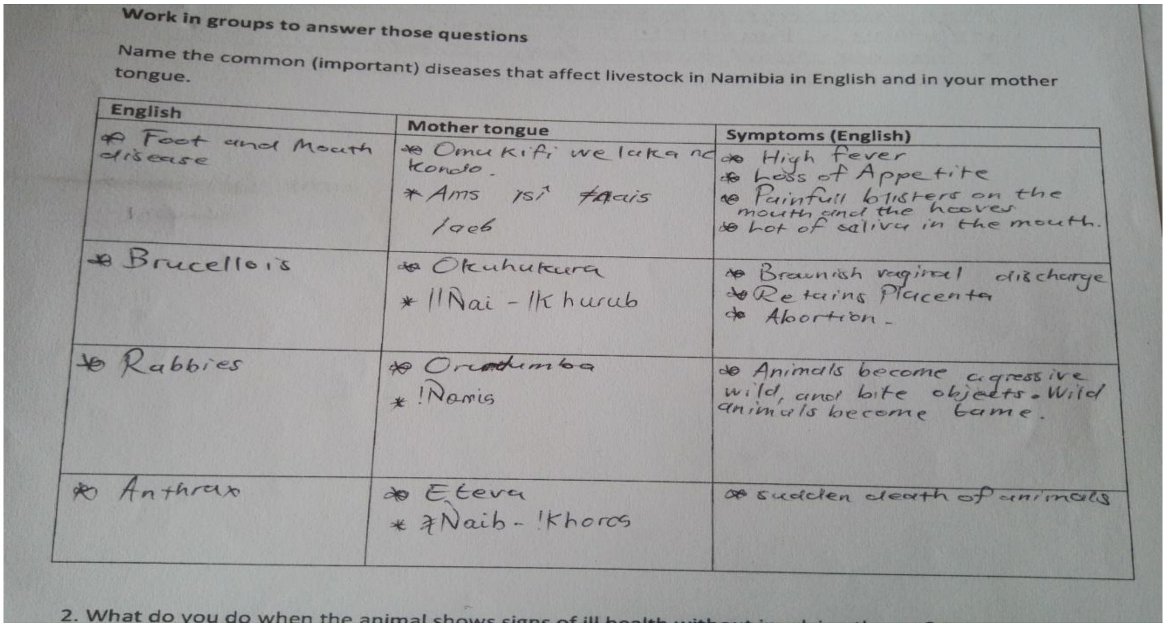
The teachers used data projectors to project images of feeds that he wanted the learners to identify. All three feeds were traditional: Figure 5.2.2 shows a picture of salt collected from the salt pan in the Aminuis area and 5.2.3. is salt found in Otjinene area in Omaheke. Figure 5.2.4 shows pods which farmers normally collect from camel thorn trees in Omakeke Region. It emerged that all these feeds were familiar to learners.

Figure 5.2.2.2: Shows salt collected from a salt pan in Aminuis Traditional feed A

Figure 5.2.2.3: Shows Natural salt in Otjinene Traditional feed B

Figure 5.2.2.4: Shows seed pods traditional feed C

As an introduction to the second lesson (presented by Tooki), he asked learners to describe the factors that affect livestock production in Namibia. The objective was for the learners to draw on their background knowledge. Their answers ranged across topics such as drought, availability of food and diseases. He then proceeded with a lesson on diseases. The teacher used the worksheet for learners to write down names of the diseases in the vernacular or mother tongue and in English and described the treatment of diseases in both traditional and Western ways. The teacher tried to elicit whether the learners knew the names of the diseases in their mother tongue and in English. Learners gave the following responses: Foot and mouth disease (*Omukifi we lakanekondo* in Otjiherero). Brucellosis (*Okuhukura*) in Damara/Nama llNai-lkurub and Anthrax (*Eteva*) and in Damara/Nama ǂnaib- !khoros (See Figure below).



Work in groups to answer those questions

Name the common (important) diseases that affect livestock in Namibia in English and in your mother tongue.

English	Mother tongue	Symptoms (English)
* Foot and Mouth disease	* Omu kifi we laka no kondo. * Ams tsi ǂAais /ae6	* High fever * Loss of Appetite * Painfull blisters on the mouth and the hooves * Lot of saliva in the mouth.
* Brucellois	* Okuhukura * ǁNai - ǁKhurub	* Brawnish vaginal discharge * Retains Placenta * Abortion.
* Rabbies	* Orumbumba * !Namis	* Animals become agressive wild, and bite objects. Wild animals become tame.
* Anthrax	* Eteva * ǂNaib - !Khoros	* sudden death of animals

2. What do you do when the animal shows signs of ill health ...

Figure 5.2.2.1: Shows a group of learners' response

Not only was the teacher trying to find out the learners' ideas on how certain diseases were treated in both traditional and Western ways, he also tried to find out their cultural beliefs in relation to the topic diseases. For example one group of learners said: *"some cultures think that when animals are sick they are being witched/jujus. When an animal is sick, it's a sign of weakness and you can't keep your animals health and also can't afford medication for your animals.)"* Explaining the facts to the learners might have led the learners to a proper understanding of why animals get sick. Interestingly, the teacher was not interested in correcting these beliefs. Instead, after the learners' presentations he projected pictures of animals showing symptoms of different diseases in an attempt to discover whether the learners were able to recognize those diseases or not.

Figure 5.2.2.2: Shows symptom of Foot and Mouth Disease

Figure 5.2.2.3: Shows symptoms of Anthrax disease

Some other pictures that were displayed were for Rabies, New castle and Brucellosis.

When a learner who wanted to know what the term for anthrax is in Otjiherero, Tooki answered and said: "*otjindjumba tjozohunguriva.*" Here, the teacher helped the learners to link the term anthrax to the word he knew in Otjiherero in order to contextualize learning.

John started his lesson by asking a question: "*apart from diseases we just discussed now what else can affect livestock on the farm?"* The teacher wanted to tap into the background of the learners and for the learners to raise concepts for discussion. Learners gave answers such as predators and parasites. After the learner mentioned parasites he emphasized "parasite" in his lesson by handing out worksheets for learners to provide the names of parasites in both their mother tongue and English and how they are controlled locally and in Western ways. Learners mentioned some cultural beliefs about

parasites, for example, one group stated that "*If your animals have lice it means that you are poor or dirty because lice stay in dirty place. If you burn ticks it is a sign of bad luck".*

A data projector was used to identify pictures of different parasites. In this activity, learners were expected to give the names of the parasites and state whether they were internal or external parasites.

External parasite Internal parasite

Figure 5.2.2.4: Shows a Tick ***Shows liver flukes***

Internal parasite External parasite

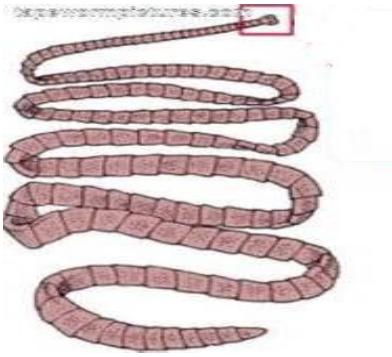


Figure 5.2.2.6: Shows a Tapeworm ***Shows a Horse fly***

John introduced the fourth lesson on breeding and selection by creating a scenario:

> "*If the farmer is having ten cattle at the farm and after three years his cattle become thirty in total. What do you think could be the cause of increase in number*?"

This question produced answers such as mating and breeding. In my view, the teacher wanted the learners to start thinking about breeding cattle and visualize the problems from the point of view of

their environment. Worksheets were used during the lesson in an attempt to elicit information about the local methods of breeding animals, their advantages and disadvantages and cultural beliefs on breeding and selection. An example of a cultural belief was given by one group of learners: "*farmers' belief that abnormal offspring is the signs of good luck."* The teacher in this case did not correct the misconception.

The two bulls that were chosen for selection purpose by the learners were put on the screen. At the end of the presentation, Tooki assisted John in further explaining some areas which John was unable to clarify. For instance, Tooki added that the learners who said behavior is one of the criteria for selection of animals was correct. In this way Tooki assisted both the learners and the teacher.

Nieto (2007) claims that mediation can be done using symbolic or psychological tools. In the presentations I describe language was used, both in writing answers on the board and on worksheets and the use of pictures during the presentations. The mediational tools in the presentation included the use of a data projector, the chalkboard and worksheets. The human mediation in this case involved learners helping each other in groups and during the presentation, the teacher helping the learners as they work (Lantolf, 1994; Nieto, 2007). Turuk (2008) says that mediation is the part played by everyone in the classroom who help the learners to improve their learning. Ludwane et al. (2015) point out that one can use expressions from the mother tongue as evidenced in Tooki's lesson.

Effect of the inclusion of IK on the lesson delivery

John felt that integration of indigenous knowledge (IK) during lessons enhances the learners' understanding. Additionally, it makes the lesson interesting as learners welcome familiar knowledge expressed in their home language. For Tooki, integration of IK encouraged learners to be actively involved in the lesson. He is also of the view that it makes learners feel comfortable as when they use their mother tongue discussions are enhanced.

The data shows that the learners involved in this study were able to express themselves freely and the integration of IK enabled the lesson to progress from the known to the unknown. As a result, learners were able to learn from one another.

The findings are supported by Erinosho (2013) who claims that integration of IK in lessons can increase the understanding of scientific concepts taught in school and can increase excitement amongst learners. The findings agree with Shizha (2007) who notes that language plays a role in

facilitating border crossing and in making learners actively engaged in the lesson. Kasanda et al. (2005) established that IK helps the learners to take control of their learning, learners could have experience that can be capitalized on during teaching thereby increasing learner participation. Mukwambo et al. (2014) notes that IK can be used as prior knowledge in class. Kibirige and Van Rooyen (2006) see IK as the starting point of the lesson as supported by Tooki.

Description of the experience of including IK in lessons

Both Tooki and John felt that learners had a wide range of knowledge on animal husbandry. For instance, they commented that learners were proud to express themselves in their mother tongue.

> *"Learners know more about livestock, especially feeding and diseases, ways of breeding"* (Tooki).
>
> "*Learners knew most the aspect on animal husbandry in their mother tongue and were keen to proudly spell those names in their languages"* (John) (See Appendix N).

This suggests that the two teachers realized that learners have information from home and they are not reluctant to express that knowledge.

The findings are supported by the Namibia Ministry of Education (2003) which states that learners are rich with knowledge from home which the teacher should make use of during the lessons. Kibirige and Van Rooyen (2006) and Roschelle (1995) emphasize that when teaching a subject like Agricultural Science, IK should be the starting point and teachers should build on what the learners already know. These findings contradict those of Agea et al. (2008) who claim that young people have the perception that IK is outdated. For instance, when learners were asked at the end of the presentations how they felt about learning things from their culture they stated that they felt proud, nice, good and so on.

Webb (2013) urges teachers to make science more relevant and accessible to the learners by acknowledging their cultural beliefs. Mukwambo et al. (2014) found that IK is founded in people's beliefs and some of those beliefs are a myth that cannot be justified. Mavuru and Ramnarain (2017) posit that failure to address the learners' cultural beliefs could result in the learner continuing to harbour these misconceptions that would be damaging to their conceptual understanding of science. In this study, I observed the teachers did not correct the misconceptions expressed as cultural beliefs during their lessons presentations. This means that these learners might well be hampered in their future understanding of science.

Regarding cultural beliefs, however, Tooki and John felt that some of these were misleading the learners. For instance, they both commented that "*The cultural beliefs were misconception*" (John) and "*Cultural beliefs sometime mislead the learner"* (Tooki) (See Appendix N).

Suggested improvements on the lessons presented

The findings of the data show that John was of the view that the teaching resources were insufficient. In his view in order to improve the lesson required more pictures of local people showing their traditional way of farming and as a contrast pictures showing how things are done in the West.

> "*I will use more pictures of local people on how they do things locally and some pictures of Western ways of doing things"* (John).

Tooki also held the view that the teaching and learning resources were inadequate. He was of the view that the corrections during the presentation should have been done immediately after the learners' provided answers to arrive at a consensus.

> *"The use of more teaching and learning aid. Immediate correcting to bring about an agreement and correct deficiency"* (Tooki).

This shows that Tooki through working with colleagues has learnt something. Scott (2016) points out that learning in ZPD takes place through collaboration with other peer. After Tooki's second presentation I asked whether they would consider correcting some of the cultural beliefs which were myths. Tooki said that '*what can I do if that is what I also believe in*." John added that:

> "*But some of this cultural believe you can see that there is no truth in them. I think those things we need to correct them. For example animal with parasite as a sign you are poor or animal giving birth to abnormal calf as sign that the animals will increase"* (John) (See Appendix N).

I believe that our sharing of ideas might play a role in the teachers correcting misconceptions on the spot. However, the teachers had different views about the beliefs

Shabani, Khatib and Ebadi (2010) claim that teacher's ZPD can be affected by the collaboration with peers and mentors. Smith (2003) argues that social capital found in the community of practice can result in a change in behavior. These finding reflect Mavuru and Ramnarain's (2017) views who found a need for culturally relevant pedagogy that engages learners in ways that allows for the maintenances of cultural identity while succeeding academically.

Learning during workshop and presentation

The data revealed that John was able to learn that the use of mother tongue has the potential to enhance understanding amongst learners. For instance, he learnt many concepts in Otjiherero from the presentations especially the names of diseases. During the workshop he reflected that he learnt how to do lesson instructions and composing worksheets. He also learnt from the inputs of his colleague. To this end he commented that "*There were many aspects that pulled my interests such as the instruction to the lesson, how to set up worksheet and inputs during the lesson had a huge impact"* (John) (See Appendix N).

Similarly, Tooki also reflected that he was able to learn about different diseases in Khoekhoegowab, Oshiwambo and Afrikaans. He noted he had learnt different presentation skills from the colleague and he learnt the value of using technology to improve lesson delivery. For example the lessons were prepared on PowerPoint on the laptop and projected using the data projector during presentations and this was something new for Tooki. He learnt that there are different ways of understanding the subject by the learners. During presentations, different strategies were used in the lessons.

Furthermore, Tooki echoed that he learnt how to plan a lesson in a more learner centred way. This shows that during the planning stage he was able to master some skills on how to plan a lesson by putting the learners at the centre of learning. Lastly, he felt that lesson planning improves the lesson organization. He commented that:

> "*I also learn different presentation skills from my colleague. The use of technology to enhance teaching and learning was of outmost important skill that I learn during the presentation"* (Tooki) (See Appendix N).

These findings are supported by Eun (2008) claiming that professional development involves activities that enhance the professional knowledge, skills and attitudes of the teacher, for the teacher to be able to improve the learning of the learners. Dean (1991) supported the finding by stating that the fast changing and sudden increase in knowledge requires the need to keep on learning. This scholar adds that the initial training for teachers is not enough for them to be able to meet the demands of education in the 21st century. Eun (2008) and Shabani (2016) agree with the finding by noting that during observation the observer learns things that are not recognizable when they are immersed in their own practice or teaching as confirmed by the participants..

Drawing on Vygotsky's (1978) seminal work, these findings support Nieto's (2007) claims that learning takes place through interactions with others, through a meaningful exchange of ideas, concepts and actions. Scott (2016) supports this by saying there is a potential for learning while working with peers. Wenger et al. (2002) note that one of the reason for taking part in the community of practice is to gain much needed new skills. Lontolf (2000) notes that the individual has the opportunity to develop their mental capacity during the professional development activities. In this case, the data shows that the teachers' zone of proximal development were transformed (Eun, 2008).

Effect of presentation on the participants' ways of doing things

For this theme, the findings show that John felt that the presentation made his work easier in the sense that learners who could not communicate in English were able to converse in their mother tongue thereby enabling their understanding of the work.

Tooki, too, felt the using different teaching methods can improve teaching and learning. Tooki saw the importance of using different methods in teaching and learning. He learnt to regard the learners as rich in knowledge which the teacher can build on. He indicated that he would now use the learner-centred approach in favour of the teacher-centred approach. He reflected on how the learners enjoyed group discussion, in which they were free to express themselves and actively participate in the lesson.

The data also revealed that Tooki saw the importance of teachers in the same field planning or teaching together as colleagues who assist each other which results in enhancing their understanding of the topic or lesson. He indicated that he would seek help when he encounters difficulties in teaching the topic and reflected that

> *"I also found that learners are not empty vessels, they have vast information that need to be built on. Use learners centered approach than teacher centered that we are using"* (Tooki).

From this excerpt, it can be deduced that Tooki did not value the learners' prior knowledge they come with from their homes or community.

These findings are supported by Klein (2011) and Shizha (2007) who state that language can be a barrier to learning and self-expression. Klein cites the dropout rate among San people of Namibia could be the result of lack of mother tongue in school. The findings resonate with Shizha (2007) who noted that when indigenous languages are integrated into the science curriculum they help to encourage understanding of the science principle and link Western science to the indigenous ways of

knowing things. If learners are not conversant in the language of instruction, there will be poor engagement; resulting in poor cognitive development and a poor learning outcome. Cronje, De Beer, and Ankiewicz (2015) posit that the use of IK can improve instruction, for example one will relate to what is taught to the learner's background which in turn is enhanced if the concepts are explained in a language the learners understand.

The finding agrees with Mukwambo et al.'s (2014) findings who found that Western science is embedded in most indigenous practices. Learners come to school with knowledge as mentioned in theme four. Wenger (1998) states a community of practice is formed by people who want to have collective learning in a certain area of interest. In this case Tooki realised the importance of a community of practice as he worked with colleagues in the some field to plan lessons and observe lessons or teach together. Tooki sees this practice as worth pursuing which Wenger (1998) and Graven (2003) refer to as community learning. After the development of the lesson that integrated IK in a learner centred way, he expressed the wish to change his method which Wenger (1998) and Graven (2003) call a change in doing or practice. Tooki feels that when he has difficulties in presenting a topic he will ask for help. This supports Teemant (2005) who established that learning is a social process achieved through contact with peers who are more knowledgeable and that is how one gains improved ZPD.

5.3 Concluding remarks

In this chapter I used the data gathered from a workshop, observation and reflections. The data showed that teachers need assistance in terms of lesson planning, presentation skills and how to deal with misconceptions. The mediation was done through the use of a data projector, worksheets, pictures, peers and colleagues providing assistance. In the next chapter, I present a summary of findings, recommendations and conclusion.

CHAPTER 6: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

6.1 Introduction

The purpose of my study was to explore opportunities for integrating indigenous knowledge (IK) and practices into the animal husbandry section of Grade 10 Agricultural Science. I developed an interest in this area as the region where I currently work practices agriculture on a large scale, yet learners have been performing poorly in the subject Agricultural Science. I therefore felt that a study of this nature might help to address the situation.

In the previous chapter, I presented the data responding to research questions three and four. In this chapter I offer a summary of the findings in relation to my research questions:

1. What indigenous practices and knowledge can be integrated into animal husbandry within Grade 10 Agricultural Science lessons?
2. What pedagogic strategies can be used to teach lessons that integrate IK on animal husbandry in Grade 10 Agricultural Science lessons?
3. How can Grade 10 Agricultural Science teachers be supported in developing model lessons that integrate indigenous knowledge and practices on husbandry?
4. How do Grade 10 Agricultural Science teachers mediate learning when teaching lessons that integrate indigenous knowledge and practices on animal husbandry?

6.2 Summary of the findings

Research question 1

What indigenous practices and knowledge can be integrated into animal husbandry within Grade 10 Agricultural Science lessons?

The study found that there are many areas on the topic of animal husbandry that are rich in indigenous knowledge that are useful to teachers, like disease prevention, disease treatment, parasite control, birth and afterbirth difficulties, feeding of livestock, dehorning, castration, breeding and selection of livestock. When teachers were asked to give reasons for the inclusion of IK, they could advance several, ranging from learning as progressing from the known to the unknown, to improving participation in class and providing space for learners to ask questions at home, and so on.

Similarly to Dziva et al. (2011), Mhakure and Otulaja (2017) suggest that making science relevant to learners involves teaching culturally relevant context and at the same time using appropriate teaching approaches that are cultural responsive. Cronje et al. (2015) believe that by including IK in the science classroom the social identity of the learners is acknowledged, thereby potentially changing their attitude and turning learning into a positive experience.

The Namibian Ministry of Education (2010) claims that if learners are taught in such a way that teaching builds on what is already known and the new knowledge is related to the reality around them, learning becomes meaningful. Learners are loaded with prior knowledge that includes IK relating to animal husbandry and that teachers need to make use of (Namibia. Ministry of Education, 2003). The starting point of lessons should be indigenous knowledge or existing knowledge, skills, interests and understanding derived from the previous experiences (Namibia. Ministry of Education, 1993; Kibirige & van Rooyen, 2006; Roschelle, 1995).

Research question 2

What pedagogic strategies can be used to teach lessons that integrate IK on animal husbandry into Grade 10 Agricultural Science lessons?

The findings from the teachers showed that strategies could include taking the learners on field trips for demonstrations and explanations, the use of local resources to make learning interesting, using interviews and questionnaires to gather data on a topic, inviting parents to assist with specific topics, and using the learners' home language when necessary. Although they utilized these strategies, the teachers were of the view that integrating IK was problematic: when it came to formal assessment, IK would not be recognized as correct or appropriate.

Ogunniyi and Ogawa (2008) suggest that instead of trying to replace indigenous knowledge with school science, learners need to be taught how to use the two knowledges together, where possible. They also need to be clear as to which of the two to use on a particular occasion.

Ludwane et al. (2015) suggest that teaching strategies like observation, experiential learning, investigation, deliberation, encouraging learners to ask their parents and other adults, should empower learners to discuss the advantages and disadvantages of both kinds of knowledge, initially in their mother tongue. Teachers can identify and design classroom tasks that bring in elements of IK that

are connected to classroom science (Kibirige & Van Rooyen, 2006). The findings also show that local resources can be used in this regard.

When teaching lessons that integrate IK, teachers could explain IK in Western terms, and vice versa (Mhakure & Otulaja, 2017). In this way IK and Western science could be linked, though perhaps subject to different modes of interpretation. Ogunniyi and Ogawa (2008) argue that providing the knowledge to educators is not enough, they need to be taught how to integrate this knowledge into the classroom situation.

Research question 3

How can Grade 10 Agricultural Science teachers be supported in developing model lessons that integrate indigenous knowledge and practices on animal husbandry?

The findings from the workshop discussions, observations and reflections showed that teachers could be assisted through workshops in which ideas might be shared on teaching strategies, lesson planning, and worksheet development. Through lesson observation, presentation skills can be shared and developed

Dean (1991) states that teachers' initial training is not enough for them to meet the demands of education; they need to keep on learning. The pace of technological development and the sudden increases in available knowledge are among the reasons why teachers need to keep on learning afresh at intervals or points throughout their lives. In the case of this study, the teachers did indeed need assistance in lesson planning, designing work sheets and teaching strategies, the use of technology and so on.

Professional development on the inclusion of IK on animal husbandry could include lectures, workshops, study groups, mentoring, and coaching of the novices and veteran teachers (Dean, 1991; Garet et al., 2001). Suzuki (2012) suggests that professional development should help the teachers to understand and support learners' learning, while Shabani (2016) warns that professional development is not a once-off event, but a continuous process that is time consuming and involves trial and error.

Research question 4

How do Grade 10 Agricultural Science teachers mediate learning when teaching lessons that integrate indigenous knowledge and practices of animal husbandry?

The findings of this study indicate that mediation occurred through language (questions, explanation and scenario created), pictures, use of the chalkboard, worksheets, projector and laptop, learners helping one another in groups and during presentations, and the assistance teachers gave to the learners working in groups, in the form of clarification and explanation.

Mediation involves helping a person to move to the next level of knowledge or understanding (Turuk, 2008). Nieto (2007) and Eun (2008) note that Vygotsky 1978 identified three kinds of mediators, namely, material tools, psychological or symbolic tools, and other human beings. All three kinds were used in the lesson presentations, notably the symbolic tool of language that Vygotsky (1978) maintains mediates all human mental activities.

6.3 Recommendations

This research was an eye-opener regarding how indigenous knowledge can be integrated into Agricultural Science lessons. It showed that there are ample opportunities for integrating IK in lessons on animal husbandry. The study thus recommends that teachers contextualize their teaching and learning by planning lessons that integrate some aspects of IK.

Curriculum developers should draft a policy on the integration of IK in the curriculum for implementers so that they can be clear on what the curriculum expects them to do.

Textbook authors should not only illustrate Western ideas but should try and contextualize those ideas, for learning to be relevant to the learners.

- During assessment, indigenous knowledge should be recognized if it forms part of the learner's answer as the curriculum advocates that it should be included;
- Higher education institutions should train teachers on how to include IK in their lessons;

- Curriculum developers should indicate clearly how IK should be incorporated and how it should be assessed;
- To avoid the loss of our valuable indigenous knowledge, the Ministry of Education should develop strategies to document IK;
- Teachers should where possible integrate IK in their lessons to contextualize the learning of science and to improve learners' participation and understanding of science; and
- Teachers should use culturally responsive pedagogies in order to improve teaching and learning.

6.4 Areas for future research

This research has laid a foundation for future researchers in the field of Agricultural Science in Namibia. Possible areas for further research include:

- Exploring indigenous knowledge on crop husbandry; how do they grow specific crops like maize, millet, groundnuts, beans and so on; indigenous ways of controlling pests, weeds and storage.
- Exploring factors affecting the recognition of indigenous knowledge during assessment in Namibia;
- Investigating the views of parents, communities and learners on the inclusion of IK in the curriculum, and how parents can share their cultural heritage and knowledge with both teachers and learners;
- Investigation of IK on pasture management; how indigenous people manage the grazing land for livestock.
- Exploring IK on animal husbandry in the whole region or country; focusing on cattle breeding, and feeding
- Investigating IK in traditional medicine for livestock; how indigenous people treat common diseases that affect livestock in Namibia in various regions.
- Investigating how indigenous knowledge can be used to improve livestock production in Namibia.

6.5 Limitations of the study

In exploring opportunities for integrating indigenous knowledge and practices into animal husbandry for grade 10 Agricultural Science lessons, national and regional educational programmes affected data collection, as during the period of data collection there were a number of workshops attendant on the curriculum review that the country was undergoing. There were meetings, for instance on 7 March 2018, between the Minister of Education, principals of the schools and the regional education office officials. Similarly, the research participants' schools also had the meeting with the Minister the next day, 8 March 2018. The planned activities for data collection had to be rescheduled. Administrative tasks required of the participants, like setting April 2018 question papers, also impeded data gathering.

The number of participants involved in the study was small, and the study was limited to a few schools in the Omaheke region, which means that the findings cannot be generalized. The study nevertheless provided some insight into the incorporation of IK in Agricultural Science lessons.

6.6 Reflections

To keep on abreast with the latest development in education, one needs to keep on learning. In 2016 I applied to continue studying with Rhodes University after resting for two years from studies. This journey started in 2017. When the journey started I was still not sure which road to take, for I had many interests. The first session we were introduced to types of research, which were practical, language and indigenous knowledge.

I immediately remembered the topic on IK in my BEd. Honours with Rhodes University. I remembered growing up herding cattle and cultivating land and I saw some science in that area. I remembered the region where I am working is an agricultural area but the performance of learners in Agricultural Science was not good. I said to myself I would go for it.

It was not an easy journey; balancing studies and work required a lot of energy and determination. There were times I got down, but my colleagues and supervisors held me by the hand and said get up, let us get going. You can get there!

The journey was characterized by lots of reading. Through my readings, I discovered Wenger's idea of the community of practice, Vygotsky's socio-cultural theory, professional development and lesson study. I was already in a professional development department when I started the journey. As I read books and articles, I noticed big gaps in my department that I could not see before, and that needed to be fixed.

I saw how little the impact we were making on our clients and asked why? I spoke to myself: Robert, you don't need a paper, all you need is knowledge. At the end of the journey, I felt the journey was hard but worth walking. What I learnt is what makes the journey worth walking: I can now say that I can be a change agent in my work place. The eye of an eagle has been fixed on me.

6.7 Conclusion

In this chapter, I summarised the research findings in respect of the four research questions. I made recommendations; I suggested areas of future research, limitations of the study was discussed, and some reflections were shared. The findings show that there is rich indigenous knowledge in the areas of animal husbandry like disease treatment, feeding, castration, dehorning and parasite control, which teachers can use to make lessons interesting and improve learners' understanding. Strategies like conducting field trips, using mother tongue or vernacular where necessary, visiting or inviting parents, can be employed when teaching lessons that integrate IK, which should increase the eagerness of learners to learn. Mediation can be done using the projector, chalkboard, peers, language, use of local resources and so on, in the interests of contextualizing learning and making it relevant to the learner.

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Appendices

Appendix A: Ethical clearance

RHODES UNIVERSITY
Grahamstown • 6140 • South Africa

EDUCATION FACULTY • PO Box 94, Grahamstown, 6140
Tel: (046) 603 8385 / (046) 603 8393 • Fax: (046) 622 8028 • e-mail: d.wilmot@ru.ac.za

PROPOSAL AND ETHICAL CLEARANCE APPROVAL

Ethical clearance number 2017.12.08.17

The minute of the EHDC meeting of 05 December 2017 reflect the following:

2017.12.8 ***CLASS B RESTRICTED MATTERS***
MASTER OF EDUCATION RESEARCH PROPOSALS

To consider the following research proposal for the degree of Master of Education in the Faculty of Education:

Mr Robert Siseho (13S7233)

Topic: Exploring opportunities for including indigenous knowledge and practices into animal husbandry for Grade 10 Agricultural Science lessons.

Supervisor: Professor M Hendricks
Co-Supervisors: Professor J Vorster and Dr S Paphitis

Decision: *Approved*

This letter confirms the approval of the above proposal at a meeting of the Faculty of Education Higher Degrees' Committee on the 5 December 2017.

The proposal demonstrates an awareness of ethical responsibilities and a commitment to ethical research processes. The approval of the proposal by the committee thus constitutes ethical clearance.

Sincerely

Ms Zisanda Sanda
Secretariat of the EHDC, Rhodes University
8th December 2017

Appendix B: Letter to the Director

EDUCATION DEPARTMENT

Tel: +27 (0) 46 603 8383

Fax: +27 (0) 46 622 8028

PO Box 94, Grahamstown, 6140

[redacted]

The Director
Omaheke Regional Council
Directorate of Education, Arts & Culture
Private Bag 2004
Gobabis

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN OMAHEKE REGION

Dear Mr [redacted]

My name is Robert Simwanza Siseho. I am a Master of Education student at Rhodes University (RU) in Grahamstown, South Africa. The research I wish to conduct for my Master's full thesis requires me to interview teachers teaching Agricultural Science, co-work with them, observe four lessons and reflect on lessons with them.

Our Namibian curriculum for Education requires teachers to incorporate indigenous knowledge in their lessons. My interest is thus: To explore opportunities for including indigenous knowledge into the animal husbandry Grade 10 Agricultural Science lessons. We assume that there should be a lot of indigenous knowledge in this area, which when incorporated into the subject, will contextualise the lessons, which might improve the interest and motivate the teachers and learners, therefore improving the results. The results of the last four years in the subject, shows that for three consecutive years the subject performed below the national average and it was only in 2013 the subject performed above the national average.

This research will be conducted under the supervision of Professor Kenneth Ngcoza.

This letter serves to seek formal consent to approach the school, the teachers, the learners and the parents of the learners, of the class where the lessons will be observed. However, the focus is not on learners but on working with teachers. For this reason, I request your permission to visit the

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following schools: [redacted] School and [redacted] I will only be conducting interviews at [redacted] and [redacted] while I will be conducting interviews, co-planning lessons, teaching, observing and reflecting on lessons at [redacted] The dates I wish to conduct my research are outlined in my research proposal - January – March 2018.

I attach a copy of my research proposal which includes copies of the consent and assent forms to be used in the research process. Once I have received ethical clearance from Rhodes University, I will provide you with the ethical clearance letter. As part of this process, I undertake to ensure that the names of the schools and all participants will be replaced with pseudonyms and that all the material I collect as part of the research will be accessible only to myself and my supervisor.

Upon completion of the study, I undertake to provide you and the teachers involved in the study with access to the research findings. If you require any further information, please do not hesitate to contact me on (0812463008) and (rsiseho@gmail.com).

Thank you for your time and consideration in this matter.

Yours sincerely

Rsiseho

Robert Siseho (13S7233)
Rhodes University

20/11/2017
Date

Appendix C: Response from Director

REPUBLIC OF NAMIBIA
OMAHEKE REGIONAL COUNCIL
DIRECTORATE OF EDUCATION, ARTS AND CULTURE

Tel: 062-577600
Fax: 062-564210/562888
E-mail: [redacted]
Enquiries: [redacted]

Private Bag 2004
Gobabis
Namibia

13 December 2017

TO : Mr. Robert Simwanza Siseho
Master of Education Student
Rhodes University
Grahamstown

Dear Colleague

SUBJECT REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN OMAHEKE REGION/SHOOLS: YOURSELF.

Your letter to me dated **20 November 2017, received on 12 December 2017** concerning the abovementioned subject matter refers.

Let me first of all take this opportunity to congratulate you on this worthy and welcome assignment of engaging in meaningful research towards obtaining a Master's Degree in Education, through a full thesis, from Rhodes University. Your research topic is equally interesting, and upon completion, your findings and recommendations, will hopefully add to the existing body of knowledge, that is existing in this particular field of interest.

My writing to you is to indicate that **full consent is hereby granted** to conduct your research in the identified schools in the Omaheke Region at your appropriate time and tempo, in search of answers to your formulated research questions. I would only advise that the normal **research ethics** will be adhered to at all times.

By producing this letter to the principals of the identified school principals and your respondents, they will be aware of the blessings for this research from this office.

All the best and good luck with your research!

Don't hesitate to call on this office in the event of any clarity or uncertainty.

I hope you find this in order.

DIRECTORATE OF EDUCATION
OMAHEKE REGION
2017 -12- 13

.....

Mr. [redacted]
Director of Education, Arts and Culture: Omaheke Regional Council

...../12/2017
Date

DIRECTORS OFFICE
PRIVATE BAG 2004, GOBABIS
NAMIBIA

All official correspondence should be addressed to the Chief Regional Officer

Appendix D: Letter to the Principal

The Principal
[redacted]
Box 36
Gobabis

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT SCHOOL

Dear [redacted]

My name is Robert Simwanza Siseho, I am a Master of Education student at Rhodes University (RU) in Grahamstown, South Africa. The research I wish to conduct for my Masters of Education full thesis requires me to conduct interviews, co-work with teachers, plan lessons with them, observe two lessons of two teachers and reflect on those lessons. This research will be conducted under the supervision of Professor Kenneth Ngcoza.

This letter serves to seek formal consent to approach the teach[redacted]he learners and the parents of the learners in their classes, as participants for this research. For this reason, I request your permission to visit your school in 2018 to conduct my research as outlined in my research proposal. However, the research is not focusing on learners but on working with teachers.

I attach a copy of my research proposal which includes copies of the consent and assent forms to be used in the research process. Once I have received ethical clearance from Rhodes University, I will provide you with the ethical clearance letter. As part of this process, I undertake to ensure that the name of the school and all participants will be replaced with pseudonyms and that all the material I collect as part of the research will be accessible only to myself and my supervisor.

Upon completion of the study, I undertake to provide you and the teachers with access to the research findings. If you require any further information, please do not hesitate to contact me on 0812463008 and the email address: rsiseho@gmail.com.

Thank you for your time and consideration in this matter.

Yours sincerely

Robert Simwanza Siseho (0812463008)

Rhodes University

..... 20/11/2017
Signature Date

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Appendix E: Response from the principal

[redacted] HIGH SCHOOL

P.O. Box 36 GOBABIS email: [redacted]hoo.com

Tel: +264 62 562658 Fax: +264 62 564087

23 January 2018

Dear Mr RS Siseho

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT OUR SCHOOL

With reference to your letter dated the 15 January 2018 which request for permission to conduct the research at our school.

The school hereby grants you permission to conduct your research at our school as stipulated in your letter.

Thank you for your interest.

Yours sincerely,

[redacted]

PRINCIPAL

OM[redacted]EKE REGIONAL COUNCIL

2 3 JAN 2018

Tel: 06[redacted]4087

DIRECTORATE OF EDUCATION

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Appendix F: Informed consent

INFORMED CONSENT FORM

Research Project Title:	Exploring opportunities for including indigenous knowledge into the animal husbandry section for Grade 10 Agricultural Science lessons
Principal Investigator(s):	Professor Kenneth Ngcoza

Participation Information

- I understand the purpose of the research study and my involvement in it;
- I understand the risks and benefits of participating in this research study;
- I understand that I may withdraw from the research study at any stage without any penalty;
- I understand that participation in this research study is done on a voluntary basis;
- I understand that while information gained during the study may be published, I will remain anonymous and no reference will be made to me by name or student number;
- I understand that other data collection requirements particular to this research, e.g. asking personal information, video recording, taking pictures may be used;
- I understand and agree that the interviews will be recorded electronically;
- I understand that I will be given the opportunity to read and comment on the transcribed interview notes;
- I confirm that I am not participating in this study for financial gain.

Information Explanation

The above information was explained to me by: (Robert Simwanza Siseho: Researcher)

The above information was explained to me in English and I am in command of this language:

Voluntary Consent

I, [redacted]

hereby voluntarily consent to participate in the above-mentioned research.

Signature: [redacted] Date: 09/03/2018

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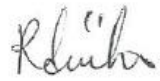
Investigator Declaration	
I, Robert Simwanza Siseho, declare that I have explained all the information to the participants and have truthfully answered all questions that the participants have asked me.	
Signature: 	Date:

Appendix G: Informed consent from parents

14 February 2018

Dear Parent,

I hope my letter finds you well!

My name is Robert Simwanza Siseho, I am a Master of Education student at Rhodes University (RU)) in Grahamstown, South Africa. I am carrying out a research project together with science teachers in Gobabis (Omaheke), in which we are working on the inclusion of local knowledge into science lessons. Your child's Agricultural Science teacher is participating in this project. Therefore, observations will be conducted in the class in which your child will be, although the focus is on the teacher, not on your child or children. It is against this background we seek permission to conduct the research in the presence of your child. Therefore, from February 2018 until March 2018, I am going to observe your child's Agricultural Science lessons twice, in order to observe the lessons that include indigenous knowledge.

I kindly ask you to give permission for your child to be included in the class:

- During my presence in the Agricultural Science lessons, I will take notes on the teaching, for example, on the teacher's explanations or teaching strategies and the mediation on lessons that infusion the indigenous knowledge. Possibly, some of the science lessons will be audio recorded.

All information will be treated confidentially: nobody except myself and the group of participating teachers, will access the information. After finalizing my Master's thesis (planned for 2019), the audio recordings will be kept for five years and the written material will be made anonymous. I will write three to four journal articles about my research. Whenever mentioning my observations from the classroom or my conversations with the teacher, I guarantee that your child will not be mentioned.

The aim of the research project is to explore the opportunity for including indigenous animal husbandry knowledge in Agricultural Science for Grade 10. There is no foreseeable risk involved in your child being part of the research activities, as named above. Please note, that all participation is voluntary. If you or your child do not wish to be part of the research, I will not include him/her. Also, you are free to withdraw your permission at any time without giving a

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reason. A decision not to be part of the class, will not have any effect on your child's participation in the science lessons.

If you have any question about the research, please feel free to contact me at 0812463008, rsiseho@gmail.com or Dr. Ken Ngcoza (k.ngcoza@ru.ac.za) at the Education Department.

Thank you very much for taking the time to read this letter. Please complete the consent form on the next page and let your child return it to the science teacher. Thank you very much!

Yours sincerely,

Robert Siseho

2018/_02/_ 14___
Date

I .....[redacted]..... (full name of parent/guardian), the father/ mother/guardian of [redacted] (full name of child) hereby confirm that I understand the content of this document and the nature of the research, and I permit my child to participate in this research.

I also understand that my child is at liberty to withdraw from participating at any time without any disadvantage.

Parent/Guardian Name..[redacted].....

Parent/Guardian Signature.....[redacted].....

Date.....09.03.18.....

Appendix H: Interview schedule

Interview schedule for MEd Science 2017-2018

1. We will be talking about indigenous knowledge. What do you understand about indigenous knowledge?
2. People have been keeping animals for a long time. What are the indigenous practices or Knowledge that you can share with me in the section of animal husbandry from your back ground or experience?
3. How do people interpret those practices/ reasons for doing those practices
4. What are your views on the inclusion of IK in the lessons of agricultural Science?
5. What do you think could be the reason why the Namibian curriculum encourages the inclusion of IK in the teaching of the subject?
6. If you were to incorporate IK in the lessons of animal husbandry in agricultural Science grade 10 what strategies could your use?

I would like us to put those ideas in practice. Can we plan two lessons together that include IK and you teach them. Then we will reflect on those lessons.

Reflection

1. How did the inclusion of IK affect the lesson delivery?
2. What where the positive things about the inclusion of indigenous knowledge (IK) you noticed?
3. What were the negative things about the inclusion of IK in the lesson you observed?
4. How do can you describe the experience of including IK in the lessons on animal husbandry?
5. Which part of the lesson did you enjoy and why?
6. Which part of the lesson could you not enjoy and why?
7. After planning model lessons and teaching them, do you think you accomplished more than you could or not?

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Appendix I: Learners' responses

Home work

Find out from elders how they treat diseases traditionally.

Name of the diseases: Oruani (Placenta)

1. What do they use

- Onyanga yomukuti/wild onion
- Sunlight soap
- Mixture of water & salt

2. How do they use them?

- Wild onion → cut it into small pieces, put the pieces in hot water and let the animal drink.
- Sunlight soap → put the soap in hot water and let the animal drink once it's cool.

Are those treatments effective?

Yes, the animal gets better within 2-3 days.
→ It heals the animals.

Cultural beliefs about .....

Diseases:

→ Some cultures think that when animals are sick they are being witched/Jujus.
→ When an animal is sick, its a sign of weakness and you can't keep your animals healthy and also can't afford medication for your animals.

[redacted]

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Gobabis High school

Topic: Animal health

2018

Group: Omaupvas!

Grade 10

In groups work on those questions

Name parasites that affect livestock in Namibia provided Local names and English names

Local name	English name
Ozongamba Ozongupa	Ticks
~~Eyoze~~ Ëze	Horsefly
Ounyataova	Lice
Ozondeku	Tape worms

Classify the parasite as internal or external parasite

Internal	External
↳ Tapeworms	↳ Ticks ↳ Lice
↳ Round worms	↳ Horsefly

How are parasites controlled?

How are parasites controlled?

Local (Indigenous) ways	In western ways
→ We apply dark oil	→ Dipping
→ We use trees as medicine	→ Dosing
→ Apply Warm ash on the body	→ Vaccination

Cultural beliefs about ......

Parasites:

→ It ~~means you~~ kills animals and thats a sign of un wealthy to some cultures

Gobabis High School

Subject: Agriculture

Date: 2018

Group: Omayuvas!

Topic: Animal health

Work in groups to answer those questions

Name the common (important) diseases that affect livestock in Namibia in English and in your mother tongue.

English	Mother tongue	Symptoms (English)
foot and mouth disease	Omutjise wotjikoti notjinyo	Lameness Loss of appetite Painful blisters on hoove High fever
New castle disease	Omutjise wozondera	Dropping wings and twisting of necks
Anthrax	Etera	Blood coming from mouth, nose and anus Sudden death
Rabies	Omutjise wozombwa ofuneklimber.	Domestic animals becomes aggresive and wild and bite objects

2. What do you do when the animal shows signs of ill health without involving the vet? Traditional ways name

- By isolating affected animals from those that are not affected
- You kill all affected animals especially the one's that are affected with new castle disease

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Appendix J: Transcribed interviews

Researcher: Good Afternoon. I am Siseho Robert, From Rhodes University. I am here to conduct interview on the inclusion of indigenous Knowledge on animal husbandry. Soo.. I will be taking the recording for the purpose of transcribing. As we are going to talk about indigenous knowledge what do you understand by the concept indigenous knowledge?

TooKi. Thank you very much Mr. Siseho

Mr. Tooki

Researcher: As we are going to be talking about indigenous knowledge. What do you understand by the concept indigenous knowledge?

Mr. Tooki : Indigenous knowledge means those are skills or practices that people were using in the past. This can be skills or practices on crops or animal husbandry. Those are information that are not documented. Those are skills we get from our people through oral communication. That is my understanding on the concept of indigenous knowledge.

Researcher: Which pseudonym should I use?

TooKi: you can use aa TooKi

Researcher: What does it mean?

Tooki: It means something precious

Researcher: For the purpose of this study will be focusing on animal husbandry. People have been keeping animals for a long time. What are the indigenous knowledge and practice that you can share with me on animal husbandry from your back ground?

Mr. Tooki: We are mostly Hereros we mostly practice animal husbandry. There are few practice that we can use one: Controlling of animal health and diseases. So During those years people were not using vaccines. They were using methods like they were isolating sick animals from others. Where by this will prevent further spread of diseases.

Researcher meaning the reason for isolation was to prevent the further spread of diseases.

Tooki: yes. The other thing that I know traditionally there are some roots of certain plants that they used to control common diseases. Apart from that the use of wood ash can be applied on animals to prevent both internal and external parasites those year they were not having those vaccine, they were using things like wood ash some herbs from certain plants. To control both internal and external parasites. The other thing also thing which I think

Researcher: How were they using this ash?

TooKi: They could just take the ash and apply on the animal, sometimes they mix it with water then they apply on external parasite like ticks.

Researcher: where there specific type of trees that they use?

Took: Mostly they used the Carmel thorn, because when you look at the ash it is a bit bitter compared to other trees. The other thing that we can look at is instance when the animal is having difficult in giving birth. You could also assist, … you find the situation may be instead of the head passing first between the legs you might find it will come out first the hind quarter, in that instance you will find that it will be very difficult to give birth so they were also having those skills on how to turn the calf in the right position , so that they can serve both the calf and the cow. The other thing I wanted to look at was the after birth. There are also instance when the afterbirth take time to come out, so what you do you use the hand and the bottle , you put hand in and then you put the bottle and you turn so that it come out . sometimes you mix water with ash or water with soup to help the after birth to come out. The after birth you are referring to is the placenta, the placenta cannot come out. They will use the bottle. what do they do with the bottle?

Tooki: put the hand in on the placenta turn the bottle (show signs of rolling the placenta on the bottle and pulls down)

Researcher: They roll the placenta on the bottle?

Tooki: Sometimes they use the ash.

Researcher: How do they use the ash?

Tooki: They mix the water with ash and give to the animal to drink… from the information I got to act as antibiotic. To prevent the further spread of infection. You put water mixed with soup or ash in the uterus

Researcher : You were speaking about diseases that they were controlling, you only looked at external parasite were there any specific diseases that they were able to treat

Tooki They were treating the diseases like tetanus in cattle, they also use to treat brucellosis in cattle by using wood ash and by using some herb roots.

Researcher: Do you have any specific tree that they used to treat those diseases?

Tooki The used the leaves of Acacia plants.

Researcher: Is they specific Acacia?

Tooki ; They used the Acacia …

Researcher: How do you call it in your language?

Took: In our language we call it Otjimbuku sometimes they use acacia… that one we call it Omuthauna

Researcher: How did they use this tree?

Tooki: They can use the leaves, you crash the leaves, after crashing the leaves you mix it with water then you give it to the animal to drink.

Researcher: Were they any reason for using those trees?

Tooki It was mostly to cure diseases? Tooki: Feeding were can look on balanced diet

The issue of feeding those years they were not having enough supplements. Those years they were using some plants like the pods of certain plants. Where they will crash them and mix them with salt. They were looking on the ways of improving animal nutrition not only for animals to depend on grasses,

But also crashed mealie meal that they harvested and mix with the pods of certain plants like the Carmel thorn . .. they were maintaining the animals during the drought.

Researcher: Was there a specific reason from all the plants they decided to go for seed pods?

Tooki. Yes, the seed pods are sources of protein. That is the main thing they were trying to balance.. that at least were having a balanced diet. Apart from that during the drought seed pods were collected and stored and used during drought as supplement for livestock. They feed it with salt.

Researcher : Which salt did they use?

Tooki: They were using the common salt, common table salt course one.

Researcher: You identified handling as there are some indigenous knowledge

Took: If we can look at dehorning part. I don't know now I don't know what they were using. But from the knowledge that I got is that …….. they could not dehorn the old animals as the horns were signs of pride . The female animals used to be dehorned using knives by cutting the horns. Those are some of thing that were used and we still use now. But it was not at the level it is now. They could off course dehorn the female animals.

Researcher: meaning the male animals were not dehorned

Tooki yes, only the female:

Researcher: At what stage where they dehorning these female animals?

Tooki: : when they were very young from two to three months. They were also considering that when you dehorn late the horn bud will be hard and will be very difficult for one to dehorn.

Researcher: what could be the main reasons for dehorning these animals?

Tooki: As I said they were mostly dehorning female animals. They were mostly milking those cows. It was easy to handle or to approach those animals without horns. Apart from that it was the sign they looked nice. The other reason they take less space especially when they are feeding.

Research: Is there still anything on handling or can we move on?

Tooki May be on handling we can talk about castration. It was a practice that was done during those days. The only difference in the system of castration is that in nowadays there are a lot of tools and equipment they are using like burdizzo, but in the past they used to castrate animals using the sharp knife. The common table salt as disinfectant, Compared to now days where people are having antiseptic.

Researcher: How where they castrating with these knives?

Tooki: Cut through the scrotum and then remove the testicles. It was like a blood methods that they used.

Researcher: What were the reasons for castrating these animals?

Tooki: to control unwanted breeding. Because through castration you will be able to do proper breeding

It was also a sign of wealth as mostly when you castrate the animals looks nice and became fat. During the funeral and wedding those are the types of animals they are using during those times.

Researcher: meaning those castrated animals they were kept in the herd?

Tooki: Yes they were kept in the herd

Researcher: When you look on breeding, anything on breeding?

Tooki: Breeding and selection they were also doing that by looking at the animal with desirable characteristics. Animals with the desirable characteristic were selected for breeding and those without wanted characteristic were culled through selling or castration. They could tell that this a good bull by looking at certain features. But what I heard that system could result in inbreeding because they were not considering this the mother and the son or the daughter and the father.

Researcher: Was the selection based on both the male and the female

Tooki: yes

Researcher: What did they do with the female that were not having good characteristics?

Tooki: those one which were not having good characteristics were culled

Researcher: Males that were not having good characteristic were castrated. What did they do with female animal which was not having good characteristic?

Tooki: Those ones where killed

Researcher: what do you think could be the reason s why the Namibian curriculum encourages the inclusion of IK?

Tooki. The main to encourage the inclusion is to pass on those information , because in they are not included in the syllabus or curriculum then where will they be written, because we said most of those one are just the information that we are told those are just oral information. But the moment we include them those learners will be able to integrate those information and will be documented. Apart from that is Most learners when we look at the concept of IK is those are things that we know from home so by including the concept of IK it will help us or the learners to learn from what they know to what they don't know. Because the concept of teaching it encourage us to teach from known to unknown. It you look on the concept of after birth if you ask how do you deal with the problem after birth they will tell you, it the after birth do not come out they will tell you. Because those are the information that they know from home. It is very important to keep those information or those information will be documented that our learners will be able to know how those information are important throughout our daily lives.

Researcher: what are you view on the inclusion of IK apart from the reason for the government for the Inclusion of IK

Tooki: according to my on view at least we are doing the right thing to include these knowledge, because if you teach from what the learners knows or if you include the indigenous knowledge that means you include those knowledge which the learners know and when you look at those concept for learners it will be every easy because they will understand the content very well . Why, because put the knowledge which they know which they do straight at home. Most of the indigenous knowledge and practices those are skill that learners know, those are skills they learn. Those are skills they learn from home, from our parents. By including them I think that is the good thing according to my own understanding. I am I support that we include that idea that we include what the learners know.

Researcher: How does the inclusion of IK affect the learners in the subject or the teaching of the subject?

Tooki: First of all it will assist them because they will, like what I said will teach the learners from what they know. In other words it will help them to master the content very well … when you are introducing the lesson disease you might ask them what those thing that you are doing at home. That way you encourage them to think outside the box, they will refer to those thing that they know not only from the books. What they know from home how to control diseases. What do you do if there is any outbreak of a disease? They obvious know.. What learners are afraid is that we sometimes implement things that are not part of their daily lives.

Researcher: If you were to incorporate indigenous Knowledge in the lessons on animal husbandry for Agriculture grade 10 what strategies could you use?

Tooki: I think I spoke of one strategy like in my introduction we use what they know. I have given one example…. ask the learners you find that a certain animal is having diseases. What is it that you are going to do. So you develop those strategies in other words you ask what knowledge do the learners have. …. By that that you can move on. The use of resources may be that learners knows and those resource that can be use to make the subject interesting. Like I spoke the use of ash, by looking, they know we use ash… now they have to find out what is it that is in ash that is used to control external parasite.

Researcher: As you are using those strategies. How can you mediate the lessons that incorporate Ik on animal husbandry? The assistance that you can provide as you are teaching those lessons.

Tooki : You can use resource that are relevant to the subject. You can use the resource people there are elders in our communities they have been farming they have been controlling diseases they have been controlling parasites. May be you can call an elder then you arrange the lesson may be on castration, may be on diseases, then you hear the view of what type of knowledge they have been using and how effective those resources. May be the other thing that you can do To encourage the learners to take part it is always good to give the topic on hand you might say go and find out at home what are the skills and indigenous knowledge the people were using in the past and how were the useful . Already when they come they know we have investigated, we went we did a research on this, than just to come and introduce today we will look on diseases. What type of

skills and knowledge those people were using. Those are some of the things you can use or to actively to involve the learners in the lesson. They might be some of those learners who have those skills we can use them also to explain to others. When you look at IK it differs from one community, one cultural background to another. May be by looking at how were hereros treating animals and you go to another tribe and so on. Because when you look at this knowledge it is not only confined to one culture. There might be a culture we do this to control diseases and another one will tell you we use this specific tree to control the disease. Someone we do this and this. By looking at that we can help by trying to integrate different cultural back ground.

Researcher: ok last question, anything you want to share on the inclusion of IK on animal husbandry in the section of agriculture.

Tooki: May one thing which I also want to say may be the policy markers. I have see many learners know knowledge on IK and skills but when it come to marking assessment you might find that a specific will ask that how do you control diseases. Some of these learners because they know a certain concept or they know what they normally use. Sometimes they might include that one as the answer. As the markers we sometimes penalize those learners. Also the answer what they give is what they do at home. So may be the issue here is that I don't know whether we should open the discussion or we should rather consider the skills as far as indigenous knowledge is concerned. I remember one year when I was marking there was a questions those kids could write things that they know but when you look at it there it is correct but the whole concept of marking you will be told this is wrong.

Researcher: meaning despite the fact that the curriculum encourages the inclusion of IK, but when it comes to assessment itself such knowledge is not recognized.

Tooki: you are right that is the only thing I want to share with you.

Researcher: thank you for your time I will transcribe then I will come back to you. For you to see if what I have transcribed is what you said.

Tooki. ok

Researcher: Thank for you time I will be looking forward to develop lessons with you that includes IK

Mwaka interview IK on animal husbandry 2018

Re: Good afternoon.

Mwaka: Good, afternoon sir.

Re: I am Siseho Robert. From Rhodes University, I am here to conduct interview on indigenous knowledge I am a student that is doing master of education science.

Researcher; we will be talking about indigenous knowledge. What do you understand by the concept indigenous knowledge?

Mwaka: ok. Indigenous knowledge is the knowledge our local people have on the practice of animal husbandry and the knowledge that they are using at their home regarding the animals, cattle or any livestock that they are keeping at home.

Researcher: thank you very much. People have been keeping animals for a long time. What are the indigenous knowledge and practice that you can share with me on the section animal husbandry from your back ground.

Mwaka: ok, I will start with nutrition as we know animals traditionally at home, in our community members do not have money to buy extra food or supplement for their animals. So most farmers let their animal graze on grass, shrubs, tree or any available food that can be provided that is sufficient enough to provide the animal with all their nutrients,

Researcher: on feeding you were talking about they are provided what type of food you provide to animals

Mwaka: they only graze on grasses. Because most farmers they do not have money to buy supplemental food. So these grasses they are sufficient enough for the animals. They provide all the nutrients

On the part of animal selection. When you want to select your animals for breeding are things that a farmer looks at may be for example you want to select a bull. They only do it by judging they don't test or go to laboratory to test. Which animal or bull is good for breeding? They will just judge looking at the characteristic of a bull for example. If it is a bull they have to look at for

example well developed testis, body structure of the bull it must have a V shape toward head toward the front. The dairy cattle they will look at the udder of the cattle it must be well developed and he body shape of the cow. On breeding when farmers are breeding the animals traditionally .for example our farmers are poor they don't have money may be to do the cross breeding or buying semen and all that. What they do there is a practice called mafisa in silozi where the farmer exchange their animals, may be it can be a bull. You are borrow a bull to come spread its characteristics in you kraal. Or to mate with you cows. Or you can take you cow to the kraal with the characteristics that you want. So that how they do it traditionally. On animal diseases the indigenous knowledge they are many diseases but I got is on I problem. The Obaherero people the combine tobacco and mix it with ash when the animal is having eye problem they crash it fine and then they put it fine like that in the eyes of the animal to cure the eye problem. The constipation in calves, when they are sucking from their mothers. Sometimes they used to suffer from constipation. The farmer will crash the soup called sunlight. They mix it with water and the animal is given to drink to help with constipation. That is what I have on indigenous knowledge of people on animal husbandry. I left another one. After birth the calf is having sharp teeth the farmer is always using the charcoal to smoothen teeth so that when it is suckling it is not sensitive to the teeth of the cow.

Researcher: do you have any interpretation of some of these practices

Mwaka: interpretation

Researcher: you said you were taking the cows to another person's animals, what was the reason for that or interpretation.

Mwaka the reason is for breeding purpose to get the required characteristic that you want in an animal may be it is having good characteristics and you want those characteristics to be in your animals also. So you bring that bull to spread its characteristic in your kraal

Researcher: Do you have any reason why they were putting the tobacco in the eyes of the animal. What is in the tobacco that was solving the problem of the eyes?

Mwaka; the ash that is in the tobacco that you are putting in the eyes they are itching. When it is put in the eyes, maybe there was something that was in the eyes, the eyes will be watery and the

tears will be coming out whatever was affecting the eyes will come out. With the tears because it is itching. Through that process it can heal the eye problem.

Researcher what do you think could be the reason for Namibian curriculum to encourage the inclusion of indigenous knowledge?

Mwaka; I will say the indigenous knowledge can be beneficial to the learners since this is the knowledge that is known back home. If it is incorporated it will be easy for the learners to understand the curriculum of agriculture. They will be help and they will even ask more at home because it is the knowledge known by their parents. So it will be interpreted better in the language that they know.

Researcher: what are you views on the inclusion of IK in the curriculum? And have you any more information on some of the topics like animal husbandry

Mwaka; Aaaa, I think indigenous knowledge must be incorporated in our education it will be easier, it will make agriculture to be easier to be understood by the learners. And also the curriculum to have more information on the topics like animal husbandry in agriculture

Researcher: What benefit will it have for you as a person teaching the subject?

Mwaka. It will benefit mostly the learners since the topic will be easy to understand, when you give work to the learners you can even invite the parents to demonstrate this indigenous knowledge to the learners for them to understand.

Researcher: if you were to incorporate indigenous knowledge in the lesson on animal husbandry in agricultural science what strategies could you use to teach the subject?

Mwaka: Ok aah especially on the subject like animal husbandry, I will take learners out aa from the class take them for excursion on the farm where parents or farmers can demonstration some of the things like animal selection, breeding or the animal diseases so that they can demonstrated or explain to the learners those topics so that is how I will do it taking the learners out of the class for excursion

Researcher; you are teaching the lesson that incorporate indigenous knowledge. How can you mediate the lesson that incorporate ik on animal husbandry?

Mwaka. ok, aaa if I was teaching a topic which includes indigenous knowledge maybe, I will ask learners, give practical where learners have to find more on topics, maybe investigations where learners have to go and ask more at home. The knowledge that they get outside and the knowledge we get from our books we compare and see what is good for our topic. So I will combine the information from outside, from parent, give investigation and what we have in our books.

Researcher: as the carry those activities what type of assistance can you render to those learners?

Mwaka; making sure that they there is no confusion between our indigenous knowledge from the parents and also what we have in our text books. So that it does not confuse the learners. With the curriculum that they have, they understand more and not get confused with what they had from indigenous knowledge and what they are having in their books.

Re. anything you would like to share with me on the inclusion of Indigenous knowledge on animal husbandry section for agriculture

Mwaka: Aa I think the inclusion of indigenous knowledge on animal husbandry will be beneficial to our learners, especially there are some regions were you find there are some learners who don't even know or know the cattle and all that. But if they hear this knowledge from people of their tribe they will understand the content even better. So it must be include in our curriculum

Re thank you very much mum that is the end of our interviews. I will come back after I have transcribed the interview. You will go through and see if what I have transcribed is the true reflection of our discussion.

Interview analysis 1

1. **1. What do you do you understand by the concept indigenous knowledge?** Mr. Tooki : Indigenous knowledge means those are skills or practices that people were using in the past. This can be skills or practices on crops or animal husbandry. Those are information that are not documented. Those are skills we get from our people through oral communication. That is my understanding on the concept of indigenous knowledge. Mr. John well I think indigenous knowledge refers to knowledge that come from the local people around or knowledge on how people have been doing things in the past. So to say original knowledge. Mwak: ok. Indigenous knowledge is the knowledge our local people have on the practice of animal husbandry and the knowledge that they are using at their home regarding the animals, cattle or any livestock that they are keeping at home.	A

OUR: Indigenous knowledge is the traditional knowledge that was then use by our grand fathers then inherited by our parents and now moved from generation to generation is the one that we are currently used.	
2.	
2**. People have been keeping animals for a long time. What are the indigenous knowledge and practice that you can share with me on animal husbandry from your back ground?** Mr. Tooki: We are mostly Hereros we mostly practice animal husbandry. There are few practice that we can use one: Controlling of animal health and diseases. So During those years people were not using vaccine.They were using methods like they were isolating sick animals from others. Where by this will prevent further spread of diseases. Researcher meaning the reason for isolation was to prevent the further spread of diseases. (follow up question) Tooki: yes. The other thing that I know traditionally there are some roots of certain	

plants that they used to control common diseases. Apart from that the use of wood ash can be applied on animals to prevent both internal and external parasites those year they were not having those vaccine, they were using things like wood ash some herbs from certain plants. To control both internal and external parasites. The other thing also thing which I think Researcher How were they using this ash? TooKi: They could just take the ash and apply on the animal, sometimes they mix it with water then they apply on external parasite like ticks. Researcher; where there specific type of trees that they use? Took: Mostly they used the Carmel thorn, because when you look at the ash it is a bit bitter compared to other trees. The other thing that we can look at is instance when the animal is having difficult in giving birth. You could also assist, … you find the situation may be instead of the head passing first between the legs you might find it will come out first the hind quarter, in that instance you will find that it will be very difficult to give birth so they were also having those skills on how to turn the calf in the right position , so that they can serve both the calf and the cow. The other thing I	

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Researcher Was there a specific reason from all the plants they decided to go for seed pods?

Tooki. Yes, the seed pods are sources of protein. That is the main thing they were trying to balance.. that at least were having a balanced diet. Apart from that during the drought seed pods were collected and stored and used during drought as supplement for livestock. They feed it with salt.

Research : Which salt did they use

Tooki: They were using the common salt, common table salt course one.

Researcher: You identified handling as there are some indigenous knowledge

Tooki If we can look at dehorning part . I don't know now I don't know what they were using.

But from the knowledge that I got is that …….. they could not dehorn the old animals as the horns were signs of pride . The female animals used to be dehorned using knives by cutting the horns. Those are some of thing that were used and we still use now. But it was not at the level it is now. They could off course dehorn the female animals . Research: meaning the male animals were not dehorned Tooki yes. Only the female Researcher: At what stage were they dehorning these female animals? (follow up question) Tooki: when they were very young from two to three months. They were also considering that when you dehorn late the horn bud will be hard and will be very difficult for one to dehorn. Researcher: what could be the main reasons for dehorning these animals? Tooki: As I said they were mostly dehorning female animals. They were mostly milking those cows. It was easy to handle or to approach those animals without horns. Apart from that it was the sign they looked nice. The other reason they take less space especially when they are feeding.	

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with female animal which was not having good characteristic? Tooki . Those ones where killed Mr. John, well from where I come from on how people have been practicing and handling animals the way how they treating the animals those that are sick. Normally they could use traditional herbs to treat animals. For example the animal that is having foot and mouth disease, they used to normally put ash on the wound itself . It the ash to apply there,. If it is also having ticks they used to use ash to apply there targeting areas were ticks are hiding that is one way. Another way could be when the animal is giving birth the whole placenta come out…….on this herbs that you were using to treat the animals. Researcher: you have specific trees that you were using to treat diseases? John: yes the Carmel thorn tree is one that they were using. They also used the leaves of the Mopane tree . Then the barks of the Baobab tree. Researcher: Which one they were using to treat which diseases?	

Mr. John: Mopane when the animal is having complication in giving birth. That is what they were using. The Carmel thorn was use for .. also the some. The barks of the Baobab tree is the one that they were using when the animal is having lumpy skin. skin problem , having pimples all over is the one they were using. Researcher: you wanted to say something on handling John: On handling. How they were handling the animals like when you want to do, either castrate the animals or do the dehorning . May be we can start with castration. On castration, how they were castrating . they were castrating using stones. How they were doing it. the stone were put underneath , then you put the testis on it. Take the other one and you smash the testis until they are completely destroyed. that's how they managed to do the castration. Then .. when it comes to putting ear marks. They were not having knives, sometimes they used bones they will sharpen it and that was used as knives. Than the can use it to cut marks on the ears. Researcher: On feeding can you share any thing	

John: when it comes to feeding from the background where I come from. People were not feeding animals like buying food from the shop. The use to let the animals on the natural grass and sometime you can cut the grass and bring it to the calves at home, but the bigger animals they were rely on their own. Researcher: Do you have any thing that you can share on breeding? John When it comes to breeding it was a very difficult thing to control. When it comes selection of the bull. Sometimes the farmer will have so many animals he chose as bulls. So in terms of the quality to selection a good bull it was very difficult. It was an open area where they were staying a bull from another farmer will just cross all. You have your cow bull a bull from another farmer is coming to mate with you cows. so it was something difficult to control when it comes to breeding. Researcher: anything on selection John: selection usually what they were looking at is just body size , when it is having a big body. That is how the selected the bull and cows was those Sanga, small ones, but the bull at least they could look on body size. As the calf is growing they could ear mark as a bull. They did not buy a bull anywhere but, but it was just this calves that are borne at home and	

they just select but mostly we look at the size only. Researcher : Is there any interpretation for some of the things you have mentioned? what are the reasons for doing some of those things? John: People were looking after these animals but then there was need on how to handle these animals when it comes to those diseases. They were trying to see how they can properly manage the animal that is why they came with this trying different herbs from trees to try to see which one can help so that they can keep the animals for quite a long time. Mwaka: ok, I will start with nutrition as we know animals traditionally at home, in our community members do not have money to buy extra food or supplement for their animals. So most farmers let their animal graze on grass, shrubs, tree or any available food that can be provided that is sufficient enough to provide the animal with all their nutrients, Researcher: on feeding you were talking about they are provided what type of food do you provide to animals Mwaka: they only graze on grasses. Because most farmers they do not have money to buy supplemental food. So these grasses they are	

sufficient enough for the animals. They provide all the nutrients On the part of animal selection. When you want to select your animals for breeding are things that a farmer looks at may be for example you want to select a bull. They only do it by judging they don't test or go to laboratory to test. Which animal or bull is good for breeding. They will just judge looking at the characteristic of a bull for example. If it is a bull they have to look at for example well developed testis, body structure of the bull it must k have a V shape toward head toward the front. The dairy cattle the will look at the udder of the cattle it must be well developed and The body shape of the cow. On breeding when farmers are breeding the animals traditionally , for example our farmers are poor they don't have money may be to do the cross breeding or buying semen and all that. What they do there is a practice called mafisa in silozi where the farmer exchange their animals, may be it can be a bull. You are borrow a bull to come spread its characteristics in you kraal. Or to mate with you cows. Or you can take you cow to the kraal with the characteristics that you want. So that how they do it traditionally. On animal diseases the indigenous knowledge they are many diseases but I got is on eye problem. The Obaherero people the combine tobacco and	

mix it with ash when the animal is having eye problem they crash it fine and then they put it fine like that in the eyes of the animal to cure the eye problem. The constipation in calves when they are sucking from their mothers. Sometimes they used to suffer from constipation. The farmer will crash the soup called sunlight. They mix it with water and the animal is given to drink to help with constipation. That is what I have on indigenous knowledge of people on animal husbandry. I left another one. After birth the calf is having sharp teeth the farmer is always using the charcoal to smoothen teeth so that when it is suckling it is not sensitive to the teeth of the cow. Researcher: do you have any interpretation of some of these practices Mwaka interpretation Researcher: you said you were taking the cows to another person's animals, what was the reason for that or interpretation. Mwaka: The reason is for breeding purpose to get the required characteristic that you want in an animal may be it is having good characteristics and you want those characteristics to be in your bring that bull to	

spread its characteristic in your kraal animals also. So you Researcher: Do you have any reason why they were putting the tobacco in the eyes of the animal. What is in the tobacco that was solving the problem of the eyes? Mwaka; the ash that is in the tobacco that you are putting in the eyes they are itching. When it is put in the eyes, maybe there was something that was in the eyes, the eyes will be watery and the tears will be coming out whatever was affecting the eyes will come out. With the tears because it is itching. Through that process it can heal the eye problem. OUR: yes, concerning animal husbandry indigenous knowledge or IK as you got it, we have got various traditional ways on how to treat some diseases or illness for example we have got also, if the animal is sick let say it is having running diarrhea . then you can take the roots of a *Acacia mellifera*. …The black thorn. The you crash that roots or if you do not crash it then let it dry out you just cut when it is fresh and then put you , you crash a little bit with the stone or something that is hard or then you put it in hot water and you let it can boil and that water you let it to stand after boiling. And that water let it to cool but not to be much cold	

while its is a little bit ,while between hot and cold then you let that calf to drink. It also helps to stop diarrhea.

Resercher: How do you call this Acacia Melifera in you language ?

OUR: Omusaona

Researcher. Apart from that …

OUR: Apart from that one we have got also *Boscia albitrunca* (Omunguingi in Otjiherero). which is the , the ,the, the tree of life. In our language we call it Omungwingi. Researcher Omu.. That one we use to treat some illnesses such as if the wound the animal has been cut open. You crash that the leaves of Bosca albitrunca and then while the powdered is a little acidic something very so then you apply it there. It makes the.. to heal fast and then to help with the clotting. The clotting process and also the flies won't be able to sit around. That is when it is having an injury; it is having an open wound that is how we treat it traditionally.

Researcher: Apart from diarrhea and the treatment of wound do you have any other diseases you used to treat traditionally?

OUR: yes, we have got other diseases that we use to treat traditionally like eeeh the Pasteurellosis . Once the animal is having that

symptoms of Pasteurellosis . We call it Okapirauka in Otjiherero we cut the ears, and the tip of the ear and the tip of the tail so that that blood can move out. It helps a lot. It is one of our traditional way long. Another one is also for the Warts , Orflorwarts on the on the mouth on the kid we normally we use to either take the copper wire we tied on either on the ears or we make a small hole here in the neck then we tie on those small ones instantly it disappeared . Re. you are using a wire do you stab … OUR: that ka soft wire, very soft one you just a k small hole then you insert in the hole then you tie it up. You let that animal to remain with it until it becomes a big goat its when you remove it. Because the warts it is the disease that affect the small one while they are still suckling. We only used to practice it like that also. Researcher : Ok . apart from healthy , if you were ee you have any other OUR: the other traditional we use, once you castrate the, the horses, cattle with knives the blood process , whereby we cut the … open and remove the testicles . for us, the , the healing process we take the , the acacia mmm how do you call this one ? Ziziphus mucronata (OMukaru) that is the Buffalo thorn one. Then that one we take its leaves and with its roots.	

You dry them up and then you crash it and then you mix that two the dried leaves and the dried roots. Mix it with ash then that ash and then that ash and that mixer after you cut it . you spray on that open wound. So we said the, the , The other one dries the place quick, this one Ziziphus mucronata and also the ash makes it to become very drier faster than the normal process. And also the flies. Sometime it does not attacked as it is left open. It also fasten the healing process . Researcher : Aa mm when you look on the issue of breeding. how were you breeding animals OUR: traditionally we were using the inbreeding process , but now due to more knowledge and based on extension services we have improved we buy now breeding stock from outside, but traditionally we use to look among you calves which one is better quality. At the tender age that one your decide the two will become the future bulls. That how we used to and also bases on , they used to look on the selection criteria : the mother is huge, contains a lot of milk, and therefore the assumed the off springs will also good milk produces. Therefore they select those are criteria they used to select the breeding stock	

Researcher: assume now you don't have a bull. how were you handling such situations. You are saying you used to selected from those calves while they are still growing you don't have a bull that time, how were you handling those processes. OUR: We were like by then because we were not having fences that control breeding. So Even your neighbor 'animal could come serve your cows. Because it is in communal setting it is more than ten households. and there are bulls from other households though I don't have a bull those other, my neighbor 's bull , other households ' bulls could come and serve in my kraal. That is one way we survived this long. Researcher. OK. You all most…did your selection? OUR: yes Researcher. Looking at the animal is huge and all those. Now Do you have anything you can share on feeding OUR: the issue of feeding normally is , is is, ee extensive grazing management. Ee during drought time like now , while we did not received nice rain we ,we turn to use Grawia flava because now they have already started sprouting leaves. And we also have a little bit of Terminalia sericea (Omusiaseta). Those	

very thin animals that cannot go far, we, we keep them in kraal and then we go out and then you cut those Grawia flava as well as Boscia albitrunca, so we cut the branches and then bring to the animals so that they can eat. And then we, we practice shifting or nomad shifting from one place to another. If where I am staying there is no good grazing I will move to the next area where there is better grazing. Nowadays , then we were not used to ask permission , you just move then you start you see people start forming kraals, because that area has got plenty of grazing and now because of aaa settled agriculture is a little bit cumbersome process. For You have to ask for permission for you to move to that particular person , place, first you go and if they say yes you can come over with a certain amount of animals. Those are the one you will take over to that place. f Researcher: aa do you have anything the , with those practices do you have some of reasons or interpretation of some of those practices? OUR :Yes. We, we have interpretation , because even some of those aaa whoo the way we use to treat diseases like ee there was time we use to take some calves we treated them with Disul Fox the one that is an antibiotic. That you buy from Disul Fox LA either ultra 7 or Swamycin and the one that we use to treat	

traditionally although this one responds very fast to the condition and the traditional one is slower I don't know whether the dose is not well calculated or sometimes we administer too little or too much, but this one scientifically is more precise because it is tested.mm	
Researcher: what do you think could be the reason s why the Namibian curriculum encourages the inclusion of IK? Tooki: The main reason to encourage the inclusion is to pass on those information , because if they are not included in the syllabus or curriculum then where will they be written, because we said most of those one are just the information that we are told those are just oral information. But the moment we include them those learners will be able to integrate those information and will be documented. Apart from that is Most learners when we look at the concept of IK is those are things that we know from home so by including the concept of iK it will help us or the learners to learn from what they know to what they don't know. Because the concept of teaching it encourage us to teach from known to unknown. It you look on the concept of after birth if you ask how do you deal with the problem after birth they will tell you , it the after birth do not come out they will	

tell you. Because those are the information that they know from home. It is very important to keep those information or those information will be documented that our learners will be able to know how those information are important throughout our daily lives. John: I think when you start from the Ik it will help the learners to know what the people have been doing before for you can come up with the new knowledge. some of the learners they are practicing these things at home. Currently as we speak. So the moment as you start with what they are doing at home and give new idea that will help the learners to understand much better. Mwaka; I will say the indigenous knowledge can be beneficial to the learners since this is the knowledge that is known back home. If it is incorporated it will be easy for the learners to understand the curriculum of agriculture. They will be help and they will even ask more at home because it is the knowledge known by their parents. So it will be interpreted better in the language that they know.	

OUR: aa it is very important because most of our farmers are still living in deep rural areas they don't come often to come get , ee to have access to modern medicines and those types of things and traditional method is the one we come a long with and is the one of the best immediate remedy to rely on because at our rural areas we don't have refrigerators . we don't have even electricity. Some of those medicines needs to be kept under refrigerated condition which not, which means if you take it from Gobabis to Eiseb Block where we staying ,this also call ee the the poisons plants I don't think it is quite effective , because it will be kept at a different temperature. And then it won't any more effective as it is suppose to be kept, but traditional knowledge will keep on using because even now to treat gebular this eee how do you call it scientifically this , this.. Researcher: you can even say it in your local language. OUR: Otji kurioma that one is a poisonous plant Gifblaar in Afrikaans (*Dichapetalum cymosum*)we use to, sometimes when the animal shows some symptoms of it, we, we mix ee spirit with jik and then we inject the animal with it. It help. The animal doesn't die instantly	

as as everything don't inject that then the animal will die instantly. Researcher: Ok OUR: ja	
Researcher : what are you view on the inclusion of IK apart from the reason for the government for the Inclusion of IK Tooki: according to me on view at least we are doing the right thing to include these knowledge, because if you teach from what the learners knows or if you include the indigenous knowledge that means you include those knowledge which the learners know and when you look at those concept for learners it will be every easy because they will understand the content very well. Why, because put the knowledge which they know which they do straight at home. Most of the indigenous knowledge and practices those are skill that learners know, those are skills they learn. Those are skills they learn from home, from our parents. By including them I think that is the good thing according to my own understanding.	

I am I support that we include that idea that we include what the learners know. Researcher: How does the inclusion of Ik affect the learners in the subject in the teaching of the subject Tooki; First of all it will assist them because they will, like what I said will teach the learners from what they know. In other words It will help them to master the content very well … when you are introducing the lesson on disease you might ask them what those thing that you are doing at home. That way you encourage them to think outside the box, they will refer to those thing that they know not only from the books. What they know from home how to control diseases. What do you do if there is any outbreak of a disease? They obvious know.. what learners are afraid is that we sometimes implement things that are not part of their daily lives. John: My view is that, of cause it is a good thing it should be done. But the problem is that it will be included but when it come to grade 10 level , marking thereof, some of this knowledge are not accepted. That is why I think, it can of cause utilized just for the seek of making learners understand. But then to be fully implemented it will then be it will save no	

purpose for me because of the way marking is done it will definitely not work hand in hand. Researcher: what do you think this indigenous knowledge is not accepted when the answer is provided in the examination? John I think the reasons could be, the way how people have been doing things before is totally different like for example people that are living in Kaokoland and people that are living in Omaheke and people living in the Northern regions people have been doing things differently . It you try to include this information on how they have been doing things. The information might not be the some it will advantage some learners and disadvantage some of the group. Researcher: If you were a law make could you accept it or could you discourage that knowledge? John: If I was a law make definitely I would encourage it to be utilized. Since it is teaching the kids the kids from what they are doing home and brings that information to classroom. Which will enhance their understanding and participation in classrooms. But it should be in the way that the information that is provided the information that is provided is coming across the country so that every body will be	

included and in that way it will be beneficial to the learners. Mwaka: I will say the indigenous knowledge can be beneficial to the learners since this is the knowledge that is known back home. If it is incorporated it will be easy for the learners to understand the curriculum of agriculture. They will be help and they will even ask more at home because it is the knowledge known by their parents. So it will be interpreted better in the language that they know. Researcher: what are you views on the inclusion of IK in the curriculum? Mwaka; Aaaa, I think indigenous knowledge must be incorporated in our education it will be easier, it will make agriculture to be easier to be understood by the learners. And also the curriculum to have more information on the topics like animal husbandry in agriculture Researcher: What benefit will it have for you as a person teaching the subject? Mwaka. It will benefit mostly the learners since the topic will be easy to understand, when you give work to the learners you can even invite the parents to demonstrate this	

indigenous knowledge to the learners for them to understand. OUR: I, I am in support of inclusion of indigenous knowledge in the curriculum because it gives the learners the immediate basics solutions to the basic problems that we cure in most cases. So if you teach them that if animal suffers from, let say…person spend like an onion malcop.. onyanga in Otjiherero then it is of at most important that the animal should not be moved , should stand and then you cut the blood so that it flows out and it helps also if the people understood what you teach them because this practice come a long way. Sometimes, somehow down the line you start to believe that..hape ,ee help the situation at hand, so I think it is better to included, it within the curriculum and also to hanest it with modern technology. So that they know if this one is not there they should rely on this one. Rather than them not knowing what, when the animal is sick and there is no doctor, nothing could be done , so that the animal could remain ideal Researcher: The animal has taken poison sir you are cutting the ears how do you interpret or what could be the reason for cutting those ears?	

OUR: the reason for cutting the ear is they said that blood, the poison circulating in the animal is comes out with few blood, so it minimize the toxicst within the blood. That is one of the believe.	
4**. If you were to incorporate indigenous Knowledge in the lessons on animal husbandry for Agriculture grade 10 what strategies could you use?** Tooki: I think I spoke of one strategy like in my introduction we use what they know. I have given one example…. ask the learners you find that a certain animal is having diseases. What is it that you are going to do. So you develop those strategies in other words you ask what knowledge do the learners have. …. By that that you can move on . the use of resources may that learners knows and those resource that can use to make the subject interesting. Like I spoke the use of ash, by looking , they know we use ash.. now they have to find out what is it that is in ash that is used to control external parasite John The strategies could be we can visit older farmers that have been farming for a long time	

in local areas they are available . we can conduct interview or questionnaires and bring this back to the classroom. If need be we can invite some of the parents to the classroom when ever a specific topic is being taught to the learners start how they have been doing and then from there we can proceed with the new information that that is currently taught. Mwaka: Ok aah especially on the subject like animal husbandry, I will take learners out aa from the class take them for excursion on the farm where parents or farmers can demonstration some of the things like animal selection, breeding or the animal diseases so that they can demonstrated or explain to the learners those topics so that is how I will do it taking the learners out of the class for excursion OUR: the strategies that we are going to employ is that we should, we should simplify the whole content so that the whole learners digest it much better and also be able to teach them in vernacular so that when you talk about certain disease they know how the call that disease in their language. And which type of traditional method one can use, because some of those things is what we used in my area is not what we used in another area. I heard the	

treatment of that otjikurioma in other areas people put diesel in the track of the animal, it means the mix diesel with water, said, they believe that it also neutralize the toxicicist of it Researcher as we said indigenous knowledge we have certain particular group of people they have knowledge on which they have lived on for some years OUR, some years yes. Researcher: So are there any other strategies that we can use to teach that indigenous knowledge? OUR: I think the curriculum should be a little bit more open so that aaa the real either those..resme can be, for the text book that the learners are to use should have the, the proper photos of those the , the those in varies vernacular , local vernacular languages so that one we talk about this particular treatment this are the types of trees we use to treat that particular thing therefore they will grab the content more easier rather than you talking from black and white they don't see anything pertaining to that. Researcher: so you mean your encourage the documentation of the indigenous knowledge OUR: I very much encourage it.	

5**. How can you mediate the lessons that incorporate Ik on animal husbandry?** Tooki : You can use resource that are relevant to the subject. You can use the resource people there are elders in our communities they have been farming they have been controlling diseases they have been controlling parasites. May be you can call an elder then you arrange the lesson may be on castration , may be on diseases, then you hear the view of what type of knowledge they have been using and how effective those resources. May be the other thing that you can do To encourage the learners to take part it is always good to give the topic on hand you might say go and find out at home what are the skills and indigenous knowledge the people were using in the past and how were the useful . already when they come they know we have investigated , we went we did a research on this, than just to come and introduce to day we will on diseases . what type of skills and knowledge those people were using. Those are some of the things you can use or to actively to involve the learners in the lesson. they might be some of those learners who have those skill we can use	

them also to explain to others. When you look at ik at differs from one community, one cultural background to another . may be by looking at how were hereros treating animals and you go to another tribe and so on. Because when you look at this knowledge it is not only confined to one culture. There might be a culture we do this to control diseases and another one will tell you we use this specific tree to control the disease. Some one we do this and this. By looking at that we can help by trying to integrate different cultural back ground. John Well at the what I am trying to do I normally make use of aaa like for example if I have to be specific. On a topic like animal heath, I normally give questionnaire to learners to go to get information from specified farmers, old farmers which are in the area which I find out my self and then send this learners to go and get this information from them. Then we discuss this information when they come back to classes. From there we conclude and have one specific information.	

Mwaka. ok, aaa if I was teaching a topic which includes indigenous knowledge maybe, I will ask learners, give practical where learners have to find more on topics, maybe investigations where learners have to go and ask more at home. The knowledge that they get outside and the knowledge we get from our books we compare and see what is good for our topic. So I will combine the information from outside, from parent, give investigation and what we have in out books. Researcher: as the carry those activities what type of assistance can you render to those kids? Mwaka; making sure that they there is no confusion between our indigenous knowledge from the parents and also what we have in our text books. So that it does not confuse the learners. With the curriculum that they have, they understand more and not get confused with what they had from indigenous knowledge and what they are having in their books. OUR: yes we do have like when we speak about the importance of trees, they go out and they collect those different parts of trees and they identify those trees and then, they also explain the type of diseases that are being treated, the come up, you will be surprised ,	

they come up with new thing that I even don't know. That sir if you have got a cut you can treat.. especially those Tswana and Bushman they know more the use of those trees. They are more of herbalist kind of. So they are better at that , us we are just cattle guys… we no more the treatment of cattle	
Anything you want to share on the inclusion of ik on animal husbandry in the section of agriculture. Tooki: one thing which I also want to, may the policy markers. I have see many learners know knowledge on ik and skills but when it come to marking assessment you might find that a specific will ask that how do you control diseases. Some of these learners because they know a certain concept or they know what they normally use. Some times they might include that one as the answer. As the markers we sometimes penalize those learners. Also the answer what they give is what they do at home. So may be the issue here is that I don't know whether we should open the discussion or we should rather consider the skills as far as indigenous knowledge is concerned. I	

remember one year when I was marking there was a questions those kids could write things that they know but when you look at it there it is correct but the whole concept of marking you will be told this is wrong. Researcher. meaning despite the fact that the curriculum encourage the inclusion of ik but when it comes to assessment itself such knowledge is not recognized. T you are right that is the only thing I want to share with you John: If I can start with grade 8 if I am teaching a topic on the history of agriculture. Normally what I do I invite people to come and teach that topic. While I am observing… local people that have been farming for a long time and than has been that has been with their older parent on how they were doing farming that is what I normally do. If I come to the topic like the importance of agriculture in grade 10 I also always invite local farmers and get information from them why agriculture is important, tell them teaching to the learners and then after presenting this information and then I take it up from there.	

Mwaka: Aa I think the inclusion of indigenous knowledge on animal husbandry will be beneficial to our learners, especially there are some regions were you find there are some learners who don't even know or know the cattle and all that. But if they hear this knowledge from people of their tribe they will understand the content even better. So it must be include in our curriculum OUR: I think the other part is that one you, while we have this grand fathers and grand mothers around people should move out and gather more information, because those guys they sit with knowledge that is not recorded anywhere, not written down but they sit with that knowledge, so once we go out and gather that knowledge and document it or put it in book for so that future generation could also have access to it. that could much better. To the benefit of aa indigenous knowledge.	

Appendix K: Workshop reflection

Assistance need

Sharing views on IK inclusion.

Sharing teaching strategies, ideas, views, knowledge

Reflection on the work shop discussion 2018 IK on animal husbandry

Before the workshop I met with the teacher when I come to explain my research and for informed concerned

Two teachers were invited to attend the workshop. In the work shop we looked on topics on animal husbandry where we can develop the lessons as the next step from interview. The purpose was to develop lesson that incorporate IK as the interview informed us on some IK that can be incorporated into the animal husbandry section of agriculture.

Many times we teach lessons without linking them to learner's experience. We need to plan lessons that that includes IK.

When we include IK in lessons this helps us to find learners' misconception and we can clear them. We can use the Western science to explain IK practices. We can use IK as prior knowledge to build on what the learner already know. It connects home experience to school topics. The IK can be used to contextualize the learning by we can give the examples from the learner' background. The inclusion of IK can improve learner participation in class. The inclusion of IK can show the relevance of the curriculum to the community and can improve parental and community participation in school activity.

The researcher asked on which topic can we develop the lessons .Mr. Tooki suggested animal health on disease and parasites, breeding and selection ,feeding and handling, while checking on grade 10 syllabus for Namibian curriculum. Mr. John agrees he think they are fine.

Research I remember there was some IK on those topics can we incorporate that IK on those topics or do you have some. John suggests for us to us those ones. Tooki talks spoke about remembering talking about the use ash to treat diseases. He also talks about the use Carmel thorn seed pods as animal feed. I also remembered I once got my colleague during weekends and even at work he like

collecting those seed pods to go and feed his animal. He is cleaner at the office with a low level of education. I one stopped as he was collecting the pods with hid young brother. I asked him what he was doing with the pods. He said he normally collect them for his animals mainly goats. I asked him whether he was feeding them like that and he said he use to take them in town at the place where there is machine to grind them then he mix them with mealies (referring to maize). I asked him why he was feed them to the animals. He said it makes the animal fat. I asked him what was in the pods that makes the animal fat and he said the contain manure he does not know the manure. The participants were having another meeting so they asked to leave. The agreement was to me the next day. The next meeting next meeting was for planning lesson incorporating IK.

The next was to find competences in the syllabus on the identified topics on which IK can be infused. Tooki. read the competencies from the syllabus on which we agree to develop the lessons. I then asked them that we should together develop the lessons that incorporate IK from those topics and competencies identified. I also share some of the strategies I read from literature on the inclusion of IK on lessons. I and Tooki were writing the lesson plan. John: Asked the lesson plan format to use. I felt we need to use the same format of the lesson plan the school was using. The lesson on feeding The objective and competencies: **Lesson objectives**: Learners will gain insight into the value of feeding animals a balance diet and the importance of the digestive system of livestock.

Competencies: learners should be able to: Describe the importance of a balance diet. Discuss the essential constituents of livestock feeds, such as carbohydrates, proteins, fats and oil, minerals, vitamins and water.

The Tooki opted to take it and he proposed to use: Teaching materials: Seed pods, salt from the pans. John proposed the use of the projector. I then suggested the development of work sheets. To introduce the lesson I propose to find out why do farmers feed the animals? Or how do they feed the animals? Teaching strategies Tooki suggest the question and answer, John, we give the work to the learners and then they present in groups. At the end of the lesson John suggest that we summaries the lesson. John promise to bring the projector during the presentations and he suggest that I bring the laptop.

On the work sheet I propose that we find the traditional feeds and how do they prepare them, why do they feed those feeds. Then we do the same with the western feeds lastly the learners should state the cultural believes on feeding.

Lesson 2.

The second lesson on livestock health (Diseases) was for Tooki. The objective and competencies: **Lesson objectives**: Learners will distinguish the different types of diseases and parasites affecting livestock in Namibia

Competencies: learners should be able to: name the important diseases affecting livestock and identify their symptoms. List organism that causes different diseases

Tooki suggest to use ash and projector as resources. On the introduction John suggest finding out things that affect livestock on the farm. Then we take it from there. When they are naming the disease they should also name them in their mother tongue. John suggest that we can also give the learner task to find out from their parents how the treat diseases after the learners have stated what they know in class. The I said the they need also to find out how they prepare those medicine and whether they were effective. We then developed the work sheet putting things we were discussion.

The third lesson was on parasites

The lesson was for John. The objective and competencies: **Lesson objectives**: Learners will distinguish the different types of diseases and parasites affecting livestock in Namibia

Competencies: learners should be able to: Indentify parasite such as round worm, ticks and liver flukes

John indicated he was going to use picture that he was having in his laptop and the projector. For lesson introduction I suggested as diseases were taught: Apart from diseases what are other things that affect animals. John suggested introducing it in this way: when the animal drink dirt water what could be the problems the animal will experience. John said he was go to see which one he was going to use or he will use both the two. Tooki suggest that learners list the parasite, how the treat them. I indicated as they list the parasites in English, they can also say how the call them in their languages. On the control they should state how they control them traditional and in western

ways. . Then John said that cultural believes about parasite. The work sheet was developed using thing the things we agreed on.

Lesson four was for John on breeding and selection. The objectives and competencies: **Lesson objectives**: Learners will understand the aim of breeding and selection of livestock in Agriculture

Competencies: learners should be able to: Discuss the aim of livestock breeding and artificial selection.

The teaching resources: pictures of cows and bulls, projector

Introduction: I suggested that if a farmer has certain number of animals after a number of years will this farmer still have the same number of animals. So we played with this to the time we agreed on the introduction below: A Farmer has ten animals after a number of years he or she has more animals. What caused the increase in number? Teaching strategies involves question and answer. Work sheets, group work, discussions,

Learners look on aims of breeding, how do locals breed animals and western ways. What locals look at when doing selection. Reason for selection, cultural believe about breeding and selection

We developed the lessons and I typed them.

Appendix L: Lesson plans

Name of School: Gobabis High School

Name: Mr. John Subject: Agricultural science

Date: Grade 10

Theme: Animal production Topic: Livestock health

Teaching materials: Pictures, projector

Lesson objectives: Learners will distinguish the different types of diseases and parasites affecting livestock in Namibia

Competencies: learners should be able to: Indentify parasite such as round worm, ticks and liver flukes

Introduction:

Apart from diseases what are other things that affect animals./ when the animal drink dirt water what could be the problems the animal will experience.

Presentation of subject content:

Learners identify local and English names of parasites affecting animals in Namibia. Group them into internal and external parasite. The will describe how they control parasite traditionally and in the western way. They discuss the beliefs about parasites.

Consolidation / reinforcement: summaries main point of the lesson

Assessment / homework:

Gobabis High school

Topic: Animal health 2018

Group: …… Grade 10

In groups work on those questions

Name parasites that affect livestock in Namibia provided Local names and English names

Local name	English name

Classify the parasite as internal or external parasite

Internal	External

How are parasites controlled? How are parasites controlled?

Local (Indigenous) ways	**In western ways**

Cultural beliefs about ……

Parasites:

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Name of School: Gobabis High School

Name: Mr. Tooki Subject: Agricultural science

Date:	Grade 10
Theme: Animal production	Topic: Livestock health

Teaching materials: Projector, ash,

Lesson objectives: Learners will distinguish the different types of diseases and parasites affecting livestock in Namibia

Competencies: learners should be able to: name the important diseases affecting livestock and identify their symptoms. List organism that causes different diseases

Introduction: What are the factors that affect livestock production on the farm?

Presentation of subject content:

Learners name the diseases that affect livestock in Namibia in groups in English and in their mother tongues. They then state how they can identify (signs) those diseases they have stated above.

The discuss what they will do when the animal shows the signs of ill health without involving the vet

Consolidation / reinforcement: write main points of the lesson

Assessment / homework: ask questions during the lesson on the topic

Ask elders how they treat diseases traditionally and report to class: which diseases they treat, what they use, how did they use them. Was or is it effective?

Gobabis High School

Subject: Agriculture Date: 2018

Group: ……

Topic: Animal health

Work in groups to answer those questions

Name the common (important) diseases that affect livestock in Namibia in English and in your mother tongue.

English	**Mother tongue**	**Symptoms (English)**

2. What do you do when the animal shows signs of ill health without involving the vet? Traditional ways name

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How are those disease treated in the modern way (western)

Name the diseases and how it is treated

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Home work

Find out from elders how they treat diseases traditionally.

Name of the diseases: ……

What do they use

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How do they use them?

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Are those treatments effective?

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Cultural beliefs about ……

Diseases:

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Lessson 1 Tooki 2018

Tooki: thank you very much again for coming.

Tooki : Our topic for today will be on animal production , Specifically on animal health. Before we start there is a question that I would like us to quickly deliberate on. In your respective groups

may be we can look on what are the factors that affect livestock production in Namibia? Lets quickly in our groups, let us name any factor that can affect livestock production in Namibia. Yes Aaa Marcus

Marcus : Rainfall

TooKi: yes we have rainfall as one of the factors any other factor. Yes

Learner: availability of food

Tooki: availability of food, yes thank you. Any other person. yes

Learners: drought

TooKi: anything else. The question is here on the display. What are those factors that affect livestock production in Namibia?

Learner: diseases

Tooki: diseases, we have four factors now. Rainfall, availability of food, drought and diseases. . Is that clear. so our topic today is on animal health and diseases

Learners : yes

Tooki: That is the topic for today in our various groups we are going to look on various disease that is why I said sit in groups. I will quickly give you a small work sheet that you have to complete. In your groups. Let us quickly look at that work sheet. yes, Factors affecting livestock production in Namibia. I think we have already named that one, that was the brief class discussion. There are those that said rainfall, drought, lack food and disease and the topic is more on livestock diseases. There is a work sheet I give you let quickly look on the work sheet. The first column, is asking diseases, so we have to name any animal diseases in our mother tongue or in our vernacular I know we are from different background or different languages. So we can put the depending on the language of the people in that particular group. Apart from that one you can also name them in English if possible. Name the symptoms or the signs they must be in English that is number one then number two what do you do when the animal shows the signs of ill health. When you are at home you will find that there are certain animals that will show some signs of sickness what do

you do? , this one let us focus more on thee modern way or indigenous way that we do every important without consulting the vet. The first that You do, when realize that one of your animal is having a disease. What do you do without consulting the vet.? So let ignore more on the western or the modern ways of doing things.

Let go back home and try to zero in and find out which are the ways we can do if we find out that one of the animals is suffering or have signs of ill health. And number three name the modern ways of treating those diseases the modern way. So the modern way or the western way, so again. First one you look at traditional how do we do it at home. Now number three you have to look at western ways of treating diseases.

Is that clear? So let's quickly do that I will give you five minutes. Disease in English, in your mother tongue or vernacular and lastly, symptoms and those symptoms should be in English is that clear. So I will give you five minutes. Let us elaborate, let us quickly discuss. Please don't mind the camera let us focus and do your work. First of all you mention the disease in English and the the second column in your mother tongue or vernacular. If your Otjiherero speaking you write in Otjiherero and if you are a Damara speaking KKG you write in KKG, Oshiwambo you do the same and all the any other language that are in group. You have four minutes, four minutes left. Let have at least four diseases. Four diseases. In case you don't know the disease in English just put in your language so that we can try ond about put the symptoms. Put the symptoms. Those diseases that you don't know in your mother tongue it is fine you can just leave like that.. but at least you can name one or two in your mother tongue. Two more minutes before we start with the presentations. Please don't write many things just write the key words. The person who is going to present he or she will elaborate more. Because I can see some of you a writing long.. In case you don't know in one of the languages, just you can write. If you don't know in your mother tongue just put in English.

Learner: in Oshiwambo like that

Tooki: are we there. How many groups are done? I can see one group here is done. Any other group that is done. Any other group that is ready. (He assists the learners) just write here KKG. Yes I thing we are almost there, almost there. Yes can we start with the presentation? Can we all conclude and start with the presentation. I know we have different ideas but those ideas that what

we want. Don't fight that know it is not like that is some one's idea just put, because may be that is what they are doing traditional. You just write. is it clear! OK! Can we start with our presentations. Any group that want to volunteer to start! First group, yes. can we clap for them.

Learner: The first disease is foot and mouth diseases. In mother tongue we call it Omukifi welakanekondo (Oshiwamba) Symptoms High fiver, loss of appetite, painful blisters on the mouth and the hooves and lot of saliva in the mouth. The second one is Brucellois (Okuhukura in Otjiherero) and in Damara/ Nama (llNai-lkhurub). The symptoms are brownish vaginal discharge, It retains placenta and abortion. The third one is Rabies (Orundumba) In Damara/ Nama (!Namis) symptoms are animal becomes aggressive wild and bites objects. The forth one Anthrax (Eteva) in Damara/ Nama (‡Naib-!Khoros) ,The sudden death of animals. What do you do when the animal show the signs of ill health without involving the vet? Traditional ways : first of all you must isolate the animal from the others. You discover the disease. Then you must find the treatment for the disease sometimes vaccination and etc. How are those diseases treated in the modern way (western). Name the diseases and how thy are treated: Rabbies; vaccination once a year. Brucellosis remove the placenta with stick orapplysoapmor detergent on your hand to remove it. Anthrax vaccination once a year.

Tooki: any question or any contribution. When it comes to the names of diseases ee three four names , for example etava you can say this is Otjiherero, KAKi this is what. Is that clear. Just specify the language of that specific disease. Yes, can I have group grouper aa

Learner: Name the common (important) diseases that affect livestock in Namibia. Is Foot and Mouth disease (‡Aidi tsî Ams laeb in Damara/Name) Omutjise wotjinotjikoti in Otjiherero. Symptoms lameness, a lot of saliva in the mouth, loss of appetite and high fever. Then Anthrax it symptoms are sudden death. Blood coming from the nose and the anus and open spaces. New castle disease (Aîn llôs in Damara/ Nama). The symptoms are dropping wings, twisting of the neck and difficulty in breathing. And Brucellosis its symptoms are its symptoms it causes abortion and vaginal discharge. What do you do when the animal shows the sings of ill health without involving the vet?

You should isolate them from the healthy ones . so that they won't contract the disease. You can also apply ash on the animal skin. You can mix ash with water and let them drink it all and apply

dark oil on the skin of the animals. And how these diseases can be treated I modern ways. You can treat mouth foot disease by regular vaccination. Give them vaccination often. And Anthrax vaccination once a year. And brucellosis can also vaccinate them.

Learner (third): the first disease foot and mouth disease (Omutjisewotjinyo notjikoti in Otjiherero) symptoms are high fever, painful blister on the mouth, tongue and hooves, loss o appetite. Rabbies (Orundumba in Otjiherero) The domestic animals become wild and wild animal become tamed. OTjikamwaha symptom :loss of appetite. And anthrax no symptom just sudden death. We are slaughter animals in case anthrax are , we kill and burn animals. Then we burry the animal's ash. Foot and mouth disease we vaccinate the animals. Orundumba we also vaccinate the animals,

The forth presenter (learner): aa foot and mouth disease (Omutjisewotjinyo notjikoti in Otjirerero) and and in Damara we call it !hâb). the symptom: painful blister on the mouth, tongue, gums and on the hooves. A lot of saliva, loss of appetite. We also have Rabies (Orundumba in Otjiherero) and (!hâb in Damara) Symptoms animal become aggressive and start to bite objects. We also have Anthrax (Eteva in Otjiherero) Symptoms are blooding coming out of the mouth and anus, from the openings and we look at new castle disease(Anin llôs in Damara) most birds die. We use ash to apply on chickens when they are sick of new castle disease and sometimes we just kill all the chickens. We also apply the black oil on the body of the animal. In now adays we use dipping to prevent diseases. I mean.. yes. Vaccination of the animals to control internal disease. Sometimes we isolate the animal to prevent the spread of the disease. Sometimes we call the veterinary office.

Tooki: yes, the last group! Let's go and present let us go and present. We are running out of time. we are waiting for you to be done. If there is a problem all of you must go and present all of you.

Learner: List the common (important diseases that affect livestock in Namibiain English and in your mother tongue: English: foot and mouth disease, Mother tongue: Omutjise notjinyo wotjikoti. Symptoms are lameness,loss of appetite, painful blisters on hoo.ves and high fever. The other one is Newcastle disease: I our mother tongue Omutjise wozondera . Symptoms are dropping and twisting of necks. Anthrax in our mother tongue is Eteva. Symptoms are blood coming out, come from nose and anus and sudden death. Rabies: omutjise wozombwa orundumba. Symptoms domestic animals become aggressive and wild and bites objects. What do you do when the animal shows signs of ill health without involving the vet? Traditional ways: by isolating infected animal

from those that are not infected. You kill all the infected animals especially those that are affected by new castle disease. How are those disease treated in the modern ways? Foot and mouth disease regular vaccination. Anthrax vaccination once a year. Rabies vaccination.

Tooki. Thank you for your wonderful presentation. Although some….Lets quickly concludes by looking at all those diseases. Thanks once more for the presentation. We go and ask more because some of us we don't know some of those names in our vernacular. We have to go out there ask the elders in the community. What is it that they are doing when they find out that the animal is sick and how do you call those names in your vernacular. Is that clear!

Learner: yes

Tooki: Because sometimes you can just tell the symptoms and then they will tell in whatever vernacular language. Is that clear!

Learners : yes

Tooki: let just look at various diseases . aa that first one is (FMD) foot and mouth disease. I think most of you did very well by saying that there painful blisters on the hooves. You can see here it is very, very painful. That is why at the end of the day the animal will be … a lot of saliva, the animal produce a lot of saliva because of those painful blisters. You can see here it is very painful. The next disease is anthrax. You mentioned that one you highlighted it very well. The animal is mostly food dead. When it is food dead you will find that they will be blood coming from all the opening. You can see this one is dead completely. Then we say don't open, that is what we call spores. You will expose the spores. Then for that matter also affects human.

Learners: hhmm.

Tooki: We have new castle disease. How do you call .... You can see there some of you, you were talking about the twisting head is in the wings. The brucellosis we spoke about abortion. Retain placenta. That is one for Rabies you can see that dog is very aggressive. You can see a lot of saliva. In short let me thank you very much for your time. We are not going to disturb another presentation. I have given you home work please let go and do that one and you bring to me all

this papers tomorrow. Number one; find out from the elders how they treat diseases traditionally. Now you go back to the elders not your own ideas we need ideas from the elders. What do they do or do they use, try to ask them those years, what is it that they use to do? How do they use them? Were those treatments effective? Some of you were talking about ash. You have to find out from the elders were those treatment effective. And any cultural believe about diseases. Thank

Appendix M: Lesson story Tooki

Mediation during lesson

Psychological function

Resources

Teacher and learners

Tooki

Lesson 2 story

Animal production: animal health

He greets the learners and starts the lesson by finding out the factors that affects livestock production in Namibia: learners mentioned rainfall, availability of food, drought, and diseases. he told the learners the topic was on animal health and diseases. The teacher gives work sheets and explains them. In various groups the look on the work sheets. Names the diseases in English and vernacular, the symptoms in English. What do they do when the animal shows the signs of ill health. He tells the learners to focus on indigenous ways of doing things without consulting the vet. They also looked on how do they treat the diseases traditional and in western ways and they were given five minutes to work.

He repeats the instructions again to the learners. He was advises them that if they do not know the disease in English they can mention it in their mother tongue. The learners are also advised to added a lot of things, they can write key words only and the presenter will elaborate more. The teacher ask the learners to start presenting. They mention diseases like foot and mouth disease, rabies, anthrax. The isolation of animals comes many times and the use of ash. At the end of their presentations the teacher thanks the learners for their good presentation and urges them to go and ask more from the elder and parents. What to do when the animal has diseases.

The teacher then shows the pictures of diseases on data projector and he explains them. He thanks the learners and gives them home work. He explains the home work what is expected from them to do..

Appendix N: Reflections

Reflection John 8 August 2018

1. What did you learning during presentation?

I learned that teaching in my mother tongue enhances understanding .There were many terms /concepts I learned in Otjiherero , specially the names of diseases

2. How did the presentation affect your ways of doing things?

It made my work much easier as those learners who cannot understand English well had an opportunity to express themselves in their vernacular and thus made them comprehend further.

3. Reflection on the lesson planning?

There were many aspects that pulled my interests such as the instruction to the lesson, How to set up worksheet and inputs during the lesson had a huge impact.

Mr. TookI/ 1 August 2018

Reflection on the presentation

1. **What did I learn during the presentation**

   I learnt different types of diseases in different languages e.g. Khoekhowagowab, Oshiwambo and in Afrikaans.

   I also learn different presentation skills from my colleague. The use of technology to enhance teaching and learning was of outmost important skill that I learn during the presentation.

   Learn that pupils have different ways of understanding the subject content hence as a teacher one should use different teaching methods to accommodate individual needs. The use of group discussion help learners to express their views and this enable a teacher to build on learners existing knowledge.

   The use and incorporation of indigenous knowledge in the lesson will enhance the understanding of the subject.

2. **How did the presentation affect ways I do things?**

   Learners learn differently, there are those that learn by doing, those that are actively engaged in the lesson under discussion hence as a teacher I learned that using different teaching methods will enhance teaching and learning.

I also found that learners are not empty vessels; they have vast information that need to be built on.

Use learners centered approach than teacher centered that we are using.

Learners enjoy group discussion as they free to air their views and actively participate in the lesson.

The use of colleagues in same field of study to teach or plan the lesson together can enhance the understanding of the lesson; hence one should seek help when you find it difficult to teach a certain topic.

3. **Reflection on the lesson plan.**

The lesson planning was more interesting as it was more of learner centered. I learn that if you plan a lesson well in advance you will be more focus and the flow of the lesson will be according to the plan i.e. from the introduction to the assessment activities.

When one plan the lesson, you tend to be well organized and manage time accordingly.

Questions and answers

Tooki

The use of ash and if they are still using it.

Ash has been used and still used to control parasites especially the external parasites.

Ash can be applied on animal's body or used in animal house e.g. chickens to control the parasites, this control method is still being used.

Animals are still being isolated to prevent the spread of diseases.

The use of bitter bush, acacia and wood ash to control diseases like brucellosis, abortion, retain placenta is still being used in our community.

On feeding animal with supplements the use of salt, crop remains and mixed camelthorn with salt is common in my community. Moving animals to salt pan is still common.

On dehorning, there are those members of my community that dehorn using the modern way, while others are not dehorning their cattle reasons being sign of pride and animal can defend itself against predators.

On castration, the using of knives has being replaced by Burdizzo and the castrator with rubber rings.

Again, there are those rich people in the community that keep castrated animals as a sign of wealth although some are moving away from the traditional way of farming to modern way of making money hence, they sell the castrated animals to get a good price.

Reflection John 2

1. How did the inclusion of IK affect the lesson delivery?

The inclusion of indigenous knowledge in the lesson enhances the understanding of learners and made the lesson interesting as learners were happy to know things in their language.

2. What where the positive things about the inclusion of indigenous knowledge {IK} you noticed?

Learners were able to articulate concepts in their vernacular languages; they were happy and felt that studying things in their own languages was a good idea.

3. What were the negative things about the inclusion of IK in the lesson you observed?

The cultural beliefs were misconception and most of them that learners brought forward could not be proven beyond reasonable doubt.

4. How can you describe the experience of including IK in the lessons on animal husbandry?

Learners knew most of the aspect on animal husbandry in their mother tongue and were keen to proudly spell those names in their languages.

5. Which part of the lesson did you enjoy and why?

Animal diseases & parasites, learners were asked to identify the diseases & In English & their vernacular and it were very interesting.

6. Which part of the lesson you could not enjoy and why?

Breeding &selection learners did not know much in their vernacular language.

7. After planning model lessons and taught them, do you think you accomplish more than you could or not?

I accomplished hence, the projector made the whole lesson interesting and learners were really enjoying.

8. How was the mediation during the lesson carried out?

My colleague,Tooki empasise more on factors to consider when selecting animals and also curried same cultural beliefs.

9. Which part of mediation did you like and why?

It was on breeding & selection where Mr.Tooki explains further on the two bulls that were displayed on the projector.

10. If you were to re-teach the lesson, how would you improve the mediation?

I will use more pictures of local people on how they do things locally and some pictures of western ways of doing things.

Reflection Tooki

1. How did the inclusion of IK affect the lesson delivery?

Learners where actively involved in the lesson, although most did not know the modern way of feeding animals and treating of diseases. Learners feel more comfort in their vernacular when using of IK.

Translation of terms from local languages to English was a problem.

2. What where the positive things about the inclusion of indigenous knowledge {IK} you noticed?

*The use of local languages, made learners to understand the content well.

There was open discussion, learners feel free because the lesson was delivered from what they know to and zero in to what they don't know.

*Learners, learn from one another on different ways of feeding and way of treating diseases.

3. What were the negative things about the inclusion of IK in the lesson you observed?

-The use of vernacular language as there diverse cultural belief

-Cultural beliefs sometime mislead the learners hence clear distinction where made on when to use those believes. E.g. calves born with cull defects is a sign of that there will be increase in the number of livestock.

-Translation of local language terms to English was a problem e.g. name of diseases and different herbs used to treat diseases.

4. How can you describe the experience of including IK in the lessons on animal husbandry?

-Learners know more about livestock, especially feeding and diseases, ways of breeding.

-Most learners are from cattle farming background; hence they had vast knowledge on livestock husbandry.

5. Which part of the lesson did you enjoy and why?

Livestock health and diseases learnt most diseases in different vernacular as well as traditional ways of treating diseases and controlling of parasites in livestock.

-Various presentations as this build confidence among the learners.

6. Which part of the lesson you could not enjoy and why?

Breeding, it was more on theory, most learners where having problems in defining the breeding systems.

Cultural beliefs and practices as it was misleading and learners feel is the only ways that one can use in livestock production.

7. After planning model lessons and taught them, do you think you accomplish more than you could or not?

Competencies where accomplished and achieve more was done, learners enjoyed the lesson and presentation as they were free to express themselves. Time allocation was enough for lesson delivery.

8. How was the mediation during the lesson carried out?

Mediation was done at the end of each presentation.

9. Which part of mediation did you like and why?

Cultural beliefs on breeding and selection e.g. cull defects as sign of increase in productivity there were a lot of deliberation on cull defects, temperament as selection method. Belief that parasites infestation is associated with poverty.

10. If you were to re-teach the lesson, how would you improve the mediation?

The use of more teaching and learning aid.

Immediate correcting to bring about an agreement and correct deficiency

Appendix O: Analysis and sub themes

Categories	Sub themes	Themes	
			Literature

: Indigenous knowledge means those are skills or practices that people were using in the pas (T) well I think indigenous knowledge refers to knowledge that come from the local people around or knowledge on how people have been doing things in the past (J). ok. Indigenous knowledge is the knowledge our local people have on the practice of animal husbandry and the knowledge that they are using at their home regarding the animals, cattle or any livestock that they are keeping at home (M) Indigenous knowledge is the traditional knowledge that was then use by our grand fathers then inherited by our parents (O)	Skills and knowledge possessed by local people		Shizha (2013); Kibirige and Van Rooyen (2006)

Those are information that are not documented (T). Those are skills we get from our people through oral communication (T). now moved from generation to generation is the one that we are currently used (O).	IK is not documented it is passed orally from generation to generation	Participants' understanding of IK	Kibirige and Van Rooyen (2006) Mavuru and Ramnarian (2017) Shizha, 2013.
.They were using and is still used methods like they were isolating sick animals from others (T)	Diseases prevention	Indigenous Knowledge on diseases treatment and prevention	Masuku, 2018
Where by this will prevent further spread of diseases. (T)	Reason action		
The other thing that I know traditionally there are some roots of certain plants that they used to control common diseases (T) They were treating the diseases like tetanus in cattle, they also use to treat brucellosis in cattle by using wood ash and by using some herb roots and still used(T) the animals those that are sick. Normally they could use traditional herbs to treat animals (j) For example the animal that is having foot and mouth disease, they used to normally put ash on the wound itself (J) Mopane when the animal is having complication in giving birth. That is what they were using. The	Animal disease treatment and control		Jadeja, Odedra, Solanki and Baraiya (2006) Subrahmanyeswari and Chander (2013)

Carmel thorn was use for .. also the some. The barks of the Baobab tree is the one that they were using when the animal is having lumpy skin. skin problem (J) there are many diseases but what I got is on eye problem (M) The constipation in calves when they are sucking from their mothers. Sometimes they used to suffer from constipation (M) animal is sick let say it is having running diarrhea . (O) Once the animal is having that symptoms of Pasteurellosis . (Okapirauka in Otjiherero) we cut the ears, and the tip of the ear and the tip of the tail so that that blood can move out (O) Orflor warts on the on the mouth on the kid we normally we use to either take the copper wire. we tied on either on the ears or we make a small hole here in the neck then we tie on those small ones instantly it disappeared (O).			
used the leaves of Acacia plants. in our language we call it Otjimbuku (Tjiherero) sometimes they use acacia.. that one we call it Omuthauna (T)	Example of plants used for treatment of diseases		Mapara (2009)

yes the Carmel thorn tree is one that they were using. They also used the leaves of the Mopane tree . Then the barks of the Baobab tree (J) *Boscia albitrunca* (Omunguingi in Otjiherero) That one we use to treat some illnesses such as if the wound the animal has been cut open. (O)			
They can use the leaves, you crash the leaves, after crashing the leaves you mix it with water then you give it to the animal to drink. (T) The Obaherero people the combine tobacco and mix it with ash when the animal is having eye problem they crash it fine and then they put it fine like that in the eyes of the animal. (M) The farmer will crash the soup called sunlight. They mix it with water and the animal is given to drink to help with constipation (M) you can take the roots of a *Acacia mellifera (Omusaona in Otjiherero)*. The you crash that roots or if you do not crash it then let it dry out you just cut when it is fresh and then put you , you crash a little bit with the stone or something that is hard or then you put it in hot water and you let it can boil and that water you let it to stand after boiling. And that water let it to cool but not to be much cold while its is a little bit ,while between hot and cold then you let that calf to drink (O)	Procedure to prepare the medicinal plant		

crash that the leaves of Bosca albitrunca and then while the powdered is a little acidic something very so then you apply it there (O)			
mostly to cure diseases. (T) when it comes to those diseases. They were trying to see how they can properly manage the animal (J) so that they can keep the animals for quite a long time. (J) to cure the eye problem (M) the ash that is in the tobacco that you are putting in the eyes they are itching. When it is put in the eyes, maybe there was something that was in the eyes, the eyes will be watery and the tears will be coming out whatever was affecting the eyes will come out (M) It also helps to stop diarrhea (O) .. to heal fast and then to help with the clotting. The clotting process and also the flies won't be able to sit around. (O)	Reason for administering		
: Otji kurioma that one is a poisonous plant Gifblaar in Afrikaans (*Dichapetalum cymosum*)we use to, sometimes when the animal shows some symptoms of it, we, we mix ee spirit with jik and then we inject the animal with it. It help (O)	Treatment of animal that ingested poisonous plant		

Apart from that the use of wood ash can be applied on animals to prevent both internal and external parasites.. some herbs from certain plants . application of ash in the house of animals to control external parasite (T) If it is also having ticks they used to use ash to apply there targeting areas were ticks are hiding that is one way (J)	Parasite control	Indigenous Knowledge on parasite control in animals	Masuku (2018) Subrahmanyeswari and Chander (2013)
They could just take the ash and apply on the animal, sometimes they mix it with water then they apply on external parasite like ticks. (T)	Procedures for application		
Mostly they used the Carmel thorn, because when you look at the ash it is a bit bitter compared to other trees (T)	Example of tree ash used to control parasite		
when the animal is having difficult in giving birth. You could also assist, … you find the situation may be instead of the head passing first between the legs you might find it will come out first the hind quarter, in that instance you will find that it will be very difficult to give birth so they were also having those skills on how to turn the calf in the right position (T)	Birth difficulties	Indigenous knoweldge to solve the birth difficulties and after birth	

so that they can serve both the calf and the cow. (T)	Reason for the action		
There are also instance when the afterbirth take time to come out, so what you do you use the hand and the bottle , you put hand in and then you put the bottle and you turn so that it come out . sometimes you mix water with ash or water with soup to help the after birth to come out . put the hand in on the placenta turn the bottle (show signs of rolling the placenta on the bottle and pulls down) : They mix the water with ash and give to the animal to drink… from the information I got to act as antibiotic. (T)	Ways to remove the placenta after birth		Saha (2014) Masuku, 2018
You put water mixed with soup or ash in the uterus	Treatment of birth canal after removal of placenta		
To prevent the further spread of infection (T)	Reason for putting ash in the uterus		

were using some plants like the pods of certain plants , also crashed mealie meal that they harvested and mix with the pods of certain plants like the Carmel thorn . Moving animals to salt pan is still common (T) The use to let the animals on the natural grass and sometime you can cut the grass and bring it to the calves at home, but the bigger animals they were rely on their own. (J) most farmers let their animal graze on grass, shrubs, tree or any available food that can be provided that is sufficient enough to provide the animal with all their nutrients, (M) extensive grazing management (O) during drought time …. use Grawia flava ... and we also have a little bit of Terminalia seriela (Omusiaseta). (O) very thin animals that cannot go far, we, we keep them in kraal and then we go out and then you cut those Grawia flava as well as Boscia albitrunca, …. bring to the animals so that they can eat. (O) . If where I am staying there is no good grazing I will move to the next area where there is better grazing (O) then we were not used to ask permission , you just move then you start you see people start forming kraals, because that area has got plenty of grazing and now because of aaa settled agriculture is a little bit cumbersome process. For You have to ask for	Animal Feeding and procedure to move animals to another place.	Indigenous knowledge on the feeding of livestock	Masuku's (2018) Thapa, Walker and Sinclair (1997)

permission for you to move to that particular person , place, first you go and if they say yes you can come over with a certain amount of animals. Those are the one you will take over to that place.(O)			
they will crash them and mix them with salt. (T)	Method of preparation (pods)		
They were looking on the ways of improving animal nutrition not only for animals to depend on grasses, they were maintaining the animals during the drought. (T) the seed pods are sources of protein (T)	Reason for feeding		
Apart from that during the drought seed pods were collected and stored and used during drought as supplement for livestock. They feed it with salt (T)	Collection and storage of feeds		

The female animals used to be dehorned using knives by cutting the horns (T)	Dehorning activities		
when they were very young from two to three months. They were also considering that when you dehorn late the horn bud will be hard and will be very difficult for one to dehorn. They were mostly milking those cows. It was easy to handle or to approach those animals without horns. Apart from that it was the sign they looked nice. The other reason they take less space especially when they are feeding. (T)	When was dehorn done and the reasons		Handling activities of dehorning and castration of animals
We can talk about castration. It was a practice that was done (T) castrate the, the horses, cattle with knives the blood process , whereby we cut the … open and remove the testicles . (O)			
in the past they used to castrate animals using the sharp knife. in our day there are a lot of tools and equipment they are using like burdizzo, castrator with rube ring. (T) they were castrating . they were castrating using stones (J)	Castration tools		Abera, Kabede and Gizaw (2014)

Cut through the scrotum and then remove the testicles (T) . How they were doing it. the stone were put underneath , then you put the testis on it. Take the other one and you smash the testis until they are completely destroyed. (J)	Castration procedure		
common table salt as disinfectant . compared to now days where people are having antiseptic . (T) healing process we take the , the acacia mmm how do you call this one ? Ziziphus mucronata (OMukaru) that is the Buffalo thorn one. Then that one we take its leaves and with its roots. You dry them up and then you crash it and then you mix that two the dried leaves and the dried roots. Mix it with ash then that ash and then that ash and that mixer after you cut it …makes it to become very drier faster than the normal process.(O)	Prevention of infection and healing after castration.		

to control unwanted breeding. It was also a sign of wealth as mostly when you castrate the animals looks nice and became fat. (T)			Abera, Kabede and Gizaw (2014)
Breeding and selection they were also doing that by looking at the animal with desirable characteristics (T) It was an open area where they were staying a bull from another farmer will just cross all. You have your cow a bull from another farmer is coming to mate with your cows (J) What they do there is a practice called mafisa in silozi where the farmer exchange their animals, may be it can be a bull. You borrow a bull to come spread its characteristics in you kraal. Or to mate with you cows. Or you can take you cow to the kraal with the characteristics that you want (M) We were using the inbreeding process , but now due to more knowledge and based on extension services we have improved we buy now breeding stock from outside (O) traditionally we use to look among you calves which one is better quality (O) Even your neighbor 'animal could come serve your cow, my neighbor 's bull , other households ' bulls could come and serve in my kraal (O)		*Indigenous Knowledge on breeding and selection of breeding stock*	Abara, Kabede and Gizaw (2014) Kohler-Rollefson (2000) Msanga, Mwakilembe and Sendalo (2012);

As the calf is growing they could ear mark it as a bull. (J)			
judge looking at the characteristic of a bull for example. If it is a bull they have to look at for example well developed testis, body structure of the bull it must k have a V shape toward head toward the front. The dairy cattle the will look at the udder of the cattle it must be well developed (M) selection usually what they were looking at is just body size , when it is having a big body. That is how the selected the bull (J) : the mother is huge, contains a lot of milk, and therefore the assumed the off springs will also good milk produces (O)	Factors to consider when selecting animal for breeding		Kohler-Rollefson (2000) Abera et al. (2014) Urgessa et al. (2013
After birth the calf is having sharp teeth the farmer is always using the charcoal to smoothen teeth so that when it is suckling it is not sensitive to the teeth of the cow. (M)	Treatment calf's sharp teeth		

to pass on those information , help us or the learners to learn from what they know to what they don't know. Because the concept of teaching it encourage us to teach from known to unknown (T) So the moment as you start with what they are doing at home and give new idea that will help the learners to understand much better (J) If it is incorporated it will be easy for the learners to understand the curriculum of agriculture. they will even ask more at home because it is the knowledge known by their parents. (M) ……. traditional method is the one we come a long with and is the one of the best immediate remedy to rely on because at our rural areas we don't have refrigerators . (O) will teach the learners from what they know. when you are introducing the lesson on disease you might ask them what those thing that you are doing at home (T) will enhance their understanding and participation in classrooms. (J) They will be help and they will even ask more at home because it is the knowledge known by their parents. I think indigenous knowledge must be incorporated in our education it will be easier, it will make agriculture to be easier to be understood by the learners (M)	Reasons for inclusion indigenous Knowledge	Reasons for inclusion indigenous Knowledge	to Mukwambo, Ngcoza and Chikunda (2014) Mavuru and Ramnarian (2017 Namibia. Ministry of Education (2010) Kibirige and Van Rooyen (2006) Cronje, Beer and Ankiewicz (2015)

inclusion of indigenous knowledge in the curriculum because it gives the learners the immediate basics solutions to the basic problems that we cure in most cases. (O) to hanest it with modern technology. So that they know if this one is not there they should rely on this one (O)			
use what they know…. ask the learners you find that a certain animal is having diseases. What is it that you are going to do. the use of resources (T) we can visit older farmers, . we can conduct interview or questionnaires and bring this back to the classroom. can invite some of the parents to the classroom when ever a specific topic is being taught (J) I will take learners out aa from the class take them for excursion . when you give work to the learners you can even invite the parents to demonstrate this indigenous knowledge to the learners for them to understand (M) teach them in vernacular so that when you talk about certain disease they know how the call that	Teaching strategies	Teaching strategies on the integration of IK in lessons	Ministry of Education and Culture (1993) Klein's (2011) Ogunniyi and Ogawa (2008) Mhakure and Otulaja (2017) Ludwane, Mashozhera, Mhlekwa, Nuntsu, Speckman and Seehawer (2015) Erinosho (2013)

disease in their language. the proper photos of those the (O)			Kibirige and Van Rooyen (2006) Namibia. Ministry of Education (2010) Shizha (2007) Toit and Sguazzin (1995) Kasanda, Lubben, Gaoseb, Kandjeo-Marenga, Kapenda and Campbell (2005) Vygotsky (1978)
use resource that are relevant to the subject. (T can use the resource people there are elders in our communities they have been farming . give the topic on hand you might say go and find out at home what are the skills and indigenous knowledge the people were using in the past and how were the useful. there	Teaching strategies on incorporating IK	Mediation during lessons	

might be some of those learners who have those skill we can use them also to explain to others. (T) give questionnaire to learners to go to get information from specified farmers, old farmers (J) learners have to find more on topics, maybe investigations. the knowledge we get from our books we compare and see what is good for our topic. making sure that they there is no confusion between our indigenous knowledge from the parents and also what we have in our text books. (M) when we speak about the importance of trees, they go out and they collect those different parts of trees and they identify those trees and then, they also explain the type of diseases that are being treated (O)			
: one thing which I also want to, may the policy markers. I have see many learners know knowledge on ik and skills but when it come to marking assessment you might find that a specific will ask that how do you control diseases. Some of these learners because they know a certain concept or they know what they normally use. Some times they might include that one as the answer. As the markers we sometimes penalize those learners. Although the answer what they give is what they do at home. So may be the issue (T) the problem is that it will be included but when it come to grade 10 level	Lack of recognition IK during assessment		Ogunniyi and Ogawa (2008) Kreisler and Semali (2001) Webb (2013) Shizha (2007)

, marking thereof, some of this knowledge are not accepted. (J) while we have this grand fathers and grand mothers around people should move out and gather more information, because those guys they sit with knowledge that is not recorded anywhere, not written down but they sit with that knowledge, so once we go out and gather that knowledge and document it or put it in book for so that future generation could also have access to it (O)	Documentation of unrecorded or unwritten knowledge for future access.		Kibirige and Van Rooyen (2006) Mavuru and Ramnarian (2017) Shizha, 2013.

Appendix P: Analysis of some reflection

Learning from lessons

Improvements on lesson

assistance

Believe

Prior knowledge

Challenges

Role of ik

	Sub theme	Themes	Theory	
			Literature	Conceptual/ theoretical framework
Q1 how did the inclusion of IK affect the lesson delivery?	The inclusion of indigenous knowledge in the lesson enhances the understanding of learners and made the lesson interesting as learners were happy to know things in their language. (J)	Role of IK during lesson	Namibia. Ministry of education (2010) Mavuru and Ramnarian (2017) Stears, Malcolm, Kowlas, 2003)	

	Learners where actively involved in the lesson, although most did not know the modern way of feeding animals and treating of diseases. Learners feel more comfort in their vernacular when using of IK. Translation of terms from local languages to English was a problem. (T)	Challenge encountered	Shihza, 2007	
yQ2what were the positive things about the inclusion of IK	Learners were able to articulate concepts in their vernacular languages; they were happy and felt that studying things in their own languages was a good idea. (J)	Vernacular language, prior knowledge and understanding	Kibirige and Van Royoon 2006 Klein, 2011; Shihza, 2007	SCT mediation Identity, belonging LCE

	*The use of local languages, made learners to understand the content well. There was open discussion, learners feel free because the lesson was delivered from what they know to and zero in to what they don't know. *Learners, learn from one another on different ways of feeding and way of treating diseases. (T)			
Q3What were the negative thing about inclusion of IK in lesson you observed	The cultural beliefs were misconception and most of them that learners brought forward could not be proven beyond reasonable doubt.(J)			

	-The use of vernacular language as there diverse cultural belief -Cultural beliefs sometime mislead the learners hence clear distinction where made on when to use those believes. E.g. calves born with cull defects is a sign of that there will be increase in the number of livestock. -Translation of local language terms to English was a problem e.g. name of diseases and different herbs used to treat diseases. (T)			

Q 4 How can you describe the experience of including IK in lessons	Learners knew most the aspect on animal husbandry in their mother tongue and were keen to proudly spell those names in their languages. (J) -Learners know more about livestock, especially feeding and diseases, ways of breeding. -Most learners are from cattle farming background; hence they had vast knowledge on livestock husbandry.(T)	Prior knowledge on animal husbandry	Namibia. Ministry of Education, 2003 ; kibirige and Van Royoon, 2006; Namibia. Ministry of Education and culture, 1993,	Gibbons 2003
Q5 which apart of the lesson did you enjoy and why?	Animal diseases & parasites, learners were asked to identify the diseases & In English &	Learning diseases , parasites in vernacular and traditional		

	their vernacular and it were very interesting. (J) - Learners know more about livestock, especially feeding and diseases, ways of breeding. Livestock health and diseases learn most diseases in different vernacular as well as traditional ways of treating diseases and controlling of parasites in livestock. -Various presentations as this build confidence among the learners. - T)	methods of treatments		

Q6 Which part of the lesson you could not enjoy and why?	Breeding &selection learners did not know much in their vernacular language.(J) Breeding, it was more on theory, most learners where having problems in defining the breeding systems. Cultural beliefs and practices as it was misleading and learners feel is the only ways that one can use in livestock production. (T)	Lack of terminology on breeding and selection and cultural beliefs as misleading	Mikwambo, Ngcoza, Chikunda, 2014; Kibirige and Van Rooyen, 2006	

Q7Afterplanning mode lessons and taught them do you thing you accomplish more than you could or not	I accomplished hence, the projector made the whole lesson interesting and learners were really enjoying. (J) Competencies where accomplished and achieve more was done, learners enjoyed the lesson and presentation as they were free to express themselves. Time allocation was enough for lesson delivery. (T)			Mediation
Q8 how was the mediation during the lesson carried out?	My colleague,Tooki empasise more on factors to consider when selecting animals and also curried same cultural beliefs. (J) Mediation was done at the end of each presentation. (T)			Lantolf, 1994; Nieto, 2007 SCT, mediatin

Q9 Which part of mediation did you like and why	It was on breeding & selection where Mr.Tooki explains further on the two bulls that were displayed on the projector. (J) Cultural beliefs on breeding and selection e.g. cull defects as sign of increase in productivity there were a lot deliberation on cull defects, temperament as selection method. Belief that parasites infestation is associated with poverty. (T)	Discussion on the topic		Human being as mediator. Mediating tool (SCT) Mcleod 2014 Interaction SCT
Q10 If you were to re teach the lesson, how	I will use more pictures of local people on how they	Improvement on short coming of	Kibirige and Van Royoon 2006,	(ZPD) SCT

would you improve the mediation?	do things locally and some pictures of western ways of doing things. (J) The use of more teaching and learning aid. Immediate correcting to bring about an agreement and correct deficiency (J)	the lessons presented		Shabani, khatib, and Ebadi 2010, Scott (2016)
Q11What did I learning during presentation	I learned that teaching in my mother tongue enhances understanding .There were many terms /concepts I learned in Otjiherero , specially the names of diseases (J)	Learning during from during presentation.		

	I learnt different types of diseases in different languages e.g. Khoekhowagowab, Oshiwambo and in Afrikaans. I also learn different presentation skills from my colleague. The use of technology to enhance teaching and learning was of outmost important skill that I learn during the presentation. Learn that pupils have different ways of understanding the subject content hence as a teacher one should use different teaching methods to accommodate individual needs. The use of group discussion help			

	learners to express their views and this enable a teacher to build on learners existing knowledge. The use and incorporation of indigenous knowledge in the lesson will enhance the understanding of the subject. (T)			
Q22 how did the presentation affect your ways of doing things	It made my work much easier as those learners who cannot understand English well had an opportunity to express themselves in their vernacular and thus made them comprehend further.(J) Learners learn differently, there		Cronje, Beer and Ankiewicz, 2015; mukwambo, ngcoza and Chikunda, 2014; kasanda, et.al, 2005	

	are those that learn by doing, those that are actively engaged in the lesson under discussion hence as a teacher I learned that using different teaching methods will enhance teaching and learning. I also found that learners are not empty vessels, they have vast information that need to be build on. Use learners centered approach than teacher centered that we are using. Learners enjoy group discussion as they free to air their views and actively			CoP Identity, practice, community, meaning (Wenger) Nieto, 2007 Teemant 2005

	participate in the lesson. The use of a colleagues in same field of study to teach or plan the lesson together can enhance the understanding of the lesson, hence one should seek help when you find it difficult to teach a certain topic. (T)			COP
Q33 reflection on lesson planning	There were many aspects that pulled my interests such as the instruction to the lesson, How to set up worksheet and inputs during the lesson had a huge impact. (J) The lesson planning was more interesting as it was more of learner centered. I learn that if you plan a	Skills and attitudes learnt during workshop	Eun 2008	ZPD (SCT) CoP CoP wenger Identity, meaning, Community, practice

	lesson well in advance you will be more focus and the flow of the lesson will be according to the plan i.e. from the introduction to the assessment activities. When one plan the lesson, you tend to be well organized and manage time accordingly (T)			

Appendix Q: Sub themes and themes

Sub theme	Theme	Literature	Theory
develop the lessons Tooki stands and highlight certain parts of the lesson like one learner said behavior was one of the selecting criterions but rejected that. He agrees with the learner and states they refer to that as temperament. H share some of the strategies **Sharing teaching strategies, ideas, views, knowledge**	Assistance teachers need	Dean 1991	Wenger, Dermott and Snyder 2002 Eun 2008 Shabani, 2016 Teemant 2005
indigenous knowledge in the lesson enhances the understanding of learners and made the lesson interesting as learners were happy to know things in their language. (J Learners where actively involved in the lesson .	Effect of the inclusion of IK on the lesson delivery.	Namibia. Ministry of education (2010) Mavuru and Ramnarian (2017) Stears, Malcolm, Kowlas, 2003)	SCT mediation Identity, belonging LCE

Learners feel more comfort in their vernacular when using of IK. (T) Learners were able to articulate concepts in their vernacular languages; they were happy and felt that studying things in their own languages was a good idea. (J) *The use of local languages, made learners to understand the content well. There was open discussion, learners feel free because the lesson was delivered from what they know to and zero in to what they don't know. *Learners, learn from one another (T)		Kibirige and Van Rooyen 2006; Klein 2011; Shihza, 2007 Klein, 2011	

Learners knew most the aspect on animal husbandry in their mother tongue and were keen to proudly spell those names in their languages. (J) Learners know more about livestock, especially feeding and diseases, ways of breeding. (T)	Description of the experience of including IK in lessons	Namibia. Ministry of Education, 2003 ; kibirige and Van Royoon, 2006; Namibia. Ministry of Education and culture, 1993,	Gibbons 2003 SCT
I accomplished hence, the projector made the whole lesson interesting and learners were really enjoying. (J) , learners enjoyed the lesson and presentation as they were free to express themselves.(T)	Views after planning mode lessons and taught them		Mediation (SCT)
My colleague,Tooki empasise more on factors to consider when selecting animals and also	Mediation during the lesson		Lantolf, 1994; Nieto, 2007 SCT, mediation Lantolf, 1994;

curried same cultural beliefs. (J) Tooki explains further on the two bulls that were displayed on the projector. (J) The teacher gives the worksheets explaining to the learners on the groups teachers uses the projector to display some of the feeds presented the teacher displays the two bulls on the projector and asks the learners which of the two bull will they select and why Tooki stands and highlight certain parts of the lesson like one learner said behavior was one of the selecting criterions but rejected that. He agrees with the learner and states			

they refer to that as temperament. teacher gives work sheets and explains them. Names the diseases in English and vernacular, the symptoms in English. What do they do when the animal shows the signs of ill health. He tells the learners to focus on indigenous ways of doing things without consulting the vet. . He was advises them that if they do not know the disease in English they can mention it in their mother tongue. The learners are also advised to not added a lot of things, they can write key words only and the presenter will elaborate			

The teacher then shows the pictures of diseases and he explains them. The teacher explain the New cattle Disease in Otjiherero explains the home work what is expected from them to do.. . After the learners have finished presenting the teacher projects the pictures of parasites			
I will use more pictures of local people on how they do things locally and some pictures of western ways of doing things. (J) The use of more teaching and learning aid. Immediate correcting to bring about an agreement and correct deficiency (T)	Improvement on short coming of the lessons presented	Kibirige and Van Rooyen 2006,	ZPD) SCT Shabani, khatib, and Ebadi 2010, Scott (2016)

I learned that teaching in my mother tongue enhances understanding .There were many terms /concepts I learned in Otjiherero , specially the names of diseases (J) I learnt different types of diseases in different languages e.g. Khoekhowagowab, Oshiwambo and in Afrikaans. I also learn different presentation skills from my colleague. The use of technology to enhance teaching and learning was of outmost important skill that I learn during the presentation . Learn that pupils have different ways of understanding the subject content hence as a teacher one should use different teaching	Learning during presentations and workshop		Shabani, 2016 Dean, 1991 Eun 2008 Mavuru and Ramnarian 2017 Lantolf 1994 Wenger,Dermott, snyder 2002

methods to accommodate individual needs. The use of group discussion help learners to express their views and this enable a teacher to build on learners existing knowledge. The use and incorporation of indigenous knowledge in the lesson will enhance the understanding of the subject. (T)			
It made my work much easier as those learners who cannot understand English well had an opportunity to express themselves in their vernacular and thus made them comprehend further.(J) … as a teacher I learned that using different teaching methods will enhance teaching and learning.	Effect of presentation on the participants ways of doing things	Cronje, Beer and Ankiewicz, 2015; mukwambo, ngcoza and Chikunda, 2014; kasanda, et.al, 2005; Erinosho (2013	CoP Identity, practice, community, meaning (Wenger) Nieto, 2007 Teemant 2005, Graven 2003

I also found that learners are not empty vessels, they have vast information that need to be build on. Use learners centered approach than teacher centered that we are using. Learners enjoy group discussion as they free to air their views and actively participate in the lesson. The use of a colleagues in same field of study to teach or plan the lesson together can enhance the understanding of the lesson, hence one should seek help when you find it difficult to teach a certain topic. (T)			

			Wenger 1998
There were many aspects that pulled my interests such as the instruction to the lesson, How to set up worksheet and inputs during the lesson had a huge impact. (J) The lesson planning was more interesting as it was more of learner centered. I learn that if you plan a lesson well in advance you will be more focus and the flow of the lesson will be according to the plan (T) When one plan the lesson, you tend to be well organized and manage time accordingly (T)	Skills and attitudes learnt during workshop Emerged with learning **NB**		ZPD (SCT) CoP CoP Wenger 1998 Identity, **meaning**, **Communit**y, practice