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Teachers' Experiences of Teaching Agricultural Science to grades 10 to 12 Learners in the Umlazi District

By

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SUPERVISOR: Dr. Cedric Bheki Mpungose

DECLARATION

I, Dorah Nokuthula Soni, declare that:

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ii. This thesis has not been submitted for any degree or examination at any other university.

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As the candidate's supervisor, Cedric Bheki Mpungose agree/ do not agree to the submission of this Dissertation

Signature_____ Date: November, 2023

DEDICATION

This research study is dedicated to my husband Allen Dumisani Soni, my mother Florah Ntombifikile Lushozi, my sister Rebecca Bonisile Lushozi and my children Mongezi Ambition Lushozi, Lwazi Mille Soni, Progress Mpilonhle Soni and Blessing Sisa Soni for their unconditional love and support.

Abbreviation and Acronyms

RNCS – Revised National Curriculum Statement

DoE - Department of Education

OBE - Outcome Based Education

NCS - National Curriculum Statement

CAPs - Curriculum Assessment Policy Statement

AGRS - Agricultural Science

ICT - Information and communication Technology

PCK - Pedagogical Content Knowledge

SASRI - South African Sugarcane Research Institute

KZN - KwaZulu-Natal

SA - South Africa

KCC- Knowledge of content and curriculum

KCT- Knowledge of content of teaching

SCK- Subject content knowledge

DBE - Department of Basic Education

FET - Further Education and training

KZNDARD - KwaZulu-Natal Agriculture and rural development

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Abstract

The purpose of this study was to explore the teachers' experiences of teaching Agricultural science to Grades 10 to 12 learners in the Umlazi District, KwaZulu-Natal. The study intended to answer the following question: 'What are teachers' experiences of teaching grades 10 to 12 learners agricultural science?', 'What informs teachers experiences in teaching agricultural science?' In answering these questions, a qualitative case study research style was utilised in the study. Shulman's Pedagogical Content Knowledge (PCK) theory of learning (1986) was used to guide the exploration of teacher' experiences in the teaching agricultural science to grades 10 to 12 learners. Four grades 10 to 12 agricultural sciences teachers were purposively selected as participants, using convenience sampling to select those who were most accessible.

To understand teachers' experiences of teaching grades 10 to 12 learners agricultural science, the data collected from both semi-structured interviews and a questionnaire were analysed and discussed. Findings show that some of the teachers found teaching grades 10 to 12 learners agricultural science challenging due to lack of relevant teaching and learning resources. The findings also revealed that lack of resources influences the teaching and learning in both positive and negative ways. Recommendations for Department of Education to provide resources for teaching agricultural science in schools were made. Furthermore, this study recommends that further research be conducted regarding teachers' experiences of teaching agricultural science outside KwaZulu-Natal to provinces like Gauteng, Limpopo.

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CHAPTER ONE
BACKGROUND TO THE STUDY

1.1 Introduction

The teaching of Agricultural Science to Grades 10 to 12 learners in the Umlazi district, KwaZulu-Natal Province, presents a unique set of challenges and opportunities. This study seeks to explore the experiences of teachers teaching Agricultural Science in this context, with the ultimate goal of improving teaching practices and learner outcomes. The Umlazi District provides a distinct context for this study, characterised by its rural setting and socio-economic challenges. The justification of this study lies in the importance of Agricultural Science education in promoting sustainable development, food security, and career opportunities for learners. However, teaching Agricultural Science poses unique challenges, including limited resources, lack of teacher training, and learner disengagement. This study employs a qualitative research design, utilising semi-structured interviews and questionnaires to collect data. A brief overview of the research methodology is presented, outlining the data collection used. Lastly, this chapter concludes with an outline of the subsequent chapters in this dissertation. The next chapter presents a literature review, followed on chapters on the research methodology, data analysis, findings and conclusions.

1.2 Title: Teachers' Experiences of Teaching Agricultural Science to Grades 10 to 12 Learners in the Umlazi District, KwaZulu-Natal

1.3 Focus and Purpose of the Study:

This study delves into the experiences of teachers teaching Agricultural Science to Grades 10 to 12 learners in the Umlazi District, KwaZulu-Natal, South Africa. Focusing on three high schools, the research explores the unique challenges and successes faced by teachers in diverse settings: one urban and two rural schools. Through in-depth analysis, the study examines the experiences of three experienced Agricultural Science teachers, comprising two female and one male teacher, teaching grades 10 to 12. By exploring their pedagogical approaches challenges, and successes, this study aims to gain a nuanced understanding of teaching Agricultural Science in the Umlazi District, ultimately informing strategies to enhance teacher support and learner outcomes.

1.4 Location of the Study

The study was conducted in three secondary schools from grades 10 to 12 in the area of Umlazi district. Umlazi district is a district with rural, township, and urban areas. There are 144 secondary schools and thirty-one that offer agricultural science as a subject in the further education and training phase. Umlazi is the fourth-largest township located on the east coast of KwaZulu-Natal. The Umlazi urban area is situated in the southern part of KwaZulu-Natal province. It lies along the south bank of the Mlazi River and adjoins the city of Durban in the southwest. In 1965, Umlazi was officially opened to Black residents by an Anglican mission. Umlazi also became part of eThekwini Municipality that has committed to local socio-economic development of Umlazi and Malukazi with a view to transforming the socio-economic landscape of the township. The key strategic focus will be on the development and strengthening of the public investment area, creating community and commercial facilities and amenities. There are local industries producing beverages, wearing apparel, leather goods, sawn wood, and wood products such as paper, rubber goods, and plastic products. Three schools teaching agricultural science in the further education and training phase (grades 10 to 12) were selected for conducting the study.

1.5 Rationale of the Study

In my personal and professional experience as a teacher of agricultural science, I have observed that the content is divided into five aspects: animal studies, plant studies, agricultural economics, basic genetics, and basic chemistry. The reason for choosing this study is that I was a concerned teacher from one of the schools where the study is conducted. From my teaching experience, I observed that some of the teachers are struggling with the teaching of agricultural science due to lack of resources for effective delivery of the subject. The Curriculum Assessment Policy Statement (CAPS) highlights that for schools to offer agricultural sciences subjects they should be provided with textbooks and an agricultural science laboratory where various practical work or experiments could be carried out or demonstrated (DBE, 2011). This was intended to prepare learners for furthering their education and becoming farmers. However, this seems impossible due to inadequate teaching and learning resources in schools. According to Anieke (2019), agricultural Science subjects have the potential to empower learners with essential skills of self-reliance. Therond, et al, (2017) indicated that learners of agricultural sciences need to learn how to efficiently produce crops or rear animals. Thus, the success of learning these skills only depends on the teachings of both practical aspects and the theory of the subject.

Numerous research studies (Al-Samarraie, et al, 2020; Wells, et al, 2019; Smalley, 2024), have highlighted the challenges of teaching agricultural science, particularly when essential teaching and learning resources are lacking. The absence of necessary resources, such as laboratories, equipment, and farm facilities, can hinder the facilitation of practical work and engagement of learners. This scarcity of resources can lead to a lack of hands-on experience, making it difficult for learners to understand complex concepts and develop skills.

This confirms that the teaching of agricultural science in schools is clouded by many challenges due to lack of support from the school in providing the teaching and learning resources for effective delivery of the subject. Many scholars have argued that lack of teaching resources in schools leads to poor content delivery of the subject. For example, Parker et al, (2020) emphasise that the challenges facing under-resourced schools must be addressed to prevent the decline of agricultural science education. The study highlights that schools with limited resources, including inadequate infrastructure, outdated textbooks, are at a higher risk of dropping agricultural science from their curriculum. This is because the lack of resources hinders the effective teaching and learning of the subject. By attending to the challenges facing under-resourced schools, educators, policymakers can help to ensure that agricultural science education remains a viable and attractive option for learners. Loss of the subject is likely to increase the problem of learners' lack of relevant agricultural skills. Therefore, it is the intention of this study to explore teachers' experiences of teaching agricultural science to grades 10 to 12 learners in the Umlazi District.

1.6 Problem Statement

Globally and locally, agricultural science teaching and learning requires a provision of learning and technical resources (Vinoth & Paramasivam, 2016). Education reform has for several reasons moved towards the centre of the education system. These reforms are initiated and developed at the state level but implemented by teachers at the school level. The change in the curriculum from curriculum 2005, known as Outcomes-Based Education (OBE), led to the introduction of the Revised National Curriculum Statement (RNCS). Thereafter, the National Curriculum Statement (NCS) was introduced; and currently, Curriculum and Assessment Policy Statement (CAPS) has seen new content in agricultural sciences being introduced (Gumede & Biyase, 2016). Despite the effort by the department, there have been reports of challenges encountered by agricultural science teachers due to poor teaching resources (Afolabi, et al, 2019). The CAPS policy stipulates that for schools to offer this subject, they should have the relevant teaching and learning resources for effective delivery of the subject.

This is because the use of resources in the teaching of agricultural science will help the teacher to deliver lessons effectively. However, a plethora of studies (Geverola, et al, 2022) have noted that the majority of the schools that offer agricultural science continue to have insufficient teaching and learning resources. On the other hand, Diise, et al, (2018) argue that the lack of sufficient teaching and learning resources for the subject makes it difficult for learners to acquire the needed skills in the agricultural science sector. The majority of learners struggle to learn the topic due to inadequate resources. This results in many schools producing learners who are unable to participate actively in the economic sector. This suggests the need for this study at uMlazi district as a whole; and specifically, on the teachers' experiences of teaching agricultural science to grades 10 to 12 learners.

1.7 Background of the Study

For decades, agriculture has been associated with the production of essential food crops (Liliane, & Charles, 2020). According to Coulibaly and Li (2020) the main source of livelihood for many people is agriculture. Globally, agriculture provides food for man, feed for animals, and provides raw materials for our industries (Osorio, et al, 2021).

Hence, it is the backbone of the economy that supports economic growth, food security, and poverty eradication (Neglo et al, 2021). Today, processing, marketing, and distribution of crops and livestock products are all acknowledged as part of current agriculture (Li, et al, 2020).

Also, in most developing countries, agriculture is known to be the backbone of economic development (Praburaj, et al, 2018). According to Derqui, et al, (2020) most high school learners are unaware of where and how the food they eat on daily basis is produced. Some learners believe that food simply comes from the store; and many learners see agriculture as only farming. However, many studies claim that contributing positively to poverty eradication through the farming system is not often recognized (Gassner, et al, 2019). In addition, the majority of the people are not conscious of the career opportunities in the food and natural resources industry (Johnson, et al, 2021). Agricultural science is the major source of human survival; hence the importance of teaching agricultural science in schools at all levels of education. Due to its contribution to the economy both national and globally, teachers' experiences of teaching agricultural science in high schools should be surveyed. Agricultural science provides knowledge on what to do, not only ensuring increased agricultural production but also how to produce profitably and efficiently (Jones, et al, 2017). Drawing from the above

literature one sees the need for educating learners about agricultural science, this subject developing the knowledge and attitudes necessary to start and manage one's own business.

Including agriculture and farming as major disciplines during schooling will help learners to undertake successful careers and to contribute for a lifetime to informed decisions in the global agriculture. In order to pursue a career in agriculture, a learner must take studies in the following areas: veterinary medicine, fisheries, soil science, inter alia. The above-mentioned courses require great competence in high school mathematics, agricultural science, and physical science (Subia, et al, 2020). More so, these subjects help to prepare learners for successful skills and attitudes not only for higher education and further studies but also for entrepreneurial opportunities and for the world of work (Valencia-Arias et al, 2022). One of the aims of teaching agricultural sciences to learners from grades 10 to 12, as stipulated in the NCS (Department of Education, 2011) is to equip learners with the knowledge, skills, and values necessary for self-fulfillment.

This means that there should be greater alignment between the principles of the CAPS policy and its aims for the learners. However, passing agricultural science is still a challenge to many learners (Okiror, et al, 2017). Therefore, an understanding of the experiences of teachers would be of significance to the quality of teaching agricultural science.

1.8 Aims and Objectives of the Study

This study aims to explore the teachers' experiences of teaching grades 10 to 12 learner's agricultural science in the Umlazi district. Based on the aim of this study, this study was conducted using the following objectives.

- To explore teachers' experiences in the teaching of grades 10 to 12 agricultural science in Umlazi district.
- To identify the reasons that inform teachers' experiences of teaching grades 10 to 12 agricultural science in the Umlazi district.

1.9 Key Research Questions

The following key research questions were used to conduct this study:

- What are teachers' experiences of teaching grades 10 to 12 learner's agricultural science?
- What informs teachers' experiences in teaching agricultural science?

1.9.1 Significance of the Study

The significance of this study was to find new knowledge and add to the existing body of knowledge (Willig, 2019). Due to the scarcity of literature on teachers experiences of teaching agricultural science to grades 10 to 12 learners, this study seeks to broaden the knowledge by giving insightful information by enriching the existing literature in teachers' experiences of teaching agricultural science to grade 10 to 12 learners. Furthermore, the findings of this study will contribute to the existing literature in teaching agricultural science, thereby contributing to knowledge. It is believed that this study will be useful to grades 10 to 12 teachers teaching agricultural science in the Umlazi district as well as to other stakeholders interested in promoting and improving the teaching of grade 10 to 12 agricultural science.

Moreover, this study will help the department of basic education to better understand the challenges faced by grades 10 to 12 teachers of agricultural science. This study can also help curriculum designers to better understand the challenges faced by agricultural science teachers, which may have resulted in some of the grades 10 to 12 learners considering the subject difficult and loosing interest in it. And, as an agricultural science teacher, this study will enable a better understanding of teachers experiences at large, particularly in the Umlazi district.

1.9.2 Research design and methodology

My research methodology is qualitative situated within an interpretivism paradigm. Creswell, and Poth (2016) opine that qualitative research begins with the assumption, a worldview, the possible use of the theoretical lens, and the study of research problems, inquiring into the meaning individuals or groups ascribe to a social or human problem. To examine this problem, researchers use a qualitative approach in which the collection of data is in a natural setting sensitive to people and places under study; while the data analysis establishes patterns or themes. The final written report or presentation includes the participants' voices and an elaborate description and interpretation of the problem.

Qualitative research, according to Cypress (2017), is used to answer questions about the complex nature of phenomena; and to describe and understand a phenomenon from the participants' point of view. A qualitative approach is suitable for the researcher's study as she intends to understand teachers' experiences of teaching agricultural science to grades 10 to 12 learners. As such, the researcher wants to understand how teachers experience the teaching of agricultural science from grades 10 to 12. What informs their decision to teach agricultural science?

1.9.3 Research paradigm

The interpretive paradigm, also known as constructivist is a methodology that emphasises the subjective nature of reality. According to Denicolo et al, (2016), researchers who adopt this approach employ systematic procedures to collect and analyse data, but acknowledges that there are multiple, socially constructed realities. Thomas (2013) further highlights that subjective nature of the interpretive paradigm, has nothing to utilise in qualitative methods to explore individual's experiences and perspectives. This approach recognises that knowledge is not objective, but rather arises from the understanding symbols, meanings, and interpretations. In essence, interpretive research seeks to uncover the complex, nuanced, and contextualised meanings that individuals assign to their experiences. By embracing subjectivity and emphasising context, the interpretive paradigms offer a rich and in-depth understanding of social phenomena. It acknowledges that reality is not fixed, but rather is constructed through social interactions and individual perspectives. This approach is particularly useful for exploring teachers experiences of teaching agricultural science to grades 10 to 12 learners in the Umlazi district.

1.9.4 Research design

This study adopted the case-study approach to understanding teachers' experiences of teaching agricultural science to learners from grades 10 to 12. Harrison, et al, (2017) argue that case studies provide an opportunity to explore the complexities of a particular situation in-depth. Case studies are located in the real world; and the research findings may be used to change practice either in the specific case used in the research or a related situation. Also, Yazan (2015) argues that a qualitative case study is an intensive, holistic description and analysis of a bounded phenomenon such as a programme, an institution, a person, etc. The researcher adopted a case study design in order to gain an in-depth understanding of the teachers' experiences of teaching agricultural science to learners from grades 10 to 12.

1.9.5 Sampling

The researcher used purposive sampling. Purposive sampling, according to Moser and Korstjens (2018), is a type of sampling that allows for choosing small groups or individuals who are likely to be knowledgeable and informative about the phenomenon under study. The sample comprised four teachers from four different schools. In this study, the researcher made use of purposive sampling to select the Four teachers from different schools for this study. On the other hand, the convenient sampling was also employed in this study because it is seen as the type of sampling technique that makes it easy and convenient to select those research participants that are available or close for the researcher to reach (Bertram & Christiansen

2014). The researcher adopted the sample because she wanted to investigate the experiences these teachers encountered in their various contexts when teaching agricultural science to grades 10 to 12 learners.

1.9.6 Research methods

The researcher employed a qualitative research method to explore the experiences of teachers teaching Agricultural Science to grades 10 to 12. This approach was chosen because it enables an in-depth examination of the meanings and interpretations that individuals or groups assign to a social or human problem (Frost, 2021). By using a theoretical lens, the researcher aimed to gain a nuanced understanding of the issues surrounding Agricultural Science education.

To achieve this, the researcher involves teachers who are directly engaged in teaching Agricultural Science to grades 10 to 12. These individuals possess valuable insights and experiences that can shed light on the research problem. To generate rich and detailed data, the researcher conducted semi-structured interviews and administered open-ended questionnaires. These methods allowed participants to share their thoughts, feelings and experiences in a freely flowing and unstructured manner, providing a deeper understanding of their perspectives. Through these qualitative methods, the researcher sought to uncover the complexities and challenges faced by teachers in the classroom, as well as their successes and strategies for effective teaching. By examining the data generated by these methods, the researcher aimed to identify patterns, themes and meanings that can inform strategies for improving Agricultural Science.

1.9.7 Interviews

Alshenqeeti (2014) claims that interviewing is the predominant mode of data or information collection in qualitative research. Researchers obtain information through direct interchange with an individual or a group that is known or expected to possess the knowledge they seek. The researcher conducted an online interview due to Covid-19 restrictions. Furthermore, Nguyen (2015) maintains that the semi-structured interviews have fairly specific interview questions that allow for individual, open-ended responses. This is suitable for this study because the researcher interviewed teachers who have differing experiences of teaching agricultural science to grades 10 to 12 learners. Their responses will help the researcher to establish their real-life and challenging experiences, and to answer the research questions.

The teachers' responses helped to provide invaluable data on teachers' authentic experiences when teaching agricultural science; this case study approach will capture the authentic views of teachers. The researcher conducted semi-structured interviews at different schools. Striepe

(2021) adds that researchers use semi-structured interviews to gain a detailed picture of a participant's beliefs about their experiences. In each interview, the researcher will use the same set of questions.

1.9.8 Questionnaires

Questionnaires were the second data generation tool that was used in this study. Bertram and Christiansen (2014) define questionnaire as a list of questions which the respondents answer. Whereas Tourangeau, and Yan, (2007) argue that questionnaires are very convenient way of collecting useful comparable data from a number of research participants. As a result, a data can be collected relatively quickly because the researcher would not need to be present when the questionnaires are complete (Addington-Hall, 2007). And since this study selected and work with the teachers in the grades 10 to 12 agricultural science class in each of the selected schools, therefore this research instrument is an appropriate and effective approach for obtaining the perceptions of grades 10 to 12 teachers' perceptions of teachers experiences in teaching agricultural science.

1.9.8 Outline of each chapter of the thesis

This study is organized into five chapters, each serving a distinct purpose in presenting the research findings. Chapter one, the introduction, sets the stage for the study by providing an overview of the research context. It commences with a clear statement of the purpose and rationale of the study, outlining the reasons behind exploring teachers' experiences of teaching Agricultural Science to grades 10 to 12 in the Umlazi district. The research objectives are then outlined, specifying the aspects of teachers experiences that the study seeks to explore. These objectives are followed by the key research questions, which guide the data collection and analysis purposes.

1.9.9 Chapter Two: In this chapter, the literature relevant to the study was exploited. More so, in this chapter, the reviews were drawn from the issues on teachers' experiences in the teaching of agricultural science to grades 10 to 12 learners. This draws on the basis of different scholars within the area who had conducted similar work to that which the researcher undertook.

1.10 Chapter Three: This chapter explains in detail the research design and the methods guiding this research study. The research made use of the qualitative research approach using an interpretive paradigm. This chapter also discussed the research style, sampling procedures used in selecting participants, the procedure for data collection as well as analysis, the location

of the study, and procedures for ensuring trustworthiness; while ethical considerations were not ignored.

1.11 Chapter Four:
This chapter includes the data analysis and discussions of the findings. In this data presentation, analysis, interpretation, and discussions of the findings were presented according to the key research questions.

1.12 Chapter Five: This chapter concludes the study by presenting a summary of the findings in relation to knowledge about the teachers' experiences of teaching agricultural science to grades 10 to 12 learners in the selected schools. The limitations of the study were also presented. This present chapter concludes with the summary, recommendations, and areas of further research.

CHAPTER TWO
REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK

2.1 Introduction

The purpose of this chapter was to review the literature relevant to this study. Thus, A literature review must be connected to the research questions, as noted by (Cooper et al, 2018). The purpose of the literature review is to discuss the literature that is relevant to the research questions. In the case of this study, the research questions are: What are teachers experiences of teaching grades 10 to 12 learners' agricultural science? What informs teachers experiences in teaching agricultural science? Furthermore, this chapter therefore presents what scholars have written in relation to the issues around the experiences of teaching grades 10 to 12 learners agricultural science.

This literature review is presented thematically. A thematic literature review is undertaken to allow the researcher to discuss and group the information and theoretical concepts into sub-topics that the researcher perceives to be significant in understanding the study (Delgosha, 2022). This is based on the experiences of teachers teaching agricultural science to grades 10 to 12 learners. The literature review addresses the teachers' experiences in teaching agricultural science as well as the strategies used during classroom delivery. The learners' performance is then used to evaluate the approaches and the implications for the negative experiences. Additionally, the use of ICT, chalkboard to teach agricultural science etc. Lastly, this chapter concluded with a summary of the theoretical framework used in this study.

2.1.1 The literature Gap

Several research on the experiences of educators instructing agricultural science have been conducted (Henry, et al, 2014; Lambert, 2014; Masha, & Maphutha, 2022; Rice & Kitchel, 2015). For example, Nzama (2020), study on teachers' experiences of teaching agricultural economics to grade 12 identified that teachers were not adequately trained on new content. In agreement, (Masha, & Maphutha, 2022) explores teachers' experiences in teaching agricultural sciences with limited resources in the Mankweng Circuit and finds that, occasionally, the course objectives were not met at times due to limited resources. Additionally, it was also shown that while experienced teachers can improvise with limited resources, the in-service teachers become demotivated by the lack of resources. Thus, it is clear that the literature reviewed focused minimally on teaches' general experiences and not on the experiences of teaching agricultural science to grades 10 to 12 learners. Therefore, this study aims at exploring

teachers' experiences of teaching agricultural science especially to grades 10 to 12 learners in the Umlazi district.

Drawing from the above scholarship, identifying and bridging the gap in the literature on the teachers' experiences of teaching agricultural science to grades 10 to 12 learners therefore, becomes vital. Also, evidence from the above literatures suggest that participants voices concerning teachers' experiences of teaching agricultural science from grades 10 to 12 learners remained silent and unheard especially agricultural science teachers at the Umlazi district. However, the next section discusses experiences in high school.

2.2 Experiences in higher education

Karahan, and Roehrig (2016) define learning experiences as the interaction, course, programme, or other experience in which learning takes place, whether it occurs in traditional academic settings (schools, classrooms) or non-traditional settings (outside-of-school locations). Peria, and Torres (2019) further indicated that an experience is a category of thinking, a minimal unit of analysis that includes learners, their use of technological resources and social environment, and their transactional relations (mutual effects on one another).

Varela, et al (2017), describes experiences as rooted in the dualism of both the mind and the world, as well as the mind and body on deductive reasoning that works from the general to the particular. Lai, (2015) further stated that an experience takes place when an individual teacher is perceiving and feeling something, through interactions with the outside world. Moreover, experiences assist in recalling some knowledge and progressively constructing a means of intelligence (Billett, et al, 2018). This suggests that for agricultural science teachers to successfully teach agricultural science to Grades 10 to 12, they should be guided or directed by experiences.

According to Masha and Maphutha (2022), teachers' experiences may be defined as anything the teachers come across or face during the teaching of agricultural sciences. Thus, individual experiences are a crucial foundation of acquiring knowledge. These could be challenges or problems they have encountered, sharing the experience of overcoming such. Many research studies have commented on the experiences as the key factors that shape learners' understanding. Hence, teachers' experiences include teachers' understanding, and approaches to and perceptions of their experiences (Viberg, et al, 2019). Moreover, in a classroom, the experiences describe how teachers and learners interact during teaching and learning. Teachers use their experiences to decide on the selection of the content, activities, and the teaching of

agricultural science. This suggests that teachers should decide how learners will be engaged while teaching agricultural science. Teachers' experiences influence what and how they teach (Shange, 2019). Thus, teachers have different experiences when teaching agricultural science content to Grades 10 to 12 learners in Umlazi District KwaZulu-Natal. Furthermore, according to Preininger, (2023), experience comes before discourse and conceptualisation of agricultural science content and plays an important role in cultivation of meaning. This is confirmed in the case study conducted by Shezi (2019) on experiences of pre-service teachers on the use of Moodle to learn, which reveals that experiences afford student teachers skills, knowledge, and attitudes through involvement; and by having once been exposed to certain activities. Therefore, it is of paramount importance that student teachers understand experiences holistically, for successful teaching of agricultural science with the teaching resources. This takes note that experience explains and drives the meaning of behaviour when teachers are using relevant resources during the teaching and learning of agricultural science. Furthermore, Khoza (2015) agrees that experiences which inform teachers in teaching agricultural science using the resources are categorised into the three levels of self-experience, communal experiences, and content experience.

2.2.1 Self-experience

Shugurova (2019) emphasises that self-experience for teaching places the individual teacher or learner at the centre of the teaching and learning environment. Furthermore, this researcher upholds that self-experience for using resources to teach agricultural science creates a setting which helps agricultural science teachers to shape their personal identities. This suggests that the knowledge of using resources by agricultural science teachers stems from self-experience of these teaching and learning resources. In support, Hiller, et al, (2021) argue that teachers' self-experiences also inform their actions when they implement the curriculum, including their choice of the teaching methods and resources to use. The above studies therefore indicate that agricultural science teachers may find it difficult to utilise technological resources in teaching agriculture if they are not familiar with or have not been exposed to technological resources in their self-experience. However, a study was conducted by Batane and Ngwako (2017) examining the effects of the agricultural science teaching experience on pre-service teachers' experience of using technological resources to teach agricultural science. The study shows that teachers who experienced technological resources use it more often, as they have passion and believe in its value. This revelation thus suggests that the use of technological resources to teach has its foundation in the self-experiences which agricultural science teachers bring to

their classroom discourses. Similarly, a study conducted by Crossdale, et al, (2019) on factors that influence teachers' use of information and communication technology (ICT) in teaching and learning, disclose that teachers' technological resources experience relates positively to their attitudes to computers. Moreover. Khoza, et al, (2020) agrees with those self-experiences can have an influence on the quality of further experiences (communal and expert experiences). In contrast, the study on exploring teachers' experiences of teaching agricultural science with limited resources in the Mankweng Circuit revealed that novice teachers become demotivated by the limited or lack of technological resources; whereas experienced teachers can improvise despite limited resources (Masha, & Maphutha, 2022).

2.2.2 Communal experiences

According to Blocker, and Barrios (2015), communal experience refers to a situation whereby an individual is interacting with other people. Pascaris, et al, (2021) confirm this, that asserting that communal experience draws much from public opinion, local knowledge, and other issues related to society. This author further argues that knowledge is horizontally constructed from the simple sources to local known sources from the community. In the case of this study, teachers experience the use of educational technologies by observing mentor teachers and other staff members during teaching practice; and by communicating with fellow student teachers on how to use these resources to learn and to teach agricultural science. Hence, social interaction among learners and in-service teachers enhances learners' technological skills (Hwang, et al, 2017). Gray, et al (2023) further believes that people always bring their communal or cultural knowledge and understanding into their reading or writing. Other experiences which inform agricultural science teachers on using resources to teach are derived from their content experiences.

2.2.3 Content experiences

Content experiences are acquired through school knowledge or learning in a particular formal institution (Khoza, 2016a). Teachers' use of educational resources is driven by the level of knowledge or experience they have about the use of these resources in teaching agriculture. Tondeur, et al, (2017) uphold that professional development (content experience) is needed in order to build on teachers' pedagogical beliefs and technology use in the classroom.

According to the DBE (2011), agricultural science addresses knowledge, skills, attitudes, and values critical to productive, ethical, and responsible informed participation in the formal and informal economic sectors. Furthermore, Potter and Hotchkiss, (2012) maintains that

agricultural science deals with food and fibre production and processing. Similarly, Busch, and Lacy (2019) assert that agricultural science is designed to introduce learners to foundational knowledge of the principles and practices of agriculture. Haleem et al, (2022) further disclose that the teaching of agricultural science has always seemed easy to others, but proven a challenge to most teachers who still use the traditional way of teaching. Hence, these researchers warn that teaching of agricultural science in the 21st century should adopt learner-centred methods (Solomon, 2018).

Expanding on this, Zogla (2019) maintain that educational technologies become the appropriate tools for effective application of learner-centred pedagogical practices. These studies thus indicate that agricultural science teachers' delivery of the agricultural science curriculum should be driven by their use of educational technological resources. This thus compels teachers to have self-communal and content experiences of educational technological resources for effective agricultural science content delivery.

2.3 Teachers' Experiences of Teaching Agricultural Science

Masha and Maphula (2022) comprehensively described teachers' experiences as encompassing all aspects of their teaching journey, including the challenges, successes, and emotions encountered while teaching agricultural science classes. One of the most significant hurdles facing South African schools is the scarcity of essential teaching and learning resources (Sikhakhane et al, 2018). This shortage often complicates the teaching process, particularly in subjects like agricultural science, where learners require hands-on experience to develop practical skills.

The absence of textbooks, laboratories and other vital resources hinders the effective delivery of agricultural science courses, ultimately affecting learners understanding and engagement. To address this, it is crucuial to provide schools with the necessary resources, enabling the to offer comprehensive agricultural science programs. By doing so learners can acquire entrepreneurial skills essential for independent living and contributing to the country's economic development.

However, several studies have highlighted the challenges of teaching agricultural science without adequate resources to support learning. The lack of resources not only affect the quality education but also limits learners' exposure to real-world applications making it difficult for them to acquire vital skills. Therefore, it is essential to prioritize the provision of resources and

support for agricultural science education to ensure that learners receive a comprehensive and practical learning experience.

2.3.1 Teachers' Negative Experiences of Teaching Agricultural Science

The availability of teaching and learning resources is one of the major challenges facing South African schools. A research study by Carayannis, et al, (2018) pinpoints the factors affecting the teaching and learning of agricultural science. Other researchers, Ramongwane, et al, (2022) argue that shortages of resources are the challenges facing many South African schools. This includes the lack of teaching and learning resources such as textbooks, lack of studying resources, study guides, library, pictures, overhead projectors, and textbooks, resulting in poor content delivery of the subject. The problems tend to impede the content delivery of the subject.

This is more obvious in a subject such as agricultural science. In view of the above argument, many studies have also revealed that the teaching of agricultural science is difficult if the required resources of facilitating teaching and learning are not available (Bird & Rice, 2021). In Zimbabwe, a study was conducted on the challenges facing the teaching of agricultural science in secondary schools. It was found that a lack of essential teaching resources, for example, textbooks, agricultural laboratory, agricultural farm, funds etc., was the most serious problem in the teaching of agricultural science.

A study conducted in Ghana by Diise, et al, (2018) found that school farms, agricultural tools, and classes were inadequate. Another study by Aholi, (2018) found that livestock units and agricultural laboratories were not available in most of the schools. Similarly, the above argument is in line with Waithera's (2013) assertion that inadequacy of teaching and learning in some high schools poses a challenge to teaching and learning of agricultural science. However, the findings are in line with those of the study conducted in Nigeria by Adamu (2022) noted that teachers are poorly equipped to deal with some of the challenges that the system poses, such as the large class size. Menka, and Atteh, (2022) further found that inadequacy of resources such as school farms, and funding also pose a challenge to teaching and learning of agricultural science. Therefore, lack of funds to acquire the required teaching and learning resources for the teaching and learning of agricultural science will hinder the effective teaching and learning of the subject.

According to Turan and Atila (2021), these resources help learners understand agricultural science subjects by appealing to their intellect and emotions and by providing them with an accurate representation of the subject. Furthermore, the unavailability of these resources does not only reduce the effectiveness of the teaching and learning process but also compels agricultural science lessons to be given as abstract rather than as practical (Kidane, & Worth, 2014).

However, research studies Margot and Kettler, (2019) argue that for any agricultural science teacher, no matter how well experienced in the subject, it is impossible to put ideas into practice if the school does not have the required resources for effective delivery of the subject. This suggests that teaching and learning materials are of importance in increasing teachers' performance, and enhancing learning (Hervie, & Winful, 2018).

According to the researcher's literature many teachers of agricultural science in the field of education have a passion for teaching learners. Teachers want to make a difference, and they want to help those who need extra help. However, Hester, et al, (2020) studies have shown that teachers can begin to be discouraged after some time because of the stress that comes with teaching in a school with insufficient resources. Even for teachers who are highly skilled and have a myriad of personal resources, decision-making, and teaching practices may be hindered by stress and burnout arising from high demands and by how resources are organised (Bottiani, et al, 2019). Teachers stand in front of a class of about twenty to forty students a day, and have to deal with the learners lacking resources. The lack of agricultural resources is not only evident in high poverty areas, but is also evident in middle-class areas (Lowder, et al, 2016).

It is difficult for schools to afford brand new laptops for each learner, which then means that the teachers in the classrooms have to devise compensation for such lack. Teachers may then turn to textbooks, if they have enough, or they turn to using a projector to allow the learners to see the teacher's screen. Regardless of what it is they must do, the additional lack of agricultural resources in schools is extremely detrimental to the students learning and the teachers instructing a class (Zhang, et al, 2020).

Another issue is lack of payment on time. Nkohla (2016) argues that agricultural science teachers do not get paid enough as it is. The lack additional lack of agricultural resources in the classroom could cause teachers to lose their will to teach. On the other hand, research studies (Bendera, et al, 2022) indicated that teachers spend their own money to supply books, pencil, paper, or any other supplies they need for the learners. This goes to show that students in high poverty areas are being affected by a lack of resources. When I started teaching in the year

1996, my monthly take-home pay was R1500. At that time there was no good infrastructure for teaching agricultural Science, no enough agricultural textbooks etc,

In Nigeria a study conducted by Agboola, and Offong, (2018) rightly observed that the poor remuneration situation of agricultural science teachers with irregular payment of salaries as well as fringe benefits and lack of teacher motivation, contributed to their low morale. A study carried out by Edho (2009) indicated that the lack of salary payment for teachers could have a detrimental effect on teacher's prompt and regular attendance at school, his attitude towards the lesson plan, and the learner's academic performance.

Babagana and Babagana (2015) carried out research on the effects of staff payment and the performance of Ramat Polytechnic Maiduguri students. Their findings revealed a strong and positive relationship between staff remuneration and performance of Ramat Polytechnic Maiduguri students. However, the researchers concluded that proper remuneration of teachers is associated with higher performance; whereas poor remuneration of teachers is the reason for poor performance of the students. On the other hand, many research studies (Muguongo, et al, 2015) have reported that dissatisfaction with fringe benefits have forced many teachers to move on to more rewarding and lucrative jobs. These researchers further maintain that for a teacher to be effective at work he must be given a good and regular salary.

In Tanzania, researchers noted that many agricultural science teachers in public schools are discontented with delays in the payment of their salaries (Katete, & Nyangarika; 2020). Observations from a study noted that teachers' salaries and benefits administration is poor in most countries in the world; and in particular the delay in payment of salaries is very common (Bruns, et al, 2011). Other scholars (Katete, & Nyangarika, 2020; Bennell, & Mukyanuzi, 2005) also found that the persistent late payment of salaries and benefits in many countries in Africa is a major demotivation for teachers, which must be urgently addressed. Additionally, with regard to late payment of agricultural science teachers, many researchers also indicated that in most developing countries, especially in many countries in Africa, teachers' salaries and benefits are considerably below the level necessary to meet basic needs and to ensure adequate motivation (Ek & Mukuru, 2013; Abdulrahman, & Hui, 2018). Finally, Mayaru, (2015) maintain that this issue of teacher's salary delays and late payment has, over time seriously eroded many teachers' motivation to carry out both their teaching and non-teaching roles effectively. Therefore, the available literature in the area of teachers' motivation shows that the vast majority of agricultural science teachers are discontented with their salaries and benefits

(Bennell, & Mukyanuzi, 2005). This point was further highlighted by Oni and Adetoro, (2015) who asserted that teacher's ineffectiveness in schools arises out of frustration due to non-payment, poor remuneration, and inattention to resources.

In the Congo, Bigawa (2014) are of the view that the majority of schools do not teach agricultural science; and even in schools where it is taught, there is no serious attempt to provide adequately qualified teachers and necessary facilities. The researchers point to non-availability of resources for teaching agricultural science. Inadequate instructional supervision hinders the effectiveness of teachers in content delivery of the subject.

More so, the teaching and learning of agricultural science consists of learning facts and figures, rules, understanding of basic concepts and explanation of concepts (Monroe, et al, 2019). It is therefore of utmost important for the teacher to use the appropriate method to bring good understanding and learning to a particular learning task. Also, aspects of agricultural science such as understanding of basic concepts, and problem-solving require a good understanding as well as problem-solving ability. Regrettably, learners tend to memorize concepts that require analytical thinking and basic knowledge in the concept concerned. This is because the subject has been more theoretical than practical due to the lack of resources for teaching and learning agricultural science (Sewell, et al, 2017). On the other hand, Hospedales (2015) noted that most of the required instructional resources for teaching and learning of agricultural science may not be available, especially in animal production, in both public and private high schools. The lack of resources in schools creates more frustrations for the agricultural science teachers who are eager to make a difference to society (Masha, & Maphutha, 2022). Other challenges in the teaching of agricultural science as identified from the literature include the issue of insufficiently qualified teachers (Olatunde & Ogunode, 2020). A study by Symeonidis, and Mudau (2018) identified the causes of teacher shortage in South African schools which, among others include resignation, retirement, and death. Thus, when a teacher exits the system, either due to retirement, death or seeking greener pastures, the department lacks the capacity for replacing such teacher with one appropriately qualified, due to a shortage of teachers.

Makola, (2023), in their study noted that the shortage of agricultural science teachers is attributed to many agricultural science teachers leaving for more lucrative jobs. As a result, the department uses either unqualified or underqualified teachers to fill the space. In Europe, Mbokazi and Lebeloane, (2022) found that the field of agricultural science education has

experienced a consistent teacher shortage in the past decades. Hence, the majority of the schools struggle to fill their open positions. Consequently, at some point, some schools have been forced to shut down agricultural science due to a shortage of teachers. According to Amadi Okagwa (2020) adequate and appropriate use of teaching and learning resources ensures effective teaching and learning of agricultural science

Porter, (2024) contend that adequate resources and strategies give students the opportunity to use their senses of hearing, smell, taste, sight and feeling. If resources are inadequate, students are made to read from textbooks while the teachers explain the concepts to them, instead of the students carrying out activities as suggested by the agricultural curriculum policy documents. This is because, as students become involved in the agricultural science activities using the relevant resources, they understand scientific concepts better and ultimately improve their performance.

In a related study, many researchers (Milligan, et al 2020; Engler, & Kretzer, 2014) identified that the quality of agricultural science teaching and learning could also be affected by other factors such as the medium of instruction. However, the use of English language as a medium of instruction has been reported as a challenge of teaching and learning agricultural science (Quansah, et al, 2019). This is because students have to comprehend scientific concepts taught, and engage in hands-on activities in the teaching and learning of the subject. Carrapiso et al, (2023), argues that the English language is the medium of instruction for teaching and learning all subjects from primary education, including agricultural science. This means that success in education at all levels depends, to a very large extent, on the individual's proficiency in the use of the English language (Erfani, & Mardan, 2017). The use of the English language could unintentionally impair teaching and learning of agricultural science (Quansah, et al, 2019).
For example, in the teaching and learning of agricultural science, students are encouraged to express their ideas. Thus, for a learner to understand concepts and express themselves effectively using such concepts, the student must have a high level of proficiency in the language used to present the concept. Therefore, the teaching and learning of agricultural science using a second language becomes problematic if the agricultural science teacher is not sufficiently proficient in English (Getie, 2020). Clearly, the use of the English language can serve as a barrier that affects students' understanding of agricultural concepts.

The above literature gives an idea on the issues affecting agricultural science teaching and learning in some South African schools. However, key challenges, as observed from the literature, are the unavailability of instructional resources, a loaded syllabus, lack of payment of teachers' wages; and a general lack of administrative support for agricultural science teachers. With little evidence emerging from South Africa, a study of this kind becomes necessary in enlightening school governing bodies and stakeholders or education officials on the challenges in agricultural science teaching in high schools and the need for such challenges to be addressed accordingly.

Furthermore, the study would inform the policy makers and curriculum developers on the possible challenges experienced by the agricultural science teachers, especially in the Grades 10 to 12 classrooms for the purpose of ensuring quality in the agricultural science curriculum. It is hoped that the results would contribute to the formulation of policies that would help position agricultural science as a keystone subject in Umlazi district.

2.3.2 Teachers' Positive Experiences of Teaching Agricultural Science

In South Africa, the majority of the teachers are motivated to teach agricultural science due to the availability of the teaching and learning resources. Resources for agricultural Science instruction and learning are crucial in helping learners comprehend the lesson's material (Afolabi, et al, 2019). Resources are the different instructional aids that a classroom teacher uses to help learners meet the specified learning objectives. Numerous academics have revealed some common teaching and learning resources for agriculture (Kononets, et al, 2021). These resources include computers, reference books, textbooks, workshops, and charts that provide more clarity on the subject matter. Teachers of agricultural science can better explain the subject to their learners with the help of these teaching and learning materials.

Studies showed that teachers have relatively easy access to materials for teaching and learning agricultural science (Ndem, & Akubue, 2016). According to a different study by Collins and Halverson (2018) certain high schools have enough technology and texts because the government provided them. For instance, a study was conducted in Nigeria on the availability and utilisation of e-learning technologies in teaching agricultural science in senior secondary school. The study revealed that some of the listed e-learning technologies were available to an extent for teaching agricultural science in senior high school. Some of these include, tablets, printers, and computers. According to Asad, et al, (2021) the benefits of e-learning technologies are that they make teaching interesting and encouraging, creating greater opportunities for

interactive learning. The above finding is in accordance with the work of Almansour and Kurt (2022), who stated that using e-learning makes it easy to control large classes. E-learning enables the learner to learn at his own pace and encourages individual learning.

Another study conducted in North Dakota identified that the agricultural science teachers experienced a change by using microcomputers in teaching agricultural science (Kleinjan, 2020). Moreover, Gorman, (2019) identified that the agricultural science teachers experienced an improvement in their profession such as increased confidence as the teaching and learning became interesting and more engaging. In accordance with the above, Leijen, et al, (2020) argue that the agricultural science teachers see the support of the school-management body as vital in helping attain their teaching objectives. Moreover, the study by Hemmelgarn, (2019) indicated that the teachers' positive teaching experiences were derived through sharing of knowledge by using the above resources to teach agricultural science.

The internet is one tool that teachers can use to their advantage. Delgado, et al (2015) remind that there are numerous resources available for teachers and learners to use in the classrooms. For example, many high schools provide Office 360 for agricultural science teachers and students, which saves students a great deal of money over the years. Research on the internet has yielded a vast potential source of improved resources, both text and visual, including unprecedented access to archived material (Ruthven, et al, 2005).

Technology in the classroom will help the learners tremendously. Teachers and learners can learn new ways of researching online. Overall, integrating technology into classrooms will benefit both learners and teachers. Learners and teachers will have an easier time communicating when it comes to their assignments with the parents not becoming distressed over textbooks. Integrating technology into classrooms removes concerns of agricultural science teachers over lack of resources. This will help to decrease their stress.

Therefore, the availability of the resources will influence students' interest in agricultural science. Other necessary facilities for effective teaching of agricultural science include the school's farm as land, and an agricultural science laboratory for preserving specimens; also, textbooks, livestock, instructional materials and resources. Lack of any of these facilities reduces effective teaching and learning of agricultural science in high school.

This study explores and understands the teachers' experiences of teaching agricultural science to Grades 10 to 12 learners in the Umlazi district, KwaZulu Natal. This study explores how these teachers' experiences influence their teaching; and also explores the resources that these teachers draw on for their teaching in the selected schools.

2.4 Resources for Teaching and Learning Agricultural Science

Teaching and learning resources can be defined as the teaching aids which enable and facilitate teaching and learning (Garton, & Graves, 2014). According to Haleem, et al (2022), the purpose of utilising teaching and learning resources in class is to assist the teacher with the presentation and achievement of teaching and learning objectives whilst aiding the learners to acquire knowledge and abilities. Furthermore, Oppong (2021) argues that the manner in which the teacher uses teaching and learning resources, and the opportunities learners have of contact with these resources, likewise play an important role in ensuring quality learning. For example, Bordoloi, et al, (2021) noted that textbooks and study guides are crucial in the teaching and learning process. These aids assist teachers in achieving a lesson's objectives. Teaching and learning support material that can be used to teach and learn agricultural science include the television, textbooks, workbook, pieces of cardboard, study guides, overhead projector, multimedia (Dar, et al, 2022). These teaching resources make it easier for a teacher to demonstrate and explain the content at hand. Teaching resources enable learners to understand better both in and beyond the classroom (Sharples, 2015). Teaching and learning resources are vital tools with which to support learners' understanding of the topics taught in class (Sanusi, et al, 2022). Therefore, schools must ensure that the resources they use for teaching balance the need to provide challenging and engaging learning programmes for learners, using teaching resources not offensive to learners (Farias, et al, 2019). The next section discusses examples of agricultural teaching resources.

2.5. Textbooks, teachers and study guides as resources for teaching and learning agricultural science

A good textbook is a teaching resource that encourages students to acquire knowledge independently (Dragana, et al, 2018). For example, learners can take the textbooks or study guides with them and study them at home because they are easy to carry. Learners can thus engage with the subject even when they are not at school (Pamungkas & Halimah, 2021). On the other hand, many research studies (Kayalar, 2017; Wimbley, 2022) argue that most learners

learn and comprehend better through visual teaching (reading) rather than through auditory teaching in which they must listen to a teacher. With the textbook and study guides learners can study agricultural science by reading in their own time while noting down important key points (Pacello, 2014). Other researchers noted that the availability of textbooks in the teaching of agricultural science influences learners' academic performance. According to Huang (2019), learners can read the textbook but not learn from it, hence it cannot be guaranteed that textbooks improve learners' academic performance. It is important for the teacher to use a textbook when teaching agricultural science; however, a textbook should not be the dominant teaching aid of the entire lesson (Nind & Katramadou, 2023). Textbooks often become an addition for teachers' knowledge and understanding of the content; teachers begin to rely solely on the textbook when teaching agriculture (Bergqvist, et al, 2017). With the use of a textbook to teach agricultural science, some teachers tend to read what is written only, giving no further examples or explanations (Hajiyeva, 2015).

Furthermore, Bovill, (2020) observed that some teachers have a tendency to assign their learners the homework found at the end of each textbook chapter rather than having them create their own assignments.

A textbook in agricultural science teaching should be used as the guide from which to work through the syllabus (Bundy, et al, 2022). Textbooks serve as guidance for teachers in terms of which topic to cover in each grade they are teaching; how much time they should assign for each topic; and which topic to start with and follow sequentially (Renzulli, 2021). Agricultural science textbooks and study guides can prove sources of higher-order understanding in agriculture. However, teachers should integrate such with other materials, for instance, articles and books (Maude s & Caldis, 2019). If used on their own, textbooks do not expose learners to different explanations. However, Sulistiyo, et al, (2021) claim that most agricultural science textbooks have visuals which are good for learners' understanding of the subject.

In some schools, especially those in locations, learners share textbooks and study guides. In some cases, a group of learners is sharing one textbook. The sharing of textbooks is not encouraged in the teaching and learning of agricultural science, learners having to take turns using one textbook (Charzyński, 2022). In cases where learners must share one textbook, learners may be disadvantaged if the book is lost (Bain, & Harris, 2009). Spaull, and Taylor, (2015) research also measured the impact of access to textbooks on educational performance. This researcher found that learners with their own reading textbooks, or who share with not more than one student, "perform significantly better" than those who have to share textbooks with more than one other classmate. However, many researchers agree that having access to

textbooks is an important contributor to improved performance (Van Tiem, et al, 2012). Therefore, it is essential for teachers to choose textbooks and study guides that are appropriate for their learners.

2.6 Information and Communication Technology (ICT) as a teaching and learning resource when teaching agricultural science

Today's classrooms are full of young minds who are technologically conscious. Using a combination of audio-visual learning resources alongside the traditional blackboard can facilitate better learning opportunities for learners (Mahmoud, & Moumene, 2024). Therefore, the introduction of ICT is vital to achieve quality education with learners. With ICT, the teaching of agricultural science is enhanced, and promotes effective teaching and learning (Ifeakor, 2021). Kilag, et al, (2023) emphasise that ICT brings about enthusiasm to the learners helping them to participate actively in the lesson, making teachers' work easier. The use of ICT plays a vital role in agricultural science teaching when it comes to saving time. Every subject, including agricultural science has notes and extended readings and the use of ICT in power points presentations saves time for the teachers and the learners (Uzun, & Kilis, 2019).

Through ICT systems, the teacher can communicate to the learners via emails and other social media networks such as Facebooks or WhatsApp (Nyasulu, et al, 2019). This is to say that the time saved by ICT enables more interaction between the teacher and the learners. There can, however, be a problem if the teachers simply present Power Points slide to learners showing key ideas, and read them as they are without explaining further. The use of ICT to teach agricultural science enables both teachers and learners to have access to a wealth of information and resources for their lessons.

This can help teachers to create more diverse and engaging lessons that cater to the various learning styles and abilities of their students. Therefore, employing an ICT-integrated approach would develop the notion with learners of ICT products as a tool for learning.

2.7 Using the chalkboard to teach and to learn agricultural science

It is almost impossible to think of a classroom without a chalkboard (Kershner, et al, 2010). While many teachers have gone the modern route and replaced chalkboards, many choose to keep the old boards and use it consistently (Msila, 2015). The use of technology in teaching and learning has increased over the past years, however, the chalkboards still remain

irreplaceable teaching aids in many South African Schools (Mpungose, 2020). Despite being replaced, chalkboards are still often used in classrooms. Many educators choose still to use chalkboards in schools, as they offer a variety of benefits for teachers and learners of agricultural science (Chuene, & Singh, 2024). Chalkboards have been widely used in schools over the years and they are the standard teaching aid (Bello, & Iddrisu, 2023). Bakadam, and Asiri (2012) note that the chalkboard availability is guaranteed in most, if not all schools; and this does not require that the school have electricity.

Furthermore, chalkboards allow teachers to maintain greater control of their classrooms by providing a place to notice and monitor disruptive learners. Most learners do not like oral presentation without the addition of notes for them to jot down in their notebooks, making it significant for teachers to use the chalkboard (Seino, & Foster, 2021). Many researchers Karthigesu and Mohamad (2020) noted that the integration of the chalkboard as a teaching aid allows the learners also to take better, more accurate notes.

Much of a teacher's style is based on how information is presented to learners. Teaching too much too quickly or too little too slowly loses learners' attention. Writing on a chalkboard makes it easier to control the pace of teaching because it encourages writing while talking. With the chalkboard as a teaching resource in agricultural science, learners' attention is on what is written on the chalkboard in a simple and readable manner and on the teacher talking in front of them (Jakonen, & Jauni, 2021). Chen, et al, (2020) argue that the chalkboard makes it possible for the teacher to break the concept down to the learners so that they understand what they are taught in class. The use of the chalkboard also enables the teacher to be in control of the lesson's pace as it encourages writing while talking (Drigas, & Papanastasiou, 2014).

2.8 Teachers' Attitudes towards Agricultural Science Teaching

Attitudes of people engaged in the teaching and learning of any subject are central to influencing the teaching and learning process (Dilling, & Vogler, 2023). Observations from a study by Qadar, and Nawab, (2022) show that teachers' attitude towards teaching agricultural science as a subject plays a very important role in content delivery of the subject. Attitudes are said to be positive when they are favorably directed towards a target. When they are directed unfavorably towards a target, they said to be negative. This is further supported by Getie, (2020) who indicated that attitudes are inferred from what a person says about a subject, from

the way the teacher feels about it and from the way the teacher behaves towards it. Researchers Galle, (2021) argue that teachers' attitude towards teaching agricultural science has an effect on their performance in the school and on students' performance. Several studies have been conducted on teachers' attitudes, with the most recent being Ekperi, et al, (2019) finding that teachers' attitudes are an important factor in the learning process as well as academic performance. Vahdany, et al, (2015) indicated that there was a statistically significant relationship between teachers' attitudes and students' success.

Therefore, Mabena, et al, (2021) argue that a negative attitude towards a subject by teachers may lead to a negative attitude towards the subject by learners, thus contributing towards poor performance in that subject. It is therefore common knowledge that a positive attitude contributes positively to the subject whereas a negative attitude contributes negatively (Getie, 2020; Kwon & Ahn, 2021; Van den Heuvel, et al 2015).

Zorrilla, et al (2019) draws the following conclusion from his research under "the fundamental principle underpinning all of these is that instructors' attitudes are very important for students learning." In the teaching profession, various factors influence the teachers' job experience, attitude towards teaching agricultural science, and their relationships with learners (Mwikali, 2018). These factors include learner numbers, previous job experience, and teachers' emotional conditions. Additionally, with regard to teachers' attitude, learner ratio in the classroom has a significant relationship with agricultural teachers' job satisfaction. In the Nigerian classrooms, it has been found that many instructors consider agricultural science to be a low-status subject that may be taught in any way (Okolie, et al, 2022).

Furthermore, the cognitive factor which impacts the attitudes of teachers in teaching may be seen as metacognition, which is how much a teacher understands his or her thought in teaching (Peters-Burton, et al, 2015). Cognitive means to think, preserve, and be able to interpret, and give meaning. The lesson learned on the cognitive factor is that teachers must be able to think, interpret, preserve, and give meaning to the teaching approach needed to teach agricultural science. As mentioned, educational background shapes teachers' attitude towards teaching. The more teachers are well-trained in teaching agricultural science, the more they will know how to approach agricultural science content for delivery. This would contribute to self-efficacy and effective teaching.

Teachers' effectiveness in teaching would make them aware of how agricultural science practices are implemented in the classroom (Reaves & Cozzens, 2018). Teachers' effectiveness in teaching would be seen when they can stimulate empathy towards teaching. Through empathy, teachers are in a position to adjust problems to build and manage trust within teaching. Once there is trust within teaching, there would be effective teaching. Through effectiveness in teaching, teachers can encourage teamwork and adopt a wide list of teaching approaches.

On the other hand, the findings of Salehi,'s et al, (2015) study show that teachers' positive attitude toward teaching increases their level of satisfaction with their teaching. It emerged from Salehi,'s et al, (2015) study that educational background plays a vital role in teachers' attitudes which affects their level of satisfaction in the way they execute the teaching of professional tasks. As much as the findings were more on male candidate teachers having more knowledge than female candidate teachers, it is argued that their attitudes toward teaching professions are quite important Salehi, et al, (2015). The importance of teachers' attitudes towards teaching has resulted in allowing the researcher to think of factors such as cognitive, effectiveness, and motivation impacting teachers in teaching Grades 10 to 12 agricultural science.

2.9 Teaching and Learning of Agricultural Science in Schools

Caffarella, and Daffron (2013) note that teaching involves a systematic planning, programming of instruction and experience, and the use of technological tools that will lead learners to gain new and useful skills, knowledge, and competencies, both mental and physical. Supporting this, Bucher (2019) also indicated that teaching is an act of attending to people's needs, experiences and feelings, and intervening so that they learn particular information, and go beyond the given.

Otekunrin (2014) argues that agricultural science teachers are trained from teacher preparation institutions for quality impact of agricultural skills, knowledge, attitudes and values on self-reliance, and promotion of agriculture and food security in their future lives. It is therefore the duty of the agricultural science teachers to stimulate and sustain learners' interest in agricultural science, and enable learners to acquire basic knowledge and skills in agriculture. On the other hand, learning is therefore an outcome of teaching that took place when there was a positive

permanent change in an individual behavior (Donohoo, 2017). The implication is that many high school graduates are seeking white-collar employment, no matter how far-fetched, because they have not learnt agricultural lifelong skills.

A study conducted by Akpan, and Salome (2015) indicated that many agricultural science teachers have failed their learners because their teaching has not led to learners' learning. The effective teaching of agricultural science will therefore give rise to the effective learning of science, i.e., attainment of goals of agricultural science. Akpomedaye (2016) recommends that every agricultural science teacher must be effective, educated, current in subject matter and pedagogy; and must be aware of what is expected of teachers and schools, respectful towards their learners, and actively involved in carrying out their duties.

Furthermore, Hosseini, et al, (2019) argue that the application of good teaching methods depends greatly on the teacher's planning ahead. In contrast, Chikari, (2021) disclose that the implication is that teachers are no longer trained for learners' certification alone but for effective inculcation of learning to learn skills. Otekunrin (2014) noted that agricultural science taught in high schools has not been able to transform the citizens and the nation adequately. On the other hand, learners should in addition to learning agricultural science, have deep understanding and application of the learning skills. The same is expected in the teaching and learning of agricultural science in the South African Schools. It is interesting to note that products of high schools still lack basic skills expected to be acquired from agricultural science. Students still search for white-collar jobs instead of becoming self-reliant and employers of labour. Such appears to be due to an inadequate teaching and learning process on the part of agricultural science teachers in South African schools.

2.10 Teachers' Understanding and Strategies for Teaching Agricultural Science

Having thorough content and knowledge is seen as the major pathway to ensuring that teachers excel in their teaching (Larsson, & Airey, 2021). This means that whoever intends to teach agricultural science should be an expert in understanding the meaning of teaching agricultural science. The understanding of what agricultural science entails become the core component of delivering a meaningful understanding of agricultural science content knowledge. The focus is thus on the foundational content of knowledge and pedagogy needed by teachers to instil effective teaching of agricultural science content of knowledge.

A study conducted by Jammeh, et al (2023) notes that understanding the subject matter becomes crucial to improving preparedness in the aspects of teaching content for knowledge. Without teachers' understanding of the subject they teach their teaching will not achieve learning outcomes. Jammeh, et al (2023) works have placed pedagogical content for knowledge as the most important aspect that teachers must have to transmit knowledge that would make the recipient more knowledgeable. Jammeh, et al (2023) has seen pedagogical content for knowledge as requiring teachers to have sound classroom management; to be able to know the amount of time to be spent to leverage content for knowledge. Classroom management has set rules that teachers must apply to give the recipient of knowledge room to articulate whatever responses are required to transmitted knowledge. Through responses from a recipient of knowledge, teachers can establish whether ideas drawn from transmitted knowledge for learning by illustrations, examples, explanations, and demonstrations have indeed formulated logic in the subject matter.

A similar study conducted by Akerson, et al, (2017) further explained that pedagogical content knowledge that teachers must have would enable them to translate content into practice. Jammeh, et al (2023) work posits that teachers translating content into practice concurs with the agricultural science Grades 10 to 12 curriculum and assessment policy statement (CAPS) which alludes to production of agricultural commodities. The agricultural science CAPS documents define agricultural science as an integrated science that is expected to combine knowledge and skills in terms of physical sciences, life sciences, social sciences, earth sciences, engineering, mathematics, and economics. This leaves no room for teachers who work in the discipline of agricultural science not to have sound knowledge of how to link agricultural science content knowledge to other related subject areas. Agricultural science is more holistic than isolated. This is understood when learners proceed to Grade 12 where they are expected to understand marketing systems and price determination used in agriculture. With this view, the findings from Jammeh, et al (2023) work has indicated that translating ideas from one subject area to another subject area has been inadequately understood by teacher subject-matter knowledge. Teachers should make agricultural science more holistic in translating knowledge content for learning into practice.

2.11 Teaching approaches and strategies for teaching agricultural science

Teaching is an instruction and delivery of a particular skill, a subject that includes the strategies and procedures used in passing on knowledge to the learners (Ukata, et al, 2017). During the teaching and learning process, learners are actively engaged in enabling their learners' understanding, and application of knowledge, transforming them. Wijaya, (2021) define teaching as having a communicative ability to use tasks effectively as well as fostering cooperative learning. Singh, et al, (2021) argue that effective teaching and learning includes encouraging contact among learners, contact design, delivery, assessment, and reflection. These general principles of teaching and learning are indicated by Gross, and John, (2003), who emphasise that good teaching should identify individual differences, recognise the importance of feedback, make good use of various teaching methods, use evaluative procedures of the learning process as well as use directed learning.

As indicated Gillies and Khan, (2009), on the teaching agricultural science, suggest that teachers should put learners in pairs, ensuring that they work together, as well as engaging them in problem-solving activities. More so, these researchers further noted that most learners did not learn effectively with slides and the lecture approach. According to Self, et al, (2017), the most effective approach was hands-on activities in which most learners would conduct the class activities on their own. In teaching agricultural science, Musa (2022) noted that teamwork and peer tutoring were the most effective methods, such as for the lecture method and problem solving. However, they further noted in their study that there is no commonly effective teaching method; the choice of method is informed by contextual factors such as age of learners, the topic under study, teacher qualifications and skill, time on task, size of class, and availability of resources.

Talbot, and Mercer (2018) explored the teaching methods of a high school teacher in the United Kingdom. The researchers found that practical work, seminars, lectures, study groups, and small groups were the most effective strategy for teaching agricultural science. However, factors that affected the delivery of instruction were teacher quality, teacher contract, school location, size of class, and gender (Du Plessis, & Mestry, 2019). Bachiller and Badía, (2020) also argue that traditional approaches such as lecture method and problem solving were not as effective as hands-on activities and demonstrations. However, drawing from the above literature, teachers have a weighty role to play in ensuring that learners understand agricultural science. To this end, the teacher would bring in her own best experiences, and teacher quality,

which are crucial to the teaching and learning of agricultural science. A teacher is simply someone who helps learners to acquire knowledge, competence, or virtue via the practice of teaching (Tirri, & Kuusisto, 2022).

Teachers are thus responsible for teaching. Teaching principles and methods used by teachers will enable students' learning. Robinson, (2018) argue that teaching methods are associated with learners' performance. Therefore, a good teaching method offers learners good information that will assist learners in the future. The researcher has been teaching agricultural science for many years at a high school; my most preferred teaching method is teamwork or any learner-centred work. On the other hand, the studies of Masha and Maphutha (2022) suggest that, irrespective of all these methods that could be used for teaching of agricultural science by teachers, the underpinning method of the CAPS policy is teacher-centred. This indicates that the teacher is the centre of knowledge; and learners are passively receiving information. Additionally, the classroom remains orderly hence teachers retain full control of the classroom and its activities. Therefore, to improve effectiveness of teaching agricultural science, it is imperative that teachers give more consideration to the learning styles of learners as well as to their teaching strategies.

2.12 Teachers' role

According to McKnight, et al, (2016), the teachers' role denotes the teaching method that a teacher uses to teach, in this case, the agricultural science curriculum to learners. Furthermore, the use of a specific teacher role in pedagogical practices is able either to hinder or facilitate learners' acquiring of relevant content and skills (Kim, et al, 2019). Agricultural science teachers' role has a greater influence on the pedagogical process, as it is determined by the kind of approach a teacher uses to communicate teaching and learning from the agricultural science curriculum via the use of educational technological resources. Effective implementation of novel pedagogies requires understanding of the teachers' role (Keiler, 2018). Additionally, the teacher's role in the curriculum answers the question: how does one facilitate teaching?

The role of a teacher as a facilitator entails encouraging and supplying the learners with the necessary tools and support for them to be more independent, and to be focused on difficulties in grasping the content (Darling-Hammond, 2021). Some teachers adopt learner-centred approaches in which their role is restricted to facilitation of the teaching process (Du Plessis, 2020). This suggests that when teachers adopt the role of a facilitator in agricultural science

pedagogy through the use of resources, learners learn at their own pace, while the teacher provides guidance. As such, the role of a teacher as a facilitator is influenced by communal experience: teachers interact with learners in the pedagogical process in order to share ideas and information among themselves and with the learners.

2.13 Performance in agricultural science

Agriculture education is important for agricultural development as it provides an avenue for the development of skills. It plays an important role in developing the learners to fit into the current and future needs of a changing and challenging global environment. Agricultural science also plays a vital role in the development of a country, particularly in the rural areas where the majority depend on agriculture for their livelihood (Oyakhilomen, & Zibah, 2014). At present, agricultural science as a subject is offered in primary school, junior and senior secondary schools. According to Miguéis, et al, (2018) the success of a learner is determined by the academic performance which is generally defined in terms of grades and scores obtained. However, their performance in agricultural science from primary to secondary has been a concern for the past several years.

Poor academic performance of learners in agricultural science education at schools in Africa may be attributed to many factors. Ogutu, (2020) contends that lack of learning and teaching materials is one of the factors that has caused poor performance, which in turn causes lack of motivation in learners. However, Baluyos, et, al, (2019) also indicate that the quality of teachers may be affected by attitudes, as job satisfaction of a teacher is generally positively related to their achievement. This simply suggests that the negative attitude of teachers towards teaching agricultural science can contribute to low performance of learners. Additionally, lack of parental support, teachers' poor attendance of classes, insufficient government support for learners and teachers contribute to poor performance. This shows that there is a challenge in the learners' performance from grades 10 to 12. Therefore, it is the intention of this study to understand experiences of teachers teaching agricultural science from grades 10 to 12.

2.14 Theoretical framework

To explore teachers' experiences of teaching agricultural science to grades 10 to 12, the study was informed by Shulman's pedagogical content knowledge (PCK) theory of learning (1986). The researcher chose this theory for its curriculum concepts to guide the study. The PCK theory

is referred to as knowledge about teaching and learning of subject matter that considers the learning demands inherent in the subject matter (Veal, & MaKinster, 1999). Shulman, (2013) maintain that the sort of knowledge to which Shulman is referring is knowledge of how to settle a class, how to attract and hold the attention of a class, and how to manage educational resources. This view is supported by Appleton, (2013), who indicated that this includes knowledge about learners and how to represent subject matter knowledge in ways that makes it comprehensible to the learners.

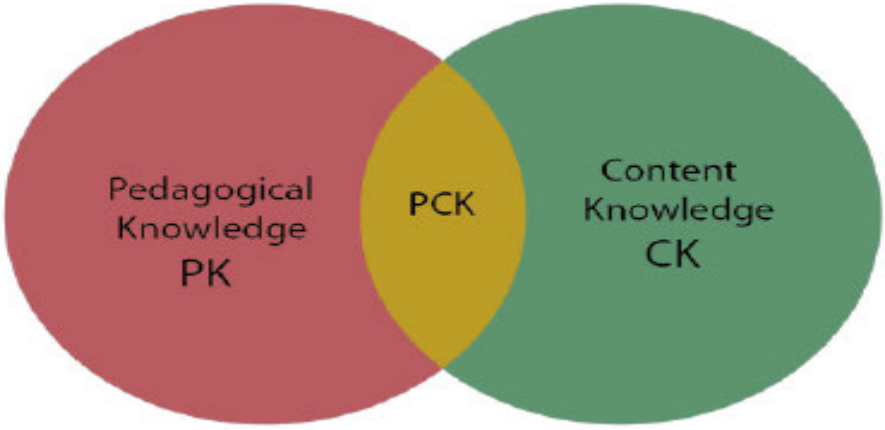

Figure 1 ***Pedagogical Content Knowledge (PCK)***

https://www.researchgate.net/figure/Pedagogical-Content-Knowledge-PCK_fig1_256454801

Relating to this, Chan, and Yung, (2018) indicated that (PCK) is the knowledge behind the planning, and the act of teaching is a piece of subject matter using methods for specific learners, promoting learners' learning. This has always been the notion by Shulman (1986) that teaching has a knowledge base. This includes content knowledge, knowledge on how to teach, knowledge about pupils and how they learn, knowledge about the curriculum, as well as knowledge about discipline and classroom management.

Furthermore, content or subject knowledge refers to knowing about a subject, as well as the disciplinary knowledge of a subject (Berry, et al, 2016). In order to teach agricultural science (content), teachers should be influenced by structured understandings thus being in line with the agricultural science content. According to CAPS, there are some content areas agricultural science teachers must cover soil science, plant studies, animal studies, agricultural economics, basic genetics and biological concepts, basic agricultural chemistry, inter alia. However, an official document clarifies how teachers should teach agricultural science. Teachers teaching

agricultural science should draw from structured understanding in order for them to obtain all information from these documents. The study conducted by Mpungose (2016) revealed that teachers should be aware of the attained curriculum which comprises various types of assessment. These levels structured, unstructured, and semi-structured, are all important in that teachers must understand them all, applying them correctly (Khoza, & Mpungose, 2018).

The term 'pedagogical knowledge' was first introduced by Shulman (1986), and was subsequently expanded by Shing, (2018). Shulman (1986) proclaims that "PCK is a blending of content and pedagogy into an understanding of how particular aspects of subject matter are organised, adapted and represented for instruction." Shulman (1986) states that content knowledge is about the amount of knowledge in the mind of the teacher. This suggests that for content knowledge one must understand the structures of the subject matter. Mastery of pedagogical content knowledge by teachers of agricultural science is the key to the teaching and learning process. It was observed that teachers with inadequate agricultural science knowledge find it difficult to appropriately sequence or connect topics (Ncisana, 2024). This study has shown that pedagogical content knowledge is nurtured in accordance with growth of job experience; hence some studies have explored qualified teachers potentially shifting knowledge. While the present study focuses on prospective teachers, this study benefits from the insight drawn from the studies conducted on qualified teachers' agricultural knowledge for teaching.

The study by Gess-Newsome, (2019) reported a professional development program designed to improve teachers' pedagogical skills and content knowledge. The first phase of the project focused on identifying the areas in which teachers' knowledge needed improvement; and the second phase focused on the issues of the content that teachers should be made aware of so that learners' achievements in agricultural science can be realised. Some teachers participated in the study where they were observed teaching soil science in secondary school. It was evident from the study that while teachers tried to use innovative instructional approaches in their teaching strategies, the instructional activities employed did not lead to learner-conceptual understanding and the expected connection of ideas. These teachers failed to organise and sequence agricultural science concepts in a way that would present agricultural science ideas coherently. The consequences of such failure to organise and coherently sequence agricultural science concepts was to teach concepts as isolated bits of information. The topics were also taught devoid of real-world application which is known to aid learners in conceptualising agricultural science concepts (Donoghue, et al, 2021). Sufficient mastery of agricultural

science knowledge for teaching goes a long way to helping teachers address teaching and learning issues highlighted above.

Where teachers have challenges with the agricultural science knowledge for teaching, teaching was characterised by rigid teaching methods, which predominantly relied on textbooks as the sole source of instructional knowledge (Bullough, & Palaiologou, 2020). The Department of Education perceived agricultural science as a content- and concept-driven subject that requires learners to authentically connect and apply its concepts in a real-world context (Department of Education, 2005). This requirement cannot be fully achieved if teachers do not possess adequate pedagogical and content knowledge

A study by Mbono (2019) sought to explore and describe the extent of pedagogical content knowledge held by four agricultural science teachers when teaching soil science at secondary school level. The study endeavoured to explore the components of pedagogical content knowledge and to determine four teachers' mastery of pedagogical content knowledge. The research was qualitative in nature and conducted per case study design. Data collection instruments used were interviews, classroom observations, and document analysis. The pedagogical content knowledge components which they found were the use of instructional strategies; such were found to have been used by the four teachers to stimulate the learning process. The teachers' lessons were found to lack instructional clarity for the learners due to inadequate conceptual knowledge.

In a study by Sun and Liu (2023), the theme of the study was the exploration of the primary school teachers' pedagogical content knowledge as they taught in the lower grades. The research design was qualitative; and case-study methodology was employed in that study. Data were collected by interviews, lesson observations and questionnaires. Chick, et al, (2006) created three distinct projections in their study. Firstly, if teachers had sufficient subject matter knowledge, this would have been evident through teachers' exhibition of thorough and deep conceptual understanding of concepts taught. Secondly, if teachers had had adequate knowledge of instructional methods, such would have been evident in their use of appropriate activities during the instruction phase; and lastly, if teachers had had ample knowledge of learners' conceptions, evidence would have been obvious if they displayed interest in the learners' prior knowledge, and dealt with learners' difficulties with the concepts taught. The findings were that teachers in the study lacked firm content knowledge.

The teachers were also observed to rely on a sole teaching method; and that method did not connect to the learners' known environment. The teachers had good lesson presentations, but lacked knowledge of how to identify and correct learners' misconceptions.

Drawing from the above literatures indicates that even qualified teachers had inadequate mastery of pedagogical content knowledge; for example, their sequencing of topics was lacking; prior knowledge was not squarely placed where it belonged; and insufficient attention was paid to addressing learners' difficulties. Teachers' difficulties with content knowledge were observed in the teaching of soil science. Teachers' application of instructional strategies was mediocre, which could have been higher since the focus was on qualified teachers with many years of teaching experience. Resorting to single teaching strategies is a sign of weak mastery of pedagogical content knowledge. Thus, for these teachers, their knowledge of teaching agricultural science was inadequate.

2.14.1Importance of the theory

Many research studies (Depaepe 2013; Doukakis, et al, 2021; Schmid, et al, 2021; Metz, & Knight, 2021) argue that pedagogical content knowledge plays an important role in the classroom as it helps teachers in solving learners' misconceptions of the subject. According to Ekiz-Kiran, and Boz (2020), PCK enables teachers to find the gaps in the subject, especially on how the learners learn, why they fail to learn, and various other aspects related to the process of teaching and learning. Other scholars agree with the above point Shahane, et al (2021) opine that it is no longer possible to teach agricultural science without knowledge of agricultural science. These researchers further state that the agricultural science teacher should be educated both on 'agricultural knowledge' and 'pedagogical content knowledge' (Urban, et al, 2018).

In other words, PCK should be more focused on the growth of teachers' understanding. When a teacher transmits knowledge to learners, the teacher must be able to discern whether or not the students are learning correctly. If the learners are not following the lesson, the teacher should be able to identify the gaps preventing the learners from understanding the lesson. The lesson learnt from the work of Park and Oliver, (2008) about PCK is that PCK embodies the understanding of the teaching and learning in such a way that teachers will be able to notice the changes required to make the teaching and learning of agricultural science more engaging.

2.15 Summary of the chapter

This chapter has reviewed relevant literatures on the importance of teaching agricultural science. The review then discussed the challenges experienced by agricultural science teachers both in the South African context and globally. These points made were then followed by the teachers' approaches as well as learners' performance in learning agricultural science. However, teachers were reported to having a series of challenges that hinder the effective delivery of the subject. On the other hand, learners' interest in agricultural science was therefore established as problematic and contributing to poor performance. This shows that there is need for more research in improving teaching methods, particularly on the topic of agricultural science. Therefore, exploring teachers' experiences in teaching agricultural science particularly in grades 10 to 12 will reveal more about the topic and contribute to closing the gap in the existing body of knowledge.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1. Introduction

Chapter Two reviewed related studies about the main focus in the teaching of agricultural science. In this chapter, the research paradigm, research approach, research design, data-collection instruments, sampling and data analysis are discussed as part of the procedure followed to gather insight into teachers' experiences in the teaching of agricultural science. This chapter concludes by discussing trustworthiness, ethical issues, and limitations of the study.

There are many scholars in the field of educational research who provide views on procedures that any researchers should follow in an attempt to gather qualitative and quantitative data about research phenomenon at hand. Various views shared by scholars provide the same opinions on the basis that, whatever research process that researchers wish to follow in collecting data, guidance should be in place. The guidance is described as research methodology, which provides various steps that are generally adopted by researchers during data collection (Scholtz, 2020). Scholtz, (2020) notes that, once data has been collected, researchers must analyse it in order to develop the main idea behind it. In this way, research methodology serves as the procedure by which researchers go about their work of collecting data, analysing, describing, and explaining phenomena. Researchers are cautioned to understand how research process interlink with one another (Prosek, & Gibson, 2021). By doing so, researchers must look deeply at the problem at hand in order to be able to take the right way of providing the best solution. The next section presents the research paradigm that presents how researchers may develop an overview of the problem at hand.

3.2 Research Paradigm

Ugwu, et al, (2021) views the research paradigm as the way of coming to understand the social reality of the world that people live in. It is further explained in the work of Ugwu, et al, (2021) that understanding social reality of people is built upon assumptions or beliefs that give rise to a particular way that people find themselves in. It is found in Ugwu, et al, (2021) work that the understanding people have about the world that they live in, becomes a crucial step towards seeking possible answers about pertinent problems. In the work of Hart (2010), the research paradigm provides researchers with a set of beliefs on gaining knowledge that goes together in guiding their actions as they perform their research. Whatever endeavour is made in gaining

knowledge that would guide actions through gathering insights into problems, the following four aspects should be adhered to by researchers (Hart, 2010). All researchers make use of at least one research paradigm as a rigorous guideline to conduct the research and take on the research venture in a manner that is most valid and appropriate. However, this study was framed within the interpretivist paradigm, as this paradigm assists in our understanding of the contemporary social world of teachers' experiences. The interpretive paradigm acknowledges the subjective nature of human action and understanding required to explore teachers' experiences. This study taps into benefits of interpretivism that allow the use of researchers' experiences to construct and interpret phenomena. This paradigm enables researchers to view reality through the experiences and perceptions of the participants. In seeking the answers to the research questions, the researcher who follows an interpretive paradigm uses those experiences to construct and interpret understanding from gathered data. Specifically, the interpretive paradigm supports researchers as they explore the world by interpreting the experiences of individuals. This study sought to explore teachers' experiences and their development of the agricultural science knowledge for teaching agricultural science at a rural-based secondary school in South Africa.

3.3 Interpretive paradigm

My study explores teachers' experiences in teaching agricultural science in secondary schools. In order to explore teachers' experiences, I will be interacting with teachers in the schools where they teach. Creswell, et al, (2003) writes that meanings of the world that people live in as well as meanings of their particular actions is explored and described by the interpretive paradigm. Moreover, teachers' behaviour in teaching agricultural science is constructed through the interpretive paradigm (Creswell, et al, 2003). In this study, the interpretive paradigm enables me to develop constructive meanings based on teachers' views on their experiences of teaching agricultural science, rather than giving my own ideas. Through the interpretive paradigm, it is hoped that deep understanding of hidden issues, such as attitudes and values relating to teachers' experiences will be thoroughly explored.

Kivunja, and Kuyini, (2017) notes that the interpretive paradigm directs research and practice in a field of study. In this study, the interpretive paradigm helped the researcher to explore and understand personal viewpoints on what hinders the teaching of agricultural science (in relation to those of agricultural science teachers meaning). The primary aim of this current study was

to explore teachers' experiences of teaching agricultural science from Grades 10 to 12. Therefore, the interpretive paradigm would be considered appropriate because it is used to study the subjective world of human experiences, eliciting reasons for their actions (Cuthbertson, et al, 2020). In addition, Uduma, and Sylva, (2015) argued that the interpretive paradigm aims to gain a deep understanding of how humans' interpretation of their reality is based on the contexts in which they find themselves.

The interpretive paradigm suited this study because the researcher aimed to understand the phenomenon investigated from participants' perspectives and their experiences. Kivunja, and Kuyini, (2017) asserts that interpretivists believe there is no one right or exact approach to knowledge. Hence, in this study, participants' responses were assumed to represent their feelings, attitudes, and understanding of the situation in which they found themselves.

Furthermore, the interpretivist paradigm is flexible, allowing the participants to account for their actions; thus, it produces rich information helping one to understand the phenomenon investigated in this study. This paradigm also matched this study's data collection, which included semi-structured interviews to improve understanding of investigated phenomena. Sutton, and Austin, (2015) suggested that these methods provide a more significant opportunity for discussion between the researcher and participant to construct a meaningful reality in the participants' context. Hence, the study's findings reflect the participants' experiences of teaching agricultural science to Grades 10 to 12 learners in the Umlazi district.

3.4 Research Approach

According to Kivunja, and Kuyini, (2017), the research approach adopted by a researcher depends on both the research paradigm and the critical questions the study seeks to answer. According to Omodan, (2022), researchers commonly utilise three main research approaches. Firstly, researchers can choose a quantitative approach grounded within the positivism or post-positivism paradigm. This research approach mainly uses numerical and statistical descriptions to test or confirm assumptions and theories (Omodan, 2022). Secondly, researchers can utilise a qualitative approach grounded within the interpretivism paradigm. Kumar et al, (2017) outlines that "the main focus in qualitative research is to understand, explore, discover and clarify situations, feelings, perceptions, attitudes, values, beliefs and experiences of an individual or group of people" (p.104). Thirdly, Tashakkori, (2012) posits that a mixed methods research approach may be used for research questions requiring textual and numerical data.

As this study aimed to explore teachers' experiences of teaching agricultural science to grades 10 to 12 learners, the qualitative approach was considered appropriate for collecting and analysing data for the present study. The rationale for choosing a qualitative approach was that it allows understanding of the participants' feelings, attitudes, perceptions, and beliefs about the phenomena investigated.

More so, the qualitative approach allows multiple understanding of the inherent complexity and variability of human behaviour and experience (Wearn, et al, 2020). The research study aimed to answer, for instance, what, how and why questions which characterise qualitative understanding, rather than simply testing a hypothesis which characterises a quantitative approach. Qualitative researchers undertake an in-depth investigation of a small group of agricultural science teachers at four different high schools in the Umlazi district. According to Wearn, et al, (2020) qualitative researchers desire to step beyond the known and to enter participants' worlds to make discoveries that contribute to the development of empirical knowledge. A qualitative approach for this study takes account of underlying factors which affect teachers' experiences of teaching agricultural science to Grades 10 to 12 learners. According to Heath, (2018) qualitative research is an inquiry in which researchers collect data in face-to-face situations by interacting with selected participants in their settings.

3.5 Research Design

Bertram and Christiansen (2014) asserted that various research styles could be used when conducting research. The authors argued that the research design to be used when conducting any research is usually influenced by research questions, methods of data collection and the research paradigm a researcher is working within. According to Hancock, et al, (2021), a case study is an in-depth systematic study of a specific case in its setting in which there may be a person (a learner, teacher, or parent), or a group of people (a class of learners or community). Case studies are useful when the researcher explores a single case within its real-life context, bound by time and activity. A case study deals with contemporary events and is concerned with how and why things happen. In other words, the researcher takes an in-depth look through the case study to capture the reality of the participants' lived experiences and thoughts about a situation (Rashid, et al, 2019). Cohen, and Grifo, (2007) suggest that case studies can penetrate situations in ways that are not always susceptible to numerical analysis. This serves as an advantage in using the case study as it focuses on gaining a comprehensive experience of a phenomenon, which is in alignment with the qualitative research. Case studies generate an

understanding of and insights into a particular instance by providing a thick, rich description of the case; and illuminating its relation to its broader context (Buchnea, 2023). It (what?) can be used to describe a unit of analysis, such as a case study of a particular organisation or to describe research (Takahashi, & Araujo, 2020). There are many case-study designs and therefore it is important for the researcher to recognize this multiplicity.

Researchers in the field of case studies have identified a variety of characteristics. For instance, there are two different types of case study research designs known as the intrinsic and instrumental case or a combination of the two (Cousin, 2005; Ridder, 2017). In an intrinsic case study, the interest is in the case itself as a unique or innovative situation that is worth understanding more fully; while an instrumental case study focuses on a particular issue and examines cases to explore this issue in depth (Hancock, et al, 2021). Kekeya, (2021) for example, points out that the researcher can carry out a single case study, multiple case studies, or a collective case study of a particular phenomenon. This study used a single case study design which involves a particular group, the instrumental(meaning?) Grades 10 to 12 agricultural science teachers teaching at the selected schools. Case study was suitable for this study, these teachers being experts in their teaching and providing insights into the ways they teach at these schools. The significance of a case study is further related to the researchers flexibility in using various methods and providing a platform for participants' voices to be heard (Cohen, & Arieli, 2011). The choice of interviews and questionnaires was still informed by the assumption of a case study design.

Table 1 ***Participants' Profiles***

Participants' Pseudonyms	**Teaching Experience**	**Subject Specialization**	**Grades**	**Qualification**	**Gender**	**Race**
Lubamba	22	Agricultural Science	10 – 12	BAgric degree	Female	African
Rueen	10	Agricultural Science	10 – 12	BSc Honours in Agric. Science	Female	African

Zangura	20	Agricultural Science	10 – 12	BEd degree in Agric. Science	Female	African
Malda	22	Agricultural Science	10 – 12	BEd and Adv. Cert. in Agric.	Male	African

3.5.1 Limitation of research design

The most significant limitation the researcher encountered during this research was time. The researcher generated data at the time the school were about to write examination. So, the time was very short because the teachers were busy in preparation for exams. However, I managed to collect data in less than two weeks before the exams. Collecting data under time restrictions may have influenced how much information the participants provided. Before performing questionnaire and interviews, the researcher explained the meaning of PCK to the teachers via online in case their responses to the interview questions did not adequately show the amount of their understanding.

3.5.2 Strengths of case study

In a case study, the researcher can employ a variety of research methodologies, create rapport with the participants, and gather valuable information. A case study offers in-depth insights. Schriver, (2017) found that researchers' use everyday language to make their findings accessible to a diverse audience. Case studies are strong in reality, practical and engaging for both researchers and participants (Darke, et al, 1998). A case study can be done by one researcher.

3.5.3 Weaknesses of case study

The results of a case study may not be generalisable. Therefore, a case study may be regarded weak. Its findings cannot be generalised because it is difficult to discover comparable cases. Furthermore, different researchers interpret the same data in various ways, showing that the researcher's emotions may have an impact on the case study. Case studies are time-consuming to complete. Observer bias and limited cross-checking are potential issues (Mangi, 2015).

3.6 Sampling

The selection of teachers who will be invited to share their views of teaching of agricultural science will be conducted through a sampling process. The process of sampling is based on deciding unit which is thought to share similar characteristics as those possessed by the entire population (Maree, et al, 2013). The sampling process is considered in educational research

with the view that unit sharing characteristics as possessed by thought population would generate information pertaining to the particular problems (Sukmawati, 2023). Every process deliberating on selecting units representing the entire population in educational research has both advantages and disadvantages (Sukmawati, 2023).

In view of qualitative educational research, the sampling process is the practical way; as the researcher gets in touch with unit that is supposed to represent the entire population for data collection (Tracy, 2019). In contrast to a practical getting in touch with a unit that is thought to represent the entire population, the researcher relies much on furnished information without having evidence that any unit is indeed representative of the entire population (Dobyns, 2017). Whatever step that researcher takes in selecting units, despite whether such units really represent an entire population, rich information should be generated in every possible way to address phenomenon issues (King, 2021).

In this study, purposive and convenience sampling techniques were applied in order to choose the research site and participants. According to Christiansen, et al, (2010) as well as Kalu, (2019), using purposive sampling, researchers can select participants who possess the necessary expertise and understanding to offer comprehensive and in-depth insights into the phenomenon they are studying.

Purposeful sampling is viewed in the educational research book by Kalu, (2019) as the process of a sampling technique which may assist researchers to decide whether a unit representing the entire population is relevant to the proposed research. Purposive sampling may be used to provide various types of information of either a qualitative or quantitative nature on a population (Christiansen, et al, 2010). Individuals, potentially teachers who are expected to partake in sharing views on the teaching of agricultural science will be selected through purposive sampling. These individual potential participants (teachers) are deemed less important than the selection criteria (Christiansen, et al, 2010).

The selection criteria are understood as considerations that enable the researcher to know which population should be located to select potential individuals of a unit (Tracy, 2019). Moreover, the population from where potential individuals' unit would be selected should be given ample opportunity to participate in the process of selection (Kalu, 2019). The criteria for selecting the participants in this study is that all participants must be knowledgeable and within easy access, the schools being within the researchers' base. The opportunity to volunteer should be fairly given to the population of interest (Tracy, 2019). Furthermore, because convenience sampling is thought to be the kind of sample approach that makes it simple and practical to choose

research participants who are available or nearby for the researcher to reach, it was also used in this study (Bertram & Christiansen, 2014).

Moreover, Schoemann, et al, (2017) agree that achieving convenience is a somewhat quick and simple method of reaching the required sample size for the study. Therefore, the convenience of the sampling approach chosen for this study is supported by the availability of research participants and proximity of the chosen schools to the researchers' base.

In this study, the purposive or convenience sampling method will provide all teachers who teach agricultural science in grades 10 to 12 the opportunity to partake in the study. A list would be requested from principals of secondary schools where the study is planned to be undertaken (Mugambi, 2015). This study is planned to consider teachers with a minimum of five years' experience in teaching grades 10 to 12 agricultural science; it is assumed that such teachers would share rich information pertaining to their vast knowledge. Three of those teachers from two selected rural and urban secondary schools are expected to partake in the study. Teachers from rural and urban secondary schools would be decided on as part of the research study in that both agricultural science, human and material courses are assumed to be inferior in a small rural high school to those used in the large urban school (Villa, Knutas, 2020). Each rural school will be represented by one teacher which brings a total of two teachers, as two rural secondary schools will be visited. One urban secondary school will be represented by one teacher. Teachers with less than five years' teaching experience in the teaching of agricultural science will not be included in this study; they are still viewed as novices and thought to be lacking in extensive knowledge.

As much as open-ended interviews gather agricultural science teachers' views, the application of one-on-one semi-structured interviews in educational research holds both advantages and disadvantages (Herrington, 2014). One-on-one conversational interviews probe for deeper insight into opinions offered through ambiguous questioning phrasing. However, the prompting of qualitative research questions would not be achieved by less experienced researchers.

Limitation

A limitation of this work stems from the availability and time of the participants. This is very important since issue of ethics must be respected. In this light, participants were not forced or coerced to be part of the interviews or part of the work in general. (Cohen et al 2011). To solve this issue, The researcher arranged with the school authorities and agree with them on the issue of availability and the time table schedule of the participant.

3.7 Interviews

According to Monday, (2020), an interview is a direct face-to-face conversation between an interviewer and an interviewee to acquire research information such as beliefs, views, perceptions, and opinions. In this study, the researcher used a semi-structured interview method. In a semi-structured interview, the researcher asks a question and receives answers from the response or behaviour of the participants (Mashuri, 2022). Further to that, "an interview is a conversation between the researcher and the participants. In this study, semi-structured interviews captured the participants' perceptions and experiences, knowledge, attitudes, and beliefs about their experiences of teaching agricultural science to grades 10 to 12 learners.

This was appropriate for my study: an interview is important when exploring or describing peoples' perceptions and understanding that might be unique to them; and it allows the researcher to ask probing questions for clarity, especially when seeking to understand a participant's point of view (Bertram & Christiansen, 2014). The researcher chose this research instrument as it does not follow a system of predetermined questions; the interviewer is free to develop each situation in whatever way he wants. Koopman, (2018) believe this system helps a researcher to penetrate deep into the problem, thereby understanding the attitudes and behaviour of people who are involved in the circumstances/context being researched. This system will help with both uniformity and in-depth information-giving. therefore, it will be helpful that participants are asked the same questions. Being semi-structured, this gives participants an added space to go further than what is asked; and by so doing add depth and clarity to questions asked. Each of the participants has had different experiences and different approaches to the narration of those experiences; a semi-structured interview method gives them liberty of response.

3.8 Questionnaire

The questionnaire is the second data-generation instrument used in this study. A questionnaire is a list of questions which the participants answer (Kim, Lee, & Gweon, 2019). According to Moses et al, (2020), questionnaires are a convenient way of collecting useful comparable data from a number of research participants. Such data can be collected relatively quickly because the researcher does not need to be present when the questionnaires are being completed (Forgasz, et al, 2018). A good questionnaire is an independent entity which enables the

researcher to collect data without requiring any personal contact with the participants. Reinharz, (2017) maintain that a questionnaire is required to stand alone; the researcher is rarely looking over the participant's shoulder while he or she completes the questionnaire. Furthermore, questionnaires are without doubt the single most popular data-collection tools in any research involving humans. While the questionnaire lacks the personal touch of the interviews, it can nonetheless be an extremely efficient data collection tool.

Asmi and Margam, (2018) concur with this and affirm that questionnaires are popular and fundamental tools for acquiring information on public knowledge. In the same Vein, et al, (2012) claim that questionnaires are good for gathering data about abstract ideas or concepts that are otherwise difficult to quantify, such as opinions, attitudes, and beliefs. These researchers argue that questionnaires can be useful for collecting information about behavior that is not directly observable. However, there are various types of questionnaire in research which include the structured questionnaire, the unstructured and the semi-structured questionnaire; but for this study, the researcher made use of the semi-structured questionnaire because it was easy to analyse.

In China, studies indicated that the questionnaire-based survey is an effective approach for obtaining public opinions (De-Vaus, 2016). The questionnaire allows the researcher to reach out to a large number of people over a very short period of time (Dewaele, 2018). Because this study selected and worked with teachers teaching agricultural science to grades 10 to 12 learners in the selected schools, this research instrument is an appropriate and effective approach for obtaining their perceptions of teaching agricultural science to grades 10 to 12 learners.

Limit

3.9 Data Analysis

Qualitative data analysis is defined by Spencer, et al, (2013) as creating a sense of data in terms of the participants' definitions of the situation, noting patterns, themes, categorisations and regularities. Moreover, Boudett, et al, (2020) outline that data analysis is about bringing together the evidence, breaking it into manageable units, fusing it and searching for patterns, while discovering which data is important and what is to be learned. This suggests checking what the data says and interpreting it so as to present the findings to the readers. According to Tracy, (2019) qualitative data analysis is a systematic way of interpreting gathered information in order to give it structure, give it meaning, and convey conclusions. Ren, et al, (2019) argue that analysis of a data is a process of inspecting, cleaning, formatting and modeling data with

the goal of highlighting useful information, suggesting conclusions and supporting decision making. Furthermore, Sarker, (2021) was insisting that the purpose of data analysis is to discover, evaluate, understand and derive useful information from the data to support decision-making. Thus, there are different kinds of data analysis. However, data collected for this study were analyzed using a thematic analysis.

Thus, in keeping with Brown and Clarke (2006) indicated six steps of data analysis. The following steps below serve as a foundation in conducting this thematic analysis. Step one. The researcher familiarised himself with the data collected in a form of a semi-structured and a questionnaire. Using Brown and Clarke (2006) **phase one** involves the immersion of the researcher in the data by continuously reading the text over a period of time to identify patterns and meanings. This was done by reading and re-reading the text several times in order to make sense of it (Belotto, 2018).

Phase two: Coding. During this stage, the researcher familise himself with the data and proceeded on from there to create the codes. According to Brown and Clarke (2006), this phase involves identifying initial codes which appears interesting and more meaningful. Then, the data was coded into manageable chunks of text.

Phase three. Generating themes. This stage involves generating themes, collating data that could match into specific or appropriate themes (Brown & Clarke, 2006). In doing this, similar text were grouped together giving the overarching theme. To this end, the researcher looked at the data that says the same thing, crystallize them for a theme to emerge.

Phase four. Reviewing themes, this phase consists of reviewing of themes generated whether it's matching with the data the researcher already has. In addition, Brown and Clarke (2006) also explain that this phase involves a thorough crosscheck if the data within themes corresponds meaningfully to the extract and the entire data.

Phase five. Defining and Naming Themes. This phase begins with concretizing the themes by defining and naming the themes (Brown and Clarke, 2006). Thus, the aim of this phase was to define what the themes and naming what the themes are. To achieve either of these intentions, the researcher concentrated on defining each theme and naming them, and looking at what is interested about the themes.

Phase six. Finally, the final stage emphasizes on analyzing and reporting about the data. To this end, the data was reported verbatim using rich and convincing extract that emerged as themes, research questions as well as literature.

3.10 Trustworthiness of the study

The use of sufficient verbatim in analysing collected data should highlight response validation (Birt, 2016). Response validation to provide reality for the study is viewed within transferability, dependability, confirmability, and credibility (Kyngäs, 2020). With reference to transferability, transcribed data can be used in other studies with similar contexts. Any reader may find it easy to make comparisons whenever findings of collected data are planned to be applied to other research (Li, et al, 2019). Once the summary of verbatim transcriptions has been made, other secondary schools with similar samples are assumed to gain similar results (Li, et al, 2019).

Results with similar samples from other Grades 10 to 12 secondary schools should be consistent whenever the study is repeated. The consistency produced by having same results in other studies is addressed through dependability (Li, et al, 2019). The reported results should be such that any future researcher is able to repeat the study even if it does not gain the same results within the same context. Dependability of research results would start by evaluating whether explanations drawn from transcribed data correspond with summary findings (Woods et al, 2016). Whatever transcriptions are made from participants' verbatim remarks, summary findings should be based on participants' own words rather than on possible researcher bias (Suter, 2012). Summary findings from participants' point of view should be claimed by related reviewed literatures.

The findings of Suter's and Wojek, (2012) study show that confirmability in the study is made by providing a detailed process of interpreting gathered data advocated within claims from literature reviewed. A rationale should be provided on codes emerging from participants' views to explain the meaning of themes (Suter, & Wojek, 2012). Moreover, results of the study should be believable from the participants' viewpoints (Suter, & Wojek, 2012). There should be correspondence between what has been raised by participants and words transcribed by researcher from participants' verbatim statements. Once theory has been developed and the study proven representative, the research has credibility (Suter, & Wojek, 2012). In this study, full transcripts will be included to enable any reader to understand that interpretation and

suggestions for future research was by perusing participants' views (& Wojek, 2012). On inclusion of transcripts, Woods et al, (2016) opines that any stage of gathering views from participants requires consent and cooperation.

3.11 Ethical Issues

The obtaining of consent and cooperation stems from ethical concerns which explain a professional code of conduct for researchers (Kyngäs, 2020). Researchers' professional code of conduct should be protecting whoever is participating in educational research so as to develop trust with them, to promote integrity and guard against misconduct and inappropriate use of data that will divulge details of private lives (Kyngäs, 2020). It is the responsibility of the researcher to protect the rights and welfare of the participants in the study. Protecting the rights and welfare of the participants has raised issues of obeying ethical principles such as permission, informed consent, rights of participants, confidentiality, and anonymity, and harm to participants (Suter's and Wojek, 2012).

It is imperative that researchers first obtain permission to allow them to conduct research (Bless, 2014). Gatekeepers such as educational authorities play a major role in giving out access to the research field prior to inviting participants to partake in the study. In view of this study, permission to visit rural and urban secondary schools would first be requested from the Department of Basic Education. An ethical clearance certificate would then be applied for from the University of KwaZulu-Natal Ethics Committee, to decide whether the researcher is indeed meeting ethical protocols for conducting research at the chosen schools.

Once ethical protocols for conducting research has been approved, the researcher will prepare informed consent that serves as a platform on which to inform potential participants on the purpose and procedures influencing their willingness to participate in the study (Johnson et al, 2008). In the informed consent, teachers who are expected to share their views about teaching agricultural science would be made aware that they may withdraw at any time from participating in the study should they feel mistreated, or for any reason whatsoever (Johnson et al, 2008).

In view of mistreating participants, Arstein-Kerslake, et al, (2020) propounds that no research work should in any way violate participants' legal and human rights. Furthermore, a crucial area of protecting participants' dignity is by understanding and respecting their values. In this

regard, teachers invited to participate in this study would be given the opportunity to terminate their participation at any time without penalty. Whatever information is shared by them would be treated with confidentiality (Clandinin, et al, 2015).

In light of confidentiality, there would be no access to personal data or the names of participants by any third party, only by the researcher. Any names linked to data would be protected through anonymity (Arstein-Kerslake, et al, 2020). Anonymity would be achieved by not revealing names of those participating in the study. Another critical issue is to safeguard time that would be spent by participants in the study. The safeguarding of time spent refers to alerting teachers who would be sharing their views that they will not be involved in any situation in which they could be harmed (Arstein-Kerslake, et al, 2020). Spending unnecessary time with participants which might lead to fatigue should be avoided at all costs (Johnson et al, 2008).
There would be intervals, breaks taken by re-playing participants' recorded responses so as ease participants' concentration in order to check whether participants are still willing to be recorded. There would be a section in the informed consent which allows participants to decide whether they want to be voice-recorded, that would limit qualitative proceedings of the interview.

3.12 Location of the study

This section describes the location, the schools at which the study was conducted. The criterion for selecting the schools was convenience for the researcher. Convenience sampling is concerned with gaining participants whom the researcher has easy access to and are convenient to reach by the researcher. In convenience sampling, the participants do not represent any group apart from themselves and do not seek to generalise on the wider population (Landers & Behrend, 2015). There are many schools in the uMlazi district, in KZN province. Of those schools located in the uMlazi district, four offer agricultural science. The researcher decided to include these in the study because the researcher felt he could gather useful data from them. In some of these schools, the school buildings are properly maintained. Each classroom is well equipped to accommodate teachers and the learners. However, most of the learners in these schools come from families where the income from employment is very low. These learners are at non-fee-paying schools.
Furthermore, in some areas, especially in the deep rural areas, transport is an issue; and people go to town according to availability. Transport to town is usually obtainable only early in the

morning. Many people are unemployed; and those who are employed are mostly contract workers in the urban areas. As a result, some of the households are run by women because the men are working in the urban areas. Most of the people in uMlazi are peasants who survive on subsistence farming and a little commercial farming. The majority of households are dependent on the government for survival.

3.13 Limitations of the study

Trust worthiness of information given by participants may also be a problem in this study. because participants may give false information just to be quick with their answers. To solve this problem, mix methods of data analysis (Triangulation) was used to find out the truth. This is further compounded by the fact that their participation is voluntary and there are no incentives or pay for them at the end of the process. This issue was solved by explaining to them in writing via online that the work is dully and solely for academic reasons. Their information or whatever they say will not be published in any newspaper and that the research will cause no harm to any person or participants.

The limitations of this study are assumed to be time limitations that might manifest in some participants disengaging at the last minute. Without participants' responses, the researcher would find difficulty in transcribing participants' spoken words that reflect a verbatim depiction (Blee & Taylor, 2002). Another limitation would be the inability to access available related literature, which requires the researcher to describe the need for various designed methods for gathering data that advocate verbatim depiction of respondents.

3.1.4 Chapter Summary

In this chapter, research design and methodology have been discussed. The study used a qualitative interpretative methodology, which was also explained. Purposive and convenience sampling were the sample methods described in the chapter. There was also a thorough explanation of the data collection procedure covered. Semi-structured interviews and questionnaires were among them. Furthermore, a detailed presentation of the location of the study, the ethical procedures, participant anonymity and confidentiality, and obtaining agreement from the appropriate parties was also provided. The last set of study restrictions included time limits, etc. the next chapter focused on the analysis and discussions of the data which emerged from the study.

CHAPTER FOUR
DATA ANALYSIS AND DISCUSSIONS OF FINDINGS

4.1 Introduction

The previous chapter discussed the methodology underpinning this study. In this chapter, the researcher presents an analysis of the data generated from the case study of four schools situated in the Umlazi district of KwaZulu-Natal province. In this study, four teachers were used as primary sources of data. As mentioned in the previous chapter, semi-structured interviews and a questionnaire were also used as data generation for this study. This method of data collection provides detailed information and allows for an in-depth understanding of the phenomenon being researched, as the participants can reflect and reason on various subjects in different ways. The data were generated to obtain teachers' experiences of teaching agricultural science to grades 10 to 12 learners. The following research questions guided the study: "*What are the teachers' experiences of teaching grades 10 to 12 learner's agricultural science in Umlazi district, KwaZulu-Natal; and what informs teachers' decision to teach agricultural science?"* Hence, this chapter is a representation of the data analysis based on the research question.

This chapter also presents the participants' biographical information to set the context in order to understand the participants' experiences of teaching agricultural science, the data analysis process, discussions of findings, and the conclusion.

4.2 Agricultural Science Teachers' Biographical Information

Table 2 ***Biographical Information of Participants***

Participants' pseudonyms	Teaching experience	Subject specialization	Grade	Qualification	Gender	Race
Lubamba	22	Agricultural science	10 – 12	BAgric. Degree	Female	African
Rueen	10	Agricultural science	10 – 12	BSc Honours in Agric. Science	Female	African
Zangura	20	Agricultural science	10 – 12	BEd degree in Agric. Science	Female	African

Malda	22	Agricultural science	10 – 12	BEd and Adv. Cert. in Agric.	Male	African

In the study conducted, teachers' biographical information plays a vital role and is discussed in this chapter. (Ryu, et al, 2019) stated that understanding participants' biography plays an important part in generating data, in that that they are leading in teachers experiences of teaching grades 10 to 12 agricultural science in the study. The meaningful insights from participants were required to address the objectives of the research (Uittenbroek, et al, 2019). Similarities were found among the shared experiences of the participants; and differences were compared and constructed from the theoretical framework of this study, based on sharing views to answer the question that the reader might have about teachers' experiences of teaching agricultural science (Stitt, et al, 2019). Van der Heijden et al. (2015) concur with Szczesiul and Huizenga (2014) view that without teachers sharing their views and working together there will be no change in their teaching. In this study, data generated from participants brought different views that explained teachers' experiences of teaching grades 10 to 12 agricultural science.

4.3 Much Experiences shared by the Participants in Teaching Grades 10 to 12 Agricultural Science

The participants in this study shared their experiences regarding teaching agricultural sciences to grades 10 to 12. Their negative experiences are presented first in this study as they are the main findings. The choice of this decision was informed by Castleberry, and Nolen (2018), who stated that any qualitative research findings that seem to be dominant must be presented first, being so the gist of the data.

When participants were asked during the interviews whether they had resources for teaching agricultural science, participants responded as follows:

Participant (Lubamba)

> *"Yes, we have some equipment that the school bought for learners also we rely more on the feeds that we have but we do have the resources like the agricultural science kit … At school, we have a science lab to use and also, they have the equipment that the school bought for learners"*

The above response from the participant indicates that the school has some resources such as agricultural science labs and some equipment the school has bought for the learners. The study

also revealed that only one of the four teachers used agricultural teaching and learning resources. The above finding resonates with Mueller, et al, (2015) study that some high schools have science laboratories mainly for agricultural science learners. In another study by Owoeye and Olatunde-Yara, (2011) it was noted that the availability of agricultural laboratories such as agricultural science kits, land laboratories, and livestock facilities, were key to success in learning agriculture. Sengai, and Mokhele (2022) insisted that the provision of resources is crucial in ensuring smooth curriculum enactment. Shulman's (1986) theory asserts that resources are the easy way of mediating effective agricultural science lessons. This means that the availability of teaching and learning resources helps teachers present and transmit agricultural science content effectively.

4.4 Challenges of teaching agricultural science

Various factors prevent teachers from transferring difficult concepts such as learner-centred tasks, projects and work, due to the lack of skills to manage learner-projects. Other factors included poor skills of teaching and a negative attitude toward project work as well as the reluctance to change. Such are constantly viewed as principal challenges to the implementation of learner-centred learning when it comes to project teaching techniques (Diise et al., 2018).

The participants in this study shared their experiences regarding their teaching of agricultural science in grades 10 to 12. Their experiences ranged from what they considered acceptable (what is beneficial to them and their learners), what enables them to perform their work well, to what they considered unsatisfactory (challenges they face), and what hinders them from performing their work well. The above is further illuminated in Shulman's theory of PCK that teacher planning and teaching was reflective of past experiences with teaching phenomena. In this case, the teacher's knowledge was informed by their experiences, thereby creating topic-specific knowledge for teaching agricultural science.

The good experiences were that other participants mentioned that they had sufficient agricultural equipment for carrying out the practicals required as part of experiential learning. Cano (2005) and Swan et al. (2011) explained that from their findings, through working with agricultural science teachers, the use of media for teaching described by (Smaldino et al., 2005) that it can actively assist agricultural science teachers to learn from their experiences and tools suitable for assisting agricultural science teachers in teaching agricultural science subject. The responses from the participants' articulations corresponded with the above-mentioned challenges.

This is what the following participants had to say:

Participant Malda:

> "*The other thing is why are we losing a number of the learners in the science is the lack of resources".*

Participant Rueen:

> *"A challenge for me in trying to get them into doing gardening, they said: "we going to sweat, we going to be smelling. What are we going to wear when we do that?" There is that stigma back in the days when we were studying you know that whenever a child is a nuisance in the class or is mischievous in class, the teacher will say: 'go and do gardening' so that became a nuisance to us when we saw agriculture as some kind of the punishment".*

Lastly, Participant Zangura:

> ***"****Some of the schools take agricultural science for granted, so they end up taking learners from other departments to do agricultural sciences because they consider it a learning area that learners pass of which it's not true because it deals with scientific terms and also falls under pure science departments".*

Malda complained about a tendency to lose a number of learners doing agricultural science as a subject due to the challenge of not having the required resources. Zangura emphasized that other teachers take agricultural science subjects for granted and created the impression that it is not as important as other subjects; while Rueen's sentiments were that the learners were reluctant to be hands-on with the idea that they would become dirty during practicals. Lubamba did not share the sentiments with the rest of the participants because her school has a laboratory in which to conduct agricultural experiments. It was also found from the study that some schools do not have interest in the subject. The above findings from the current study indicated that teachers seem to face challenges when teaching agricultural science.

Furthermore, the school has a library that was established by the School. Agricultural science teachers' experiences with the school library are not ideal for the teaching of agricultural science. The participants who took part during the questionnaire emphasised that, although, the school has a library, but there is not enough material in it.

Participant Malda stated:

> "*We have books for other courses such as life science and Physical science, but most of the books are outdated"*

This outdated school library materials makes it inadequate for teaching and learning of agricultural science. Another type of inadequacy experienced by the agricultural science teachers speaks to content coverage.

As Participant Reuben indicated:

> "*The books in the school library have topics that are not in the agricultural science CAPS document. Just a few speak to some of the topics we cover".*

This shows that although there is a library in the school, it barely enhances the teaching and learning of agricultural science. The teachers claimed that they have complained about the inadequacy of the library, but nothing was done by the school management.

This is supported by participant (Zangura) that:

> "*The school has library for many years now. The time the new CAPS policy document was introduced, we asked the school management for new books to be made available at the library, nothing was done till now".*

The inadequate library resources have also had a detriment impact on the teaching and the learning of agricultural science with regard to assessment, according to the participating agricultural science teachers. Regarding this,

Participant Zama said: "*I can hardly give the learners class activity that will make them to use the library material because they will have to go the library elsewhere in order to access the informative books".*

However, the findings of this study also showed that where the school is located, there is no library and the only library accessible to the learners apart from the inadequate school library is the library in town. This situation has made some agricultural science teachers to adjust their assessment practices. The assessment preparation for agricultural science is negatively impacted by inadequate library resources since teachers have to adjust to the ways in which learners interact with the content.

Additionally, some of the participants during the questionnaire indicated that the teaching of agricultural science was limited to a few strategies.

Zangura concurs with this, stating that:

> *"Due to lack of resources to teach agricultural science, when I teach, I have no choice but to use the same method I have been using to teach agricultural science".*

This finding is therefore linked to some of themes below as noted by

Zama who said "*I mostly use textbooks, chalk and board because they are only available to me"*. This is to say that teaching methods are influenced by the resources to which they have access. *The school do not afford field trips, we only rely on textbooks.*

This indicates that for so many years, teachers have not relied on any other kind of instruction outside of the classroom, which is damaging to their learners' ability to contextualize agricultural events. Once more, agricultural science teachers find it difficult to include different teaching pedagogies because their instruction is confined to the classroom. Traveling across agricultural science is not an option. The limitations of instructional methodologies are significantly impacted by the school's context, because most of the parents in the townships cannot afford to pay for field trips, agricultural science teaching is only available in classrooms with limited resources.

4.5 Underrating Agricultural Science

Furthermore, the participants' responses also suggest that there is evidence of underrating of agricultural science as a subject based on negative attitudes. Little attention is on the teachers who are teaching the subject. This is supported by Participant Lubamba:

> *The teaching of Agricultural science is difficult because, the subject is not taken seriously by the learners. Learners come with the mentality that Agricultural science is all about farming.*

Participant Malda:

> *Learners who are not doing well in other subject, like life orientation, are pushed to do Agricultural Science if they are not doing well in those subjects.*

Participant Reuben:

> *I have many learners in my class due to many learners from other subjects that joined my class*

The participants' responses indicate the underestimation of school agriculture by the school system. Thus, the negative experience is that the learners still fail agricultural science because they have underestimated it. Moreover, one of the participants emphasised that he has experienced cases in which a learner who is not doing well in other subjects has been encouraged by the school to take up agriculture. Another participant (Reuben) highlighted that, as a result, they have large numbers of learners who have no interest in doing agriculture as a subject. The negative experience is aptly captured by Participant (Zangura), who's pointed out

the challenge for them as teachers to work with learners whose interest is not on the subject, and who are not driven by any sort of passion for the subject. Therefore, this has a negative impact on how agricultural science learners receive the agricultural subject. Such means that teachers must deal with learners who have little interest and love for agricultural science.

Additionally, other than the observed negative experiences by the teachers, participants responses from the questionnaire also indicated that agricultural science is deemed an easy subject by both the learners and teachers. The assumption is that anyone can take agricultural science and pass it. This has had an impact on teachers who are teaching the subject. This is supported by Participant Zangura:

> *Teaching Agricultural science is very difficult because first of all History is not taken seriously. Learners come with the mentality that Agricultural Science is just the by the way subject, you just have to know by going to farm*

Participant Zama:

> *One of my learners does not take Agricultural Science subject seriously, saying that she was forced to register the subject. She further indicated that she wanted to go for physics, but was not allowed to do so*

Participant Zangura:

> *I have the largest number of learners in my class who show little or no interest in doing Agricultural Science. Some of those learners were doing Sciences but they were forced to join my class as some of them were underperforming*

Participant Reuben:

> *Learners who offered subjects like Physics and Mathematics are being given more attention, the school send them for trips, organize extra classes for them especially during holiday, these learners usually have double period compared to those learners who offer Agricultural Science*

This indicates the underestimation of school agricultural science by the entire school system. The negative experience is that the learners still fail agricultural science because they have underestimated it as a serious discipline. Furthermore, Participant Zama emphasised that the school has experienced cases where learners enroll in agricultural science, who had initially registered for science, but were not doing well. These learners were transferred to the agricultural science courses. Participant Zangura highlighted that agricultural science teachers are obliged to have large numbers of learners who have no interest in agricultural science.

The negative experience is aptly captured by Participant Malda:

> *Since most learners do not choose Agricultural Science subject but Agricultural Science was chosen for them, they are not enthusiastic about the subject and they show little interest on the subject*

This participant suggests that choosing agricultural science for learners who are underperforming has an influence on how the learners feel about the subject and how they treat it. Participant Malda further highlighted that it is a challenge for them as teachers to work with learners whose interest is not in the subject, and who are not driven by any sort of passion for the subject. Participant Reuben noted *that the lack of passion that Agricultural Science learners have derives from a misconception about other subjects. In her words:*

> *Learners' view of Agricultural Science comes from what most people have painted Agricultural Science to be like and it is not a good picture.*

Therefore, this has a negative impact on how agricultural science learners receive the agricultural science lesson, which means that teachers must deal with learners who have little interest in the subject. This unfortunate perception of agricultural science as a subject impact negatively on the way in which teachers experience teaching and learning of agricultural science in Umlazi District.

4.6 Lack of background

During the interviews, all the participants indicated the various challenges they experience when teaching agricultural science. One of the challenges the participants experience was the lack of background in life science subjects in learners. Therefore, learners experience problems in some topics as indicated by Participant Zangura who commented on his challenges of teaching agricultural science.

> *When I introduce Agricultural Science in my class taking life science, they become confused thinking that they in life science class. Hence, they have the negative attitude towards Agricultural Science which negative impact on learners' success.*

This implies that if learners have a negative attitude towards agricultural science, they will most likely not engage in agricultural careers. Guzey, et al, (2016) state that a learner's attitude towards learning affects their outlook towards learning throughout life. This suggests that

teachers must be motivated to increase the performance of the learners in agricultural science. This also implies that for better performance, agricultural science teachers should create innovative teaching approaches to sustain the learners' interest and participation throughout the lesson period. Learners' attitude towards the study of agricultural science can affect their subject performance (Bunce, et al, 2017).

4.7 Shortage of resources in teaching agricultural science

The presence of agricultural science resources plays a vital role in the teaching of grades 10 to 12 agricultural science. This subject should be incorporated into other important subjects such as mathematics, physical science, natural sciences, life sciences, and economics, in that it combines the holistic knowledge and skills of the mentioned subjects in the CAPS in the teaching of grades 10 to 12 agricultural science (DBE, 2011). Resources such as hose pipes, watering cans, spades, and garden forks as well as laboratories are regarded as the main resources that might influence the teaching of agricultural science, as suggested by one of the participants. Participants (Rueen) were asked about the resources that they were lacking, resulting in the shortcomings of effective exposure and teaching in grades 10 to 12 classes. Rueen also agreed that garden tools such as hose pipes, watering cans, spades, and garden forks as well as having laboratories were some of the physical resources required by agricultural science teachers for simplified implementation of laboratory practical learning experience. However, the following comments were made by the teacher participants.

Participant Zangura: *"we got a shortage of resources and equipment ...we end up taking learners to other departments other than agricultural sciences as a result of limited resources"*

Participant Rueen:

> Rueen: *"... It is the duty of the teacher if there is a need for resources. The teacher must be the one to ask for resources from the principal. The teacher must put it on the table that this is what we are lacking"*

Participant Malda:

> *"I teach them normally but don't have an overhead projector I'm relying on the textbook and some resources from other colleagues and some of the information from the internet. I make copies out of my phone ..."*

The above responses indicate that all the teachers lack resources for teaching agricultural science. For instance, Zangura and Rueen shared their experience of lacking resources which to some extent led to them as teachers distributing learners to other learning streams in Zangura's school. Malda's teaching relied on a textbook due to lack of resources such as an overhead projector to show pictures while teaching agricultural science. It can be concluded from the participants' statements that the resources are not available for the ease of teaching agricultural science as a subject and to attract learners to embark on further studying of this subject at any length. However, the shortage of resources in schools creates more frustration and seems to be a major problem for a teacher who is willing to make a difference in society through impacting knowledge of learners. It evident the participants do not have the required resources for teaching agricultural science, hence they find it challenging to deliver to the learners.

Furthermore, lack of resources (overhead projectors and other study materials) affect teaching and learning of agricultural science especially in the grades 10 to 12 classroom. Learners do not have an opportunity to improve their understanding beyond what is in the book. Therefore, it is evident from the above statements that some resources are available for teaching agricultural science but these are inadequate. This hampers teachers' delivery of quality lessons to the learners. Resources are significant when teaching learners agricultural science particularly in the grades 10 to 12 classes, because resources make the understanding of concepts easy and more meaningful. The Shuman theory also captures the importance of resources to support learning. The system cannot function properly in the absence of resources. This suggests that agricultural science outcomes are not achieved when resources are inadequate. Shulman's theory (1978) also captures the importance of resources to support learning.

4.8 Inadequate information communication technology (ICT)

The study participants were asked about their experiences of teaching agricultural science to grades 10 to 12 learners. The following participants raised the issue of the inadequacy of ICT which contributed to the predominance of textbook use in their teaching and learning. Participant Zangura:

I normally use Agricultural textbooks since the overhead projector is not always available. because the other teachers are always using it for their lesson.

Participant Reuben:

Sometimes is hard to teach without having to show learners some pictures in Agriculture using projector etc, at least for a better understanding. Some of our classes almost start the sametime, most of the time you find out that other teachers have taken the projector, so it makes the teaching very challenging. So, I mostly show learners some pictures on the textbooks.

This above responses from the study participants show that the lack of ICT becomes an issue amongst teachers. The findings of this study reflect that not only does the inadequacy of ICT create problems among the teachers, but it also disrupts teachers' lessons for the day.

Participant Malda:

We have projector but teachers always rush to take to teach their subject, so is hard

The above responses show that the inadequacy of ICT has a negative impact on what teachers have initially planned to teach. At the same time makes some of the teachers to rely mostly on the use of agricultural science textbooks as the main resource for their teaching of agriculture. This means that the textbook is the predominant teaching and learning support material due to lack of resources. As reported by several studies (Munje & Jita, 2020) some teachers in high schools' experience challenges related to insufficient technical support due to lack of ICT in their classrooms.

Researchers Ani, et al, (2016) argue that ICT includes computers, the internet, and electronic delivery systems such as radios, televisions, and projectors, among others. In contrast to this study, Hanaysha, et al, (2023) argue that the use of ICT can have a considerable impact on the learners' academic success. However, Cheng, et al, (2020) noted that knowledge can be acquired through video clips, audio instruction, and visual presentation. ICT, therefore provides both teachers and learners with more educational affordance and possibilities.

4.9 Language of instruction

The findings of this study suggest that some participants expressed challenges in teaching agricultural science, given that some learners are still struggling to understand the language used by the agricultural science teachers. This may explain why some teachers have negative

experiences of teaching agricultural science to grades 10 to 12. In line with the discussion, the following views of participants were stated here related to language.

Participant Lubumba:

Majority of the learners in my classroom are still struggling with understanding Agricultural Science content not because Agriculture is a difficult subject but because learners are not familiar with the English language.

This shows that the medium of instruction is a factor resulting in learners not responding as expected to agricultural science teaching and learning. Another participant (Zangura) pointed out that some of her learners are not comfortable with speaking the English language in class. As a result, only a few learners try to answer questions during agricultural science lessons. As a solution, the teachers in this school have resorted to using their mother tongue (IsiZulu) during the teaching and learning of agricultural science.

Participant Malda:

Each time I go to class, I use most of the time to teach Agriculture in IsiZulu in order to accommodate every learner.

The above responses show that the weak familiarity of English language use by the learners posed a significant threat to the teachers. Therefore, the experience of agricultural science teachers is that learners experience challenges with English language which determines the language that teachers ultimately use when teaching agricultural science. This issue of language negatively impacts on the teachers teaching agricultural science. The learners still perform poorly in agricultural science: teachers must set examination questions in the language prescribed by the Department of Education. The medium of instruction that teachers use in this school during the teaching and learning of agricultural science is influenced by the context, in that they use the language that all their learners are familiar with which is the isiZulu language.

Participant Reuben:

I have noticed that some learners are not good at speaking English language in front of their fellow learners, it is usually those learners who try and engage verbally

Ortega, (2019) argues that a learner who cannot use the language he or she can understand well, for example, the home language in the classroom, is disadvantaged, and not likely to do well in class. This finding also supported the existing study by Rolin-Ianziti, and Varshney, (2008) who insisted that some learners cannot ask questions nor make suggestions in class

when the home language cannot be used. This in turn has a negative impact on the way they learn.

4.10 Using agricultural science textbook

Among other issues that relate to the inadequacy of teaching and learning support material, is the use of the textbook. The participants' responses indicated that textbooks dominate pedagogy during agricultural science lessons. Thus, the dominance of the textbook as the teaching and learning support material is due to factors that the participants mentioned in their responses. This is evidenced in the responses that teachers gave when asked about their normal agricultural science lesson.

Participant Lubumba:

> *I always tell my learners to bring out their textbooks and open a certain page to discuss some of the examples*

It is noteworthy that when the participants were asked about the teaching and learning support materials that they use for agricultural science lessons, the response from some of the participants was that they use textbooks for agricultural science and learning. However, the predominance of the textbook as the teaching and learning support material is not the teachers' choice. It is the circumstances that they find themselves in that compels the teachers to rely mostly on the use of textbooks. However, the agricultural science teachers view this predominance of agricultural science textbooks as a negative experience. Apart from the chalkboard, agricultural science textbooks dominate the process of teaching and learning of agriculture due to their availability. The above findings are in line with Milligan, et al, (2017) assertion that some schools depend only on the textbooks due to availability. On the other hand, Hewitt and Manning (2019) argues that textbooks may be essential to the teaching and learning of agriculture but should not be the dominant resource. This also suggests that the predominance of the textbooks in the schools hampers the effectiveness of teaching and learning. The above teacher used textbooks for classwork examples. The chalkboard was also used during the lesson to writes notes. However, this teacher has demonstrated more of KCS and KCC than of KCT. He taught his learners without allowing them to ask questions or discuss. He did not provide learners with group activity. *Lubumba*, demonstrated KCC by understanding the CAPS curriculum standards and how they relate to previous and future grades. KCT was not fully exhibited since he did not use diverse instructional materials to encourage learners. He showed KCT by writing on the board.

4.11 Relationship between Teachers' Interest in the Teaching of Agricultural Science and Creating a Positive Classroom Environment

In order for a teacher to achieve the desired goal in teaching agricultural science, pedagogical content knowledge (PCK) must be included as a tool to effectively execute the teaching and learning of agricultural science. The PCK approach relies on adequate teaching skills, effective teaching techniques, lesson plans and notes, relevant instructional aids, and on updating methods of teaching from teacher-centred to learner-centred techniques (Modebelu & Nwakpadolu, 2013). Cano (2005) described interest as the extent to which the learners' curiosity is awakened and sustained by utilising the resource materials to intensify their understanding. Additionally, the learners' interest and curiosity can be utilised to stimulate the learners' performance and to actively stimulate the learner-centred approach (Daluba, 2013). In response to the question on teachers' interests in teaching agricultural science, the participants responded as follows:

Participant Malda:

"Stimulation of the interest wants you to be interested … Then you can even create a joke but out of the subject and then also change the tone not using the same tone every day".

Participant Rueen:

> *"I bring pictures from magazines to maybe introduce a Nguni cattle and tell them a little or brief history about Nguni cattle … Sometimes it's better to touch on history before you do the lesson …".*

Participant Zangura:

> *"Sometimes I plant some crops in a school yard … I buy different food that is produced … as part of agriculture ….".*

Participant Lubamba:

> *"… I am a product of agriculture. Even at the tertiary level, I found a bursary with Sugarcane Industry (SASRI), and then everything is from agriculture. … I teach in rural areas where farming is more important …"*

According to Lubamba's experience, she used her bursary to spark interest in the learners and show them that there are many funding's within the field of agricultural science that can be provided at the tertiary level. Lubamba also went back to teach in rural areas with enhanced knowledge for bettering agricultural science in learners. Zangura also created an interest in

learners by bringing the freshly produced crops to class to show learners that if they embark on agricultural science as a career these are the results as they see in class. Rueen instilled an interest in the learners by introducing them to the history of agricultural science, recounting how the history of agricultural science had evolved since the beginning of animal domestication. Participant Malda puts learners at ease by creating an acceptable environment for them to be comfortable learning agricultural science. Overall, the importance of the involvement of teacher training creating efficiency in teaching agricultural science was evident. This will result in enhancing learners' interest in class during teaching and learning (Masha & Maphutha, 2022).

4.12 Teachers' Varying Attitudes towards the Teaching of Grades 10 to 12 Agricultural Science

It is up to the teacher to create and execute a positive attitude in class to generate optimism on the teaching and learning to yield a positive response from the learners. A positive attitude is a necessary tool to be developed by teachers to perform and teach beyond their disciplines. Additionally, teamwork with other teachers will assist in changing current instructional strategies for teaching grades 10 to 12 agricultural science (Salami, et at, 2017). Teamwork, interdisciplinary teaching, and teaching satisfaction (Salami, 2017) will contribute to promoting and implementing of various teaching techniques and facilitated teamwork. A certain set of skills and knowledge is required to implement an interdisciplinary curriculum. Rockland et al. (2010) pointed out that for the instruction to be developed, it is necessary to meet in groups to discuss teaching techniques for teaching grades 10 to 12 agricultural science.

The attitudes of the participants were portrayed in the following manner as they went on sharing about their teaching of agricultural science:

Participant Malda:

> *"I won't take that stress to my kids … I'm always positive"*.

Participant Zangura:

> "*The attitude is positive but only that there are some of the things happening in the surrounding environment that ends up turning me down but still I've got a positive attitude because of love of agriculture … I think that if they can organize colleges of agriculture so that learners will start doing Agriculture from grade 8 to 12 that can be much better as compared to doing it in school*.

Participant Lubamba:

"I've got a very positive attitude … I do it with passion with my learners".

It can be concluded from teachers' verbatim comments that they shared the same attitudes towards remaining optimistic when teaching agricultural science. The participants also emphasised that they show positivity to the learners while teaching, because such results in smooth teaching and learning of agricultural science. Therefore, a positive attitude towards agricultural science assists learners to relax, focus, and absorb information as they learn.

4.13 Diversity in Teachers' Methods of Teaching Grades 10 to 12 Agricultural Science

Evidence from the research findings in this study suggest that some participants stepped up by employing different approaches while teaching agricultural science for a better understanding of the agricultural concepts. Thus, a good teaching method provides learners with information to be used now or in the future. Narratives and discussions are thought to be an effective approach to teaching agricultural science as suggested by Participant Malda:

> *"The methods differ, you can use the narrative method and you can use also the discussion method, questions and answers by using maybe slides we've been using the overhead projector you ask them questions. I come up with different skills in teaching practicals, one because they've done theory part so like animal nutrition, they do it themselves and they draw the structures and labels it with the function of the structures".*

The above response reflects that the participant uses various methods to teach agricultural science to grades 10 to 12 classes. Thus, teachers engage learners in the learning process by working together and showing learners what they need to know. This also reveals that teachers use mostly discussion methods, narrative methods, questions and answers. According to Fahrman, et al, (2020) a teacher's choice of teaching method depends on their technical know-how and the nature of the content. Agricultural science teachers choose a flexible teaching approach in order for learners to develop critical thinking.

Furthermore, evidence from the participants' responses indicated that they involved learners in questions and answers, practicals to help structure a lesson and to improve engagement and knowledge retention, learners learning more easily by actually undertaking activities (Venton, & Pompano, 2021). The methods discussed above expose learners to long-lasting experiences and assist them to think critically. The interviewed agricultural science teachers indicated that

they apply various skills while teaching practicals in grades 10 to 12. The choice of this method is to equip learners with the relevant skills to apply knowledge in practical situations. This is in line with Reis, et al, (2021) study that teachers work systematically during teaching and learning in their classrooms with the goal of enriching and improving learners' learning, concomitantly improving their teaching methods.

4.14 Inspirational Effects of Teaching Grades 10 to 12 Agricultural Science

A teacher may also inspire the learners by organising educational trips and taking the learners out to career exposition centres where they can be career guided to motivate them to further their education. A teacher may also include educational excursions, agricultural trips to farms, agricultural research institutes (companies), and agricultural colleges in which the learners can experience the real life of agricultural science careers in various streams. In general, inspiration must be linked to the learning process, one possibly having an effect on the other (Cicuto & Torres, 2016) Various factors contribute to inspiring teaching and learning agricultural science. It is not only the responsibility of a learner: it also should involve the academic environment such as teachers and their functioning environment (de Freitas et al., 2020). To inspire learners, the teachers also involve the cultivation of crops in learning agricultural science, while the participants responded as follows:

Participant Zangura:

"I take my learners for educational excursions to some of the agricultural institutions like Owen Sithole agricultural College and Cedara at Pietermaritzburg".

Participant Malda**:**

"*When doing animal nutrition… they know they will eat some and enjoy some meal. I have videos for artificial insemination and like one of the areas I took them to Owen Sithole College and, they were shown how to do (AI)artificial insemination. They were laughing to some up point".*

Participant Rueen:

"Learners must be taken to field trips. I take them to Cedara or Owen Sithole College of Agriculture, that's where they get to see how it's done, this is how livestock looks like, they have cattle, sheep, goats have poultry this is how they are incorporated into agriculture. They have to learn about field management, veld management, pasture, and all that so the educational trips are more important and they help in terms of intensifying the subject understanding in a child".

Participant Lubamba:

"I am a product of Agriculture. Even at the tertiary level, I found a bursary with Sugarcane Industry (SASRI), and then everything is from agriculture. I always tell them to pursue careers in agriculture because it's not about becoming a professional in agriculture you can even start your own business and become a farmer".

4.15 Benefits of Teaching Agricultural Science to Grades 10 to 12

4.8.1 *Initiating agricultural school farming projects*

From the participants' responses, it is evident that agricultural school farming projects initiated by a teacher may assist in harnessing the skills of learners in producing fresh produce and also training the learners to trade with what they had produced to circulate money, simultaneously gaining a profit. The participants' responses to the beneficial effect of teaching agricultural science were as follows:

Participant Lubamba:

I learn some of the things that their indigenous knowledge that they acquire at home…and that's an interesting subject that opens my mind and I see that they are agricultural business opportunities for agriculture that we can instill to learners and also to us to alleviate poverty (by growing and selling fresh crops and seedlings) so that we do agriculture as a subject but to equip them so that they can even do it at home to generate income for their families".

Participant Malda:

"There are so many opportunities even job security. More chances of getting employment. Learners can even start their businesses. Promote innovation by coming up with new ideas and being involved in cooperative marketing or farming" ...

Participant Rueen:

"*You don't go hungry, because you know that in your backyard you just grow lettuce, carrot, turnip or your mealies without going to the market and have to spend money… it eradicates hunger. It also teaches them to be hands-on and be responsible as well".*

The above responses indicated that in both schools, not only are the teachers teaching learners agricultural science but educating and developing their skills on how they can grow crops.

These findings are consistent with some previous studies. In a study by DiBenedetto, et al, (2018) it was found that agricultural science teachers educate learners on agriculture and how they can grow crops. Ige, et al, (2016) also found that high school agricultural science teachers conduct program that will educate learners about career pathways in agriculture.

Wells, et al, (2021) found that some teachers do not educate their learners on how they can grow crops and trade with what they have produced. In this study, teachers appear to be more enthusiastic about educating their learners on how they can grow some crops and trade with what they had produced.

4.16 Future Way Forward in Teaching Grades 10 to 12 Agricultural Science

Despite using images and communication techniques, Zangura and Lubamba opined that the provision of food and bursary opportunities to learners can stimulate the teaching of grades 10 to 12 agricultural science. The achievement of pursuing agricultural science relies more on teachers who can show passion in teaching towards pursuing a sustainable career in agriculture. Alston; et al, (2020) wrote that agricultural science needs teachers who can utilise the land for food production and be able to identify donors to assist in pursuing agricultural science careers. With that in mind, teachers are foreseen as leaders in ensuring that the success of agricultural science lies within them having to overcome social and economic issues (Alston; et al, 2020). Van der, et al, (2015) write that teacher as agents of change should be able to acknowledge problems existing within the school and to provide possible solutions.

4.17 Summary of the chapter

This chapter focused on the data analysis and discussion of the findings of the data generated from this study. Due to the current Covid-19 pandemic, the researcher ensured there was no physical contact while collecting data. This meant that the researcher could not go to the school to collect the data from my research participants. For this study, the researcher employed semi-structured interviews and a questionnaire to generate data online which explored the teachers' experiences of teaching grades 10 to 12 agricultural science in the Umlazi district. The data presentation was given as themes generated by the participants. In addition, verbatim comments were employed to ensure that the participants' voices were heard. In the discussion of the findings, references to the relevant literature were used to support the argument. The next chapter discusses the summary, recommendations, and conclusion of the study.

CHAPTER FIVE
SUMMARY OF FINDINGS AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, the researcher presented the data analysis and discussion of the findings of this study. This section presents the last chapter which provides the summary of the findings that responded to the research question. Recommendations from the findings as well as limitations are provided by the researcher. The recommendations for future research are also presented.

5.2 Summary of the key research findings

This section provides the summary of the findings that responded to the key research question used to guide this study as stated again below:

1. What are teachers' experiences of teaching grades 10 to 12 agricultural science in the uMlazi district?
2. What informs teachers' decision to teach agricultural science?

5.2 .1 Summary of findings on the key research question

Using the key highlights, the findings of the present study on the key research are summarized as follows.

The findings of this study suggest that the teachers had both negative and positive experiences while teaching agricultural science in uMlazi district. The participants in this study had a realistic view of their teaching experiences. The findings, however, identified some of the factors inhibiting the teaching of agricultural science from grades 10 to 12 as discussed below. One finding revealed that participants experienced lack of teaching resources for example, garden tools, overhead projectors, as well as agricultural science laboratories. As such, the above findings suggest that teachers' experience of teaching agricultural science in these schools is difficult because they lack the required teaching resources.

Other issues in this study that make the teaching of agricultural science problematic. For example, inadequate teaching and learning support materials such as information

communication technology (ICT) systems come into play. Also, unfairly, subjects such as chemistry, mathematics, and life science are given priority over agricultural science.

Another finding in this study was the experience of using the textbook as a dominant teaching and learning resource. As shown in the preceding chapter, the agricultural science teachers view this dominance of the agricultural science textbook as a negative experience. Relating this to earlier findings, the overreliance on the textbook limits pedagogy and learners' access to multiple perspectives. Apart from the chalkboard, many research studies argue that agricultural science textbooks dominate the processes of the teaching and learning of agriculture due to their accessibility and affordability (Lawal, & Kannan, 2021; Howley, 2013; Martell, 2012; Mohammed, et al, 2021). This agrees with Krishnan, et al, (2020) assertion that most schools depend solely on the textbooks due to their cost-effectiveness and convenience since they are portable and comparatively easily accessible.

More so, Milligan, et al, (2017) emphasise that sharing textbooks is a barrier to effective teaching and learning. This means that the availability of even those resources that are said to be easily accessible, such as textbooks, is still in question in some schools in South Africa. This is supported by the fact raised by Kapur (2018) that some parents cannot even afford to buy adequate stationery, textbooks and school uniforms for their children at school. Additionally, Legotlo, (2014) asserts that frequently, it is the government that is obliged to buy the stationery; unfortunately, supplies are often insufficient. This is the case for the school in this study, making the agricultural science teachers and learners' victims of the lack of agricultural science textbooks. Liu, et al, (2022) argue that textbooks may be very important in the teaching of agriculture, but they should not be the predominant resource. The predominance of agricultural science textbooks in the school impacts negatively on the effectiveness of teaching and learning agricultural science.

Having a textbook dominating the pedagogy means that learners only have access to perspectives within the textbook, their knowledge thus mostly limited to what is written in the textbook. According to Al-Issa, et al, (2019) the teaching and learning of Agricultural Science should go beyond textbooks, textbooks only facilitating rote learning. Learners in agricultural science classes have negative experiences of the teaching and learning of agricultural science due to the unpleasantness that comes with the inadequacy of teaching and learning materials.

Another negative experience in teaching agricultural science to grades 10 to 12 learners stems from the inadequacy of ICT. According to Al-Mahrooqi, (2015) teaching and learning support

material is a necessary key feature of effective teaching and learning. This is supported by Hung, and Chen, (2018) who noted that visuals make teaching and learning result in better understanding of the content. This is consistent with Wang, and Wong, (2017) who maintain that teaching is a process of transferring knowledge through showing, telling, and demonstration. Thus, for the agricultural science teachers in this study, the teaching and learning process is mainly focused on the telling and only to a limited extent, on demonstration. The showing part is impossible in practice because of the unavailability of teaching and learning support material that can facilitate the teaching of agricultural science through primary sources. Inadequacy of ICT and other teaching and learning support materials results in agricultural science teaching in this study relying heavily on the use of textbooks. Textbooks are the only available and accessible resources for agricultural science teaching to grades 10 to 12 learners.

Furthermore, the findings of the study in relation to negative experiences of teaching agricultural science teachers was that the agricultural science subject is underrated. Agricultural science as a subject is thus not given deserved credit; and misconceptions abound around the subject. The findings of the study show that most agricultural science learners were not be allowed to register for science-related subjects that they initially wanted to do because they were deemed underperforming. The assumption is that any learner can do agricultural science and pass it: this is the reason for the majority of the learners intentionally registering for agricultural science. This shows that agricultural science is underrated by the learners and school management.

The underrating of agricultural science is also evidenced by the absence of field trips. This reveals that subjects such as chemistry, physics, and life science are given more attention than agricultural science, even to the extent that trips are undertaken in these subjects. It is thus not so that the school cannot pay for field trips; it is about priority subjects. Furthermore, the study revealed that some teachers were teaching agricultural science because they are passionate about teaching the subject, acknowledging that it is exciting to teach, and that they gain pleasure from teaching the subject. This is similar to the study by Snider, et al, (2021), who noted that most teachers teach agricultural science for the love of the subject.

5.3 Issues of language

The findings presented in the previous chapter also showed that agricultural science teachers and learners experienced challenges with language. The agricultural science teachers noted that

academic language and the language of instruction are challenges in the teaching and learning of agricultural science to grades 10 to 12 learners. Challenges were found of teaching agricultural science content and giving assessments using academic language and English as a medium of instruction. As presented in Chapter 4 of this study, agricultural science learners are not familiar with the English language and expressed difficulty with agricultural science language which impacts negatively on the teaching and learning of agricultural science. These findings correspond with those of Macaro, et al, (2018) who assert that language is key to learners' ability to learn agricultural science be it by talking or writing. The study also suggests that the difficulty with the English language stems from the context of rurality where the learners are largely exposed to their mother tongue language which is IsiZulu, making it a challenge for learners to transition to English.

The fact that agricultural science teachers have resorted to teaching agricultural science in IsiZulu for better understanding, seems not to make much of a difference; learners still have to write their examinations and class tests in English. This links to an assertion made by Macaro, and Lee (2013) that language is an issue in rural schools so much so that teachers use codeswitching when teaching for the benefit of learners. Learners still fail the agricultural science examination, as claimed by Matthews, and Lerner, (2024) because the relationship between language and learning is central to learners' understanding of the content.

5.4 Underrating Agricultural Science

The last finding in relation to negative experiences of agricultural science teachers was that the agricultural science subject is underrated. This finding implies that agricultural science is not given deserved credit, and there are misconceptions surrounding the subject. As shown in Chapter 4 of this study, some learners are not interested in agricultural science and take the subject unwillingly. Findings indicated that most agricultural science learners could not be admitted for science streams that they initially wanted to do because they were deemed underperforming. The assumption is that anyone can take agricultural science and pass, which is why some learners intentionally take it up imagining that they will attain good marks. This shows that agricultural science as a subject is underrated by teachers, learners, and school management.

First of all, it is a negative experience for learners to be taking a subject that many people denigrate. Secondly, the teaching and learning experience has shown that learners still struggle with the agricultural science subject as much as they struggle with other subjects. Learners are

still failing agricultural science, disproving the assumption that any student can perform well in agricultural science. The underrating of agricultural science is also evidenced by the absence of allocated field trips, as mentioned earlier. Findings show that other subjects such as mathematics and physics are given more priority than agricultural science to the extent that those teachers can even take their learners on field trips.

It is therefore not so much about the school not affording field trips, but about prioritising of subjects. Furthermore, for holiday classes and extra classes, agricultural science is not allocated many slots on the timetable compared with s other subjects. This also speaks to the underrating and misconception that agricultural science learners do not need extra lessons. It is concerning that underperforming learners are pushed to agricultural science, yet the same agricultural science is not given attention. One would expect that the learners who are deemed underperforming would be given other means of improving their academic performance such as extra lessons which would help slower learners to understand the content better. Instead, more attention is given to subjects applying to top achiever learners. This contradicts the purpose of the school environment which is to educate and impart knowledge to learners. The underrating of agricultural science stems from learners being sent to school so that they can secure jobs in the future as (Cantú, 2017) states. However, this is not the only purpose of education. It is unfortunate that in most rural areas agricultural science is not amongst the popular subject choices because of the perception that it does not open doors to well-paying careers, as notes (Fisher, 2017).

In another study Serin (2017) expresses that a teacher with passion positively influences the learning experience. There is a correlation between a teacher's passion and the learners' intrinsic motivation to learn. Passion leads to interested, energetic, and participating learners in the subject. For some of the participants, teaching agricultural sciences is important to them. Their subject equips learners with sustainable knowledge and necessary skills, which will enable them to make their own sound decisions. These participants have a passion for teaching agricultural sciences to learners. It is said that learners' viewpoints about learning are directly dependent upon the teacher's passion.

Passionate teachers are good at creating beneficial relations with their learners. Salau, (2023) indicated that the teaching of agricultural sciences should be included in the school curriculum for learners to acquire knowledge and skills to meet society's basic food production needs and industrial raw materials. Therefore, teachers should utilise the teaching and learning of

agricultural sciences to equip the students for good living, stimulating learners' interest in agriculture, and integrating their knowledge and skills.

5.5 Recommendations

It is evident that in this study the participants' negative experiences dominate; however, there are various measures the schools selected for this study can employ to enhance the participants' teaching experiences based on the findings of this study. Other schools can also make use of some of these measure that could be employed by the school in this study. The study has shown that the participants need adequate support from all stakeholders (management, DoE, inter

The present study findings suggest the following recommendations:

- In order to improve the teaching and learning of agricultural science, the researcher recommends the building of agricultural colleges which offer short courses that will uplift the standard of teachers teaching agricultural science.
- The DoE should organize continuous workshops in rural and urban areas to enhance teacher knowledge and understanding of agricultural science.
- To overcome the challenges of teaching the grades 10 to 12 agricultural science, the DoE and Education board should equip schools with all relevant resources for teaching agricultural science in schools for effective content delivery of the subject.
- The DoE should provide an experimental site in Umlazi district where the learners can go for agricultural science practicals.
- The researcher recommends that learners be exposed to more practicals and demonstrations, excursions to bridge the gap between theoretical and practical aspects of the subject.
- Lastly, the DoE should work together in order to promote effective teaching of agricultural science in schools.

5.6 Recommendations for further research

The following recommendations for further research are presented below:

- The study was specifically aimed at grades 10 to 12 learners. The study should also be aimed at grade 7 to 9 learners for a more comprehensive picture of teachers' experiences of teaching agricultural science to these classes.

- Further studies exploring the teachers' experiences of teaching agricultural science in a different district, such as KwaMashu in KZN or in another province should be undertaken.

5.7 Limitations of the study

Huber and Helm (2020) argue that a research study often does not go according to the original plans; which indicates that all research has certain limitations. The limitations of this study are assumed to be time limitations that might manifest in some participants disengaging at the last minute. Teachers value their time and prefer not to be disturbed during their break and lunch hours at school. To address this, the researcher requested after-work sessions with teachers for one-on-one interviews. The researcher made sure the schedule did not interfere with their working hours.

Without participants' responses, the researcher would find it difficulty in transcribing participants' spoken words that reflect a verbatim depiction (Blee & Taylor, 2002). Another limitation is that the study was conducted in grades 10 to 12 and did not include the lower classes, i.e., grades, 7 to 9. The study included only four teachers who have taught agricultural science in schools. However, the inclusion of more agricultural science teachers might give a different result.

5.8 Summary of this chapter

By putting the voices of actual grades 10 to 12 agricultural science teacher's front and center, this study sought to understand how these teachers have been experiencing the teaching of agricultural science. The purpose of this study was to give agricultural science teachers in grades 10 to 12 the chance to analise how they understood their own experiences teaching these grade levels. The research's conclusions make it clear that teachers encounter challenges while teaching agricultural science to grades 10 to 12 class. It is also clear that the kinds of activities that take place in the classroom are significantly influenced by the teaching and learning tools available. This leads to the conclusion that teaching and learning processes are often determined by the kind of resources available to schools.

Some educators who were interviewed also hinted that portion of the curriculum were skipped from schools due to shortage of resources. This also highlights the fact

that certain teachers find it challenging to improvise, raising concern about the institutional capability of the educational system. The difficulties these institutions face all have adverse effect on the development of critical farming skills that learners studying agricultural sciences should learn. As a result, learners are unable to raise their standard of living through education.

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P.O Box 342
PINETOWN
3600

08 April 2019

The Principal

REQUESTING PERMISSION TO CONDUCT A RESEARCH IN YOUR SCHOOL

My name is Dorah Nokuthula Soni, a student at University of KwaZulu-Natal Edgewood Campus (South Africa). I am interested in exploring experiences of teachers teaching Agricultural Science in grade 10-12 in the uMlazi District.

The topic of my study is "Exploring experiences of teachers teaching Agricultural Science in grade 10-12 in the uMlazi district".

Your school has been selected to conduct this research study as it will contribute a valuable insight in exploring an understanding of this topic. I humbly request your participation which will be greatly appreciated.

The school functionality will not be disrupted in any way and the participants will be interviewed after school. I will also ask the permission to utilize a tape recorder when interviewing participants.

- Names of the school and teachers will not be mention or linked to any data generated.
- In this way pseudonyms for all the participants and the school will be used, and will under no circumstances will be revealed without your permission.
- The name of the school will remain confidential and pseudonyms will be used.
- For the purpose of the data generation the discussion will be tape-record, but at all time the identity of the school and respondents will be protected.
- Data collected will be stored in a safe place at the University and after five years it will then be disposed of.
- Participant is voluntary, if at any time during the course of the research they will wish to withdraw themselves from the research, they will be free to do so, without any negative consequences.

Thank you for taking my request to consideration

[redacted]

[redacted]

[redacted]

INFORMED CONSENT OF RESEARCH PARTICIPANTS

Dear Sir/ Madam

My name is Dorah Nokuthula Soni, doing MEd in Curriculum Studies at University of KwaZulu-Natal. I am a Curriculum MEd candidate studying at the University of KwaZulu-Natal. As part of the requirements for the degree I am required to conduct a research study. My study is entitled 'Exploring teachers experiences in teaching Agricultural Science in grade 10-12 in uMlazi district'. I am requesting your participation in this study.

This study aims to answer the following question:
What are teachers' experiences in teaching Agricultural Science in grade 10-12?

Please note that:
Your confidentiality is guaranteed. You will be allocated a pseudonym to ensure confidentiality.
You have a choice to participate or withdraw from the research project. You will not be penalized for taking such an action.

- Any information given by you cannot be used against you, and the collected data will be used for purposes of this research only.
- No harm is associated with participating in this research.
- You have a right not to answer specific questions but continue as a participant.
- Your involvement is purely for academic purposes only, and there are no financial benefits involved.
- Interviews will be used as a method of collecting data in this research project.
- The interviews will be private and will take place in a mutually agreed upon location.
- I would like to make an audio- recording of the interview.
- Please indicate whether you like to be recorded or not by ticking the correct box:

Equipment	**Willing**	**Not willing**
Voice recorder		

- Data will be stored in secure storage and destroyed after five years.

Thank you for your co-operation.

Dorah Nokuthula Soni
Contact Details: 0826219638
Email address: nokuthulala@gmail.com

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma Tel: 033 392 1063 Ref.:2/4/8/2031

Mrs DN Soni
PO Box 342
Pinetown
3600

Dear Mrs Soni

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"EXPLORING EXPERIENCES OF TEACHERS TEACHING AGRICULTURAL SCIENCE IN GRADE 10-12 IN THE UMLAZI DISTRICT",** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 16 September 2019 to 01 March 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private BagX9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

[redacted]

Dr. EV Nzama
Head of Department: Education
Date: 08 October 2019

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

06 May 2020

Mrs Dorah Nokuthula Soni (215079905)
School Of Education
Edgewood Campus

Dear Mrs Soni,

Protocol reference number: HSSREC/00001165/2020
Project title: TEACHERS' EXPERIENCES OF TEACHING AGRICULTURAL SCIENCE TO GRADE 10-12 LEARNERS IN THE UMLAZI DISTRICT
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 05 February 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 06 May 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

[redacted]

[redacted]
Professor Dipane Hlalele (Chair)

/dd

ADDENDUM A: COPY OF SEMI-STRUCTURED INTERVIEW INSTRUMENT

Introduction to participants

I am Nokuthula Soni, a Master's student at University of KwaZulu-Natal. The purpose of the interview is to explore experiences of teachers in teaching Grade 10-12 Agricultural Science. Your participation in the interview will be confidentially and anonymously.

Participant's information

Name of school where you teach: _____

Name of subject you teach: _____

Number of years teaching the subject: _____

Name of institution where you obtain your qualification: _____

Please state your qualification: _____

Tell me your interests in teaching Grade 10-12 Agricultural Science: _____

The following open-ended questions are planned to be asked during semi-structured interviews:

a) What are some of your experiences in teaching Grade 10-12 Agricultural Science?

……

……..

b) How do you teach Grade 10-12 Agricultural Science?

……

……

c) What challenges do you experience when teaching Grade 10-12 Agricultural Science?

……

……..

d) How do you overcome challenges encountered whilst teaching Agricultural Science in Grade 10-12?

……

……

e) What are some of the benefits of teaching Agricultural Science?

……

……..

f) In your teaching, how do you link practical aspect to theoretical knowledge when teaching Agricultural Science?

……

……

g) What teaching methods do you use that you think are suitable for teaching Agricultural Science in Grade 10-12?

---

h) What are physical resources of teaching the practical part of Agricultural Science in Grade 10 to 12?

---

i) At present, what would you say is your attitude towards teaching Agricultural Science as a subject?

……

……

j) How do you stimulate the interests when teaching Agricultural Science?

K) What are some of your thoughts on teaching Grade 10 to 12 Agricultural Science in the future?

……

……

……

I) General comments about teaching Grade 10 to 12 Agricultural Science

……

……

……

……

Thank you so much for your participation in the study. Should you require any information regarding the interview I will be available to assist you

Questionnaire for Grade 10 to 12 Agricultural Science teachers

Full name/s and surname:……

School…….

Teaching Subjects……..

1. Why do you teach Agricultural Science? _____
2. Goals (Aim, and Objectives): Towards which goals are you teaching Agricultural Science?_____
   _____
   _____
3. Teaching activities: What resources do you normally use to teach Agricultural Science to Grade 10 to 12?_____
   _____
   _____
4. Do you enjoy teaching Agricultural Science to Grade 10 to 12 learners? *Explain in detail*_____
   _____
   _____
5. What are your experiences of teaching Agricultural Science from Grade 10 to 12 learners?_____
   _____
   _____

Proofreading Services

Lydia Weight
NTSD English Specialist
SACE No: 11135129

E-mail: lydiaweight@gmail.com

Pinpoint Proofreading Services

40 Ridge Rd
Kloof
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3610
12 Nov 2023

To whom it may concern

This is to certify that I, Lydia Weight, have proofread the document titled: Teachers' experiences of teaching agricultural science to Grades 10-12 learners in the Umlazi district, by Dorah Nokuthula Soni. I have made all the necessary corrections. The document is therefore ready for presentation to the destined authority.

Yours faithfully

L. Weight

Teachers' Experiences of Teaching Agricultural Science to Grades 10 to 12 Learners in the Umlazi District, KwaZulu-Natal

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	researchspace.ukzn.ac.za Internet Source	6%
2	scholar.ufs.ac.za Internet Source	2%