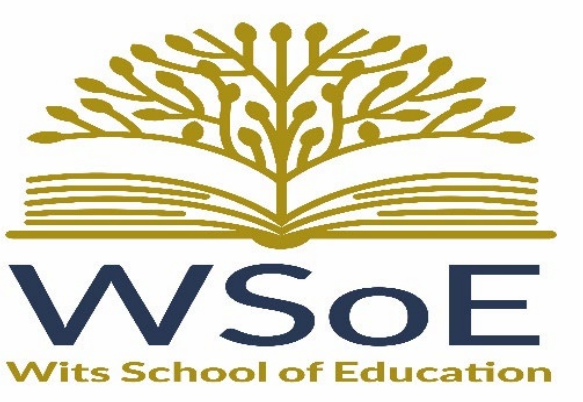

"Integration of Cultural Heritage when teaching and learning about the kidney in Grade 11 Life Sciences classrooms in SA: A Self Study"

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Abstract

In this research I was researching my own practice in the classroom; therefore, the research is focused on my practice. However, my practice cannot happen without my learners. I am conscious that my learners are indirect participants because it is their reaction to my teaching that determines how I will teach.

This study seeks to establish how use of knowledge from my culture and the learners' cultural heritage as a methodology can be conducted meaningfully to teach the concept of the kidney in my Grade 11 class of Life Sciences. This is because learners often feel that there are major differences that exist between their culture and the culture of the science they come to learn at school (Aikenhead & Jegede, 1999). The use of cultural heritage in a classroom has the potential to help move learners from one level of cognitive development to another (Mandikonza, 2019). Furthermore, the National Curriculum and Assessment Policy Statement (CAPS) grades R-12 that stipulates policy on curriculum and assessment in the schooling sector in South Africa suggests that all learners be given the expression of what is regarded as knowledge, skills and values that are worth learning (CAPS, 2012). It emphasizes that children need to acquire and apply knowledge and skills in ways that are meaningful to their lives (lived experience); as such, the curriculum promotes the idea of grounding knowledge in local contexts (realities) while being sensitive to global imperatives (CAPS, 2011).

This study used a qualitative research design and followed an interpretivist approach. The theoretical frameworks that guided this study was the social constructivism theory -Vygotsky's social development theory, Zone of Proximal Development (ZPD) and More Knowledgeable Other (MKO). Learners in my Grade 11 class were purposively selected to participate in the study. Data collecting techniques included journaling that I used as a way of reporting observations, reflection

and reactions to classroom occurrences as well as observation by critical friend who observed and can asked questions that were provocative which provided data to be studied through another lens (Noor & Shafee, 2020). Multiple data collecting tools were used which included semi-structured interviews, audio and video recordings. A narrative enquiry was used to analyze my data. Findings from this study suggest that CH contributes meaningfully in the learning of science concepts, there are challenges that are associated with integrating CH in the science classrooms that need to be addressed lastly, there is a need for teachers to constantly improve their practice in the classroom. Findings from this study may in some way contribute in assisting the production of culturally appropriate learning material for curriculum developers.

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- Finally, my brother Mkhululi Nkabinde for editing my work.

Table of acronyms

CAPS: Curriculum and Assessment Policy Standard

NCS: National Curriculum Statement

DoE: Department of Education

GDE: Gauteng Department of Education

ICH-Intangible Cultural Heritage

CH- Cultural Heritage

IK – Indigenous Knowledge

Table of content

Chapter 1

1. INTRODUCTION TO THE STUDY

1.1 Introduction

Scholars in the domain of cultural heritage argue that education that is not linked to people's consciousness, beliefs, traditions, and values is likely to fail (Ocampo &Delgado, 2014). Learners who are taught in ways that integrate their cultural heritage experience learning that is linked to their personal experiences and teachers can use this way of teaching to help learners learn concepts from abstract to concrete (Mandikonza, 2019). In this introductory chapter, I provide an orientation and overview of my study that focuses on investigating how my use of cultural heritage in a Grade 11 Life sciences class can promote a conceptual understanding of the concept of the kidney. To do this I discuss the background of the study, the context of the study, the rationale of the study, as well as the problem statement. I further discuss the aims and objectives of the study, introduce the research questions, and provide the overall research structure.

1.2 Background of the study

A curriculum that embraces the use of cultural heritage is likely to produce individuals who acquire and apply knowledge and skills in ways that are meaningful to their lives (CAPS, 2011). Cultural heritage refers to knowledge that is shared among or circulated among members of the community through shared activities. In most communities, this knowledge is passed on from one generation to another, it evolves in response to changes in the communities (Bakar, Osman, and Bachok, 2011). Cultural heritage is seen as a way of living, it is developed and expressed by communities and gets passed on through customs, values, objects, places, and expressions that are artistic (Bakar, Osman, and Bachok, 2011),

According to Vygotsky (1978), learning first takes place in a social environment. learning happens in a process that involves building knowledge from a foundation of prior knowledge (Krahenbuhl, 2016). This prior knowledge emanates from people's beliefs and lived experiences as such, learners create their meaning based on old and newly learned information (Krahenbuhl, 2016). Learners are social actors and thus interact with their social environment first before coming to

school (Vygotsky, 1978). Teachers who use pedagogies that involve the use of cultural heritage in their classrooms equip learners with knowledge that is relevant to their lives and help them acquire skills that can be applied outside of the premises of the school (CAPS, 2011).

1.3 Context of the study

This study was conducted in a township secondary school near a metropolitan city in South Africa. The secondary school falls under a quantile 3 school that is under the care of the Department of Basic Education (DBE). The DBE is responsible for all public primary (grades 0 - 7) and secondary (grades 8 12) schools. Public schools, under DBE, are divided into groups, namely, the General Education and Training (GET) band (Grades 0/R – 9) and the Future Education and Training (FET) group (Grades 10 - 12). Schools in quantile 3 are non–fee-paying schools, meaning they do not have many resources available to aid their teaching and learning in class as such they rely heavily on what the teacher delivers to them for every lesson. This self-study was conducted using grade 11 learners in my life sciences class. Many of my learners were born and raised in the urban areas with little exposure to life in the rural areas however, live with families that practice customs and norms brought in by parents and grandparents from their rural backgrounds.

1.4 Rationale of the study

One of the major challenges in science education cited by literature points to how learners perceive school science (Aikenhead & Jegede, 1999). Learners often feel that school science is foreign in language and culture (Aikenhead & Jegede 1999). The reason for this is the major differences that exist between learners' cultures and the culture of the science they come to learn at school (Aikenhead & Jegede, 1999). The cultural clashes that exist between the worlds that students live in and the world of school science challenge educators who teach science to come up with curricula that are culturally sensitive and methodologies that will reduce the feeling of foreignness experienced by learners in the science classrooms (Aikenhead & Jegede,1999).

Aikenhead and Jegede (1999) argue therefore that a learner's success in science is dependent on three things; the first one is the degree of differences in culture that the learner has lived and experienced and science. Secondly, the ability of the learner to effectively move from their worldview and culture to the culture of science or school science, and thirdly the help that learners receive to facilitate the transition and make it easy (Aikenhead and Jegede, 1999). In this

research, I investigate how my use of knowledge from my cultural heritage can be used to teach the concept of the kidney in my Grade 11 class of Life Sciences. I use this knowledge to teach the kidney because it has the potential to help reduce the feeling of foreignness that learners experience when they are in the science classrooms but instead, show the alignment of science in the classroom and practices that learners are exposed to in their home environment.

1.5 Research problem/ Problem statement

The occurrence of chronic kidney disease (CKD) has shown an increase globally, ranking as the 27 causes of death in the 1990s. In 2010, CKD was ranked as the 18th cause of death, and in 2019, CKD was the 10th cause of death (Madrim, Ja'far, & Hod, 2021). CKD among other non-communicable diseases contributes significantly to morbidity and mortality globally (Madrim, Ja'far, & Hod, 2021). The goal of the UN's Sustainable Development is to see a decrease in CKD and to achieve the goal; greater attention has to be directed toward learning about this disease that is linked to the kidney. Learners in my Grade 11 Life Sciences class have demonstrated struggles with understanding the concept of the kidney in previous years. This research is done in an attempt to help me improve my practice in the classroom using pedagogies that involve the use of knowledge from my CH and the learner's CH to build a conceptual understanding of the kidney.

1.6 Aims and objectives of the study

Aim:

To determine how cultural heritage knowledge can be used to teach the concept of the kidney in a Grade 11 class of Life Sciences.

Objective:

To find out which relevant CH knowledge on the concept of the kidney should I bring to the teaching and learning process at the grade 11 level.

To explore how I can use the relevant CH knowledge in teaching and learning about the kidney among Grade 11 learners.

To establish my views on the affordances of integrating CH knowledge into the teaching and learning of the kidney at Grade 11 Life Sciences.

1.7 Research questions

Primary research question

How can I integrate cultural heritage (CH) knowledge into the teaching and learning of the kidney at Grade 11 Life Sciences?

Sub-Questions

What relevant CH knowledge on the concept of the kidney do I bring to the teaching and learning process in Grade 11?

How can I use the relevant CH knowledge in teaching and learning about the kidney among Grade 11 learners?

What are my views on the challenges of integrating CH knowledge into the teaching and learning of the kidney at Grade 11 Life Sciences?

1.8 Research structure

Chapter 1 of this study covered the introduction by discussing the background of the study, the context of the study, the rationale of the study, the research problem statement, the aims and objectives of the study, as well as the questions that guided this research. The literature review is presented in Chapter 2, which establishes familiarity and understanding of current research in the field of Cultural Heritage (CH) in education as well as the theoretical framework employed by the study. In Chapter 3, I discuss the research design and research methodology that has been employed in collecting data in this study. Also, it includes the research strategy, population and sample of this study, research instruments, data analysis, and ethical considerations for this study. Chapter 4 covers the data analysis and findings. Lastly, Chapter 5 discusses the findings, covers the answers to the research questions guiding this study, recommendations, limitations of the study, and my reflections on conducting and compiling this research report.

1.9 Summary of the chapter

The purpose of this study was to investigate how my use of cultural heritage knowledge in a Grade 11 Life sciences class can promote a conceptual understanding of the concept of the kidney. In this introductory chapter, the background of the study gave the reader the foundation that is surrounding my research topic. The background of the study established the significance of this study by setting the scene of this paper which showed the reader why this study was important. The context of the study was necessary for the reader to understand the circumstances in which the study was conducted, this will help the reader to understand the pedagogic reasoning of the educator in chapter three. Chapter one of this study also discussed the rationale of the study which provided a justification of why the study is important. Among other reasons, the rationale discussed the use of knowledge from the teacher and the learner's cultural heritage having the potential to help reduce the feeling of foreignness that learners experience when they are in the science classrooms but instead, show the alignment of science in the classroom and practices that learners are exposed to in their home environment. Furthermore, this introductory chapter discussed the research problem of this study, aims and objectives of this study as well as the research questions that guided this study. Lastly, this chapter provided the overall research structure of the study.

Chapter 2

2. Literature review

2.1 Introduction

In this chapter, I review and report on some of the background research studies that have been done in the past on cultural heritage and the systems associated with local knowledge and place-based learning. This is done to build an argument based on the careful analysis of the different literature. This literature review will also discuss South Africa's curricular mandate the Curriculum and Assessment Policy Statement (CAPS) on valuing cultural heritage in South African Classrooms.

2.2 Understanding Cultural Heritage

Heritage according to Bakar, Osman, and Bachok (2011) refers to anything that is handed over from one generation to another, this refers to elements that are natural or man-made. Cultural heritage can be tangible or intangible (Bakar, Osman, and Bachok,2011). The tangible cultural heritage exists in the natural and built environment while the intangible cultural heritage (ICH) is made up of continuous cultural practices, living ethnicities, knowledge, and experiences of living that emanated from the past (Bakar, Osman, and Bachok,2011). Tangible heritage includes historical sites, monuments, archaeological, ethnological, scientific, and any material that was collected in the past (Bakar, Osman, and Bachok,2011). Tangible heritage is all the elements that can be viewed or touched in the present that were preserved from the past (Bakar, Osman, and Bachok,2011).

Petronela (2015) says intangible cultural heritage (ICH) serves as a bridge between the past, present, and future, she says it brings in experiences like transition and transcendence in the changing and continuity of the structures of societies (Petronela,2015). ICH expresses itself through phrases, processes, abilities, and know-how that include cultural spaces with their identified objects that people have claimed as what makes their cultural heritage, it is constantly changing as it gets recreated (Petronela,2015). It gets recreated because communities change over time in response to environmental changes (Bakar, Osman, and Bachok,2011). ICH ensures

strong humanity amongst members of a community as well as builds a strong sense of identity and continuity (Petronela (2015).

2.3 Culturally appropriate education

This research uses the term cultural heritage instead of indigenous knowledge because from literature indigenous knowledge and cultural heritage are said to fall under the same body of knowledge that believes in norms, beliefs, and knowledge being acquired by local people through experiences and informal experiments (Warren and Rajasekaran,1993). Indigenous knowledge remains the same since time and is untouched or unchanged by influences from outside that environment (Warren and Rajasekaran,1993). Cultural heritage recognizes that knowledge does not remain the same over time however is modified through time and by the environment (Petronela,2015).

UNICEF (2004) articulated that all children have the right to education and a system of education that supports the culture of the child, their language, and access to schooling that is without discrimination. The United Nations Convention on the Rights of Indigenous People and Preservation also cites that children have the right to education in cultural contexts that are familiar to them (United Nations, 2005). The concept of culturally appropriate education is drawing much more attention from many scholars in curricular reforms all across the globe (Reyhner, Sakiestewa & Louise, 2011). Culturally appropriate education is good educational practice and not just a basic human right (Reyhner, Sakiestewa & Louise, 2011).

The best way for education to be contextualized is to relate the culture, communities, and lives of the learners to what they are learning (Reyhner, Sakiestewa & Louise, 2011). This is supported by Shizha (2007) whose argument lies on the importance that school science is connected to children's cultural background as learning that involves the use of culturally appropriate pedagogies and models improves learning. He says that learners respond differently when knowledge from their cultural background is made visible in their science classrooms (Shizha, 2007). It brings learners lived experiences to their classroom which allows them to work to their full potential, gain confidence and self-esteem, be more creative as well as understand and experience the coexistence of these two ways of knowing (Shizha, 2007). It is therefore important

for educators to respond to the local concerns that the learners may bring to class (Reyhner, Sakiestewa & Louise, 2011).

Jerome Brunner who was a professor from Havard University said “Culture shapes the mind, it provides us with the toolkit by which we construct not only our worlds but our very conceptions of ourselves and our powers” he states further that “you cannot understand mental activity unless you take into account the cultural setting and its resources, the very things that give the mind its shape and scope. Learning, remembering, talking, imagining: all of them are made possible by participating in a culture” (Bruner, 1996, pp. xxi). The education of the child must be comprised of the social, emotional, ethical as well as academic priorities of the child (Reyhner, Sakiestewa, and Louise,2011). Schooling which is part of education that is conducted in a formal institution such as a school, university, or college is a small sub-unit of education (Bass, 2008). Education comprises of total of everything that one learns in their lives and not just what they learn at school (Bass, 2008). Education does not occur in space but occurs within a social environment since humans are by nature social beings (Vygotsky, 1978). In essence, education occurs within societies, and inside societies, a culture exists (Aikenhead and Elliott, 2010). It is through education that one generation can pass over what it has learned through experience to another generation therefore without education each upcoming generation would have to start from the beginning of the quest for knowledge discovery (Bass, 2008).

The role of education however is to pass on more than knowledge, it passes on laws, beliefs, values, and customs that help shape and govern societies, in a nutshell, education transmits culture (Bass,2008). This transmission of culture occurs regardless of whether the schools are present or not, it does not necessarily occur in school. Learning starts from the time a person is born and much of what is learned at that time is culture (Vygotsky, 1978). When that individual starts with formal schooling, they already have had some education in their life (Schunk, Cobb & Bowers, 1999). It is based on this knowledge that this research advocates for the integration of learner’s knowledge from their culture to teach the concept of the kidney in a grade 11 classroom.

2.4 Cultural heritage knowledge and the concept of the kidney in Grade 11 CAPS curriculum

2.4.1 What are kidneys?

Kidneys are organs that are central to homeostasis, through delicate sensory mechanisms, kidneys regulate water levels, sodium levels, blood pressure, potassium levels, acidity, and hemoglobin but their main function is the excretion of metabolic waste from urine (Rayner, Thomas, and Milford, 2016). Kidneys play an important role in keeping the body functioning, as such, learners need to understand how they work to keep them healthy (Rodriguez, 2020). According to grade 11 ATP under excretion topic, learners are expected to know the basic structure of the kidneys, their position in the animal body, their role in homeostatic control of water and salts as well as the roles of hormones ADH and aldosterone (CAPS, 2011). Learners are taught the kidney using textbook diagrams as well as textbook terminologies (see www.learnxtra.co.za). This way of teaching is not consistent with the ideas of Specific Aim 3 on the South Africa Curriculum and Assessment Policy Statement (CAPS) for life sciences, this aim says that learners should be taught in ways that will equip them with the knowledge that relevant to their lives and help them acquire skills that can be applied outside of the premises of the school (CAPS, 2011). Using a methodological approach that will allow for the integration of a learner's cultural heritage to explain the kidney may help in linking the knowledge that is stipulated in the learner's textbooks and one that they are familiar with.

2.4.2 Cultural heritage knowledge and the concept of the kidney

Reasoner (2011), says that kidneys are one of the complex organs in the human body and thus teaching the kidney may be overwhelmingly challenging as there is a lot of information regarding its function including how solutes are regulated in the concentration of urine as well as their physiology. Ristanto, Rahayu, and Mutmainah, (2021) argue that a conceptual understanding of the kidney can be built if learners are taught the excretory system through constructivism. Constructivism is a theory that argues that learning that involves interactions in a social environment plays an important role in the cognitive development of the child. (Steiner & Mahn, 1996). Using constructivism as a lens to teach the excretory system means that learners will be able to apply their knowledge in daily life (Ristanto, Rahayu, and Mutmainah, 2021). Conceptual understanding is demonstrated when a learner can interpret and explain the meaning of a concept in their language (Ristanto, Rahayu, and Mutmainah, 2021). Learners can understand a

concept better if they are actively involved in the process of learning (Ristanto, Rahayu, and Mutmainah, 2021). Teachers who use methodologies that draw from learners' cultural practices are likely to be in a better position to reach out to the learners and encourage them to be actively involved in learning (Mandikonza, 2019). When a teacher brings this knowledge into the classroom, it becomes familiar to the learners and thus draws them to learning. Learners who are exposed to this way of learning usually see the alignment of the school curriculum concerning their personal and communal lives (Mandikonza, 2019).

Ristanto, Rahayu, and Mutmainah, (2021) say that life sciences is a subject that comprises abstract concepts, among them is the concept of the kidney. They argue that the kidney is abstract because to understand the concept, one has to understand the content that was explained that is related or integrated with it (Ristanto, Rahayu, and Mutmainah,2021). Using learners' knowledge from their culture may help learners learn concepts from abstract to concrete (Mandikonza, 2019). This is stated in Mandikonza, (2019) as learning that involves learners understanding concepts that they are familiar with and can relate to first, when learners have fully understood the concept, they can then apply it at the abstract level (Mandikonza,2019).

2.5 The use of cultural heritage knowledge in the class and CAPS

The National Curriculum and Assessment Policy Statement (CAPS) for grades R-12 stipulates policy on curriculum and assessment in the schooling sector in South Africa. The general aim of this South African curriculum is to give grade R-12 learners the expression of what is regarded to be knowledge, skills, and values worth learning. It also ensures that children acquire and apply knowledge and skills in ways that are meaningful to their lives (lived experience); as such, the curriculum promotes the idea of grounding knowledge in local contexts (realities) while being sensitive to global imperatives (CAPS, 2011).

The National Curriculum and Assessment Policy Statement among other things serve the purpose of equipping learners, irrespective of their socio-economic background, race, gender, physical ability, intellectual ability, and religion (markers of difference) with the knowledge, skills, and values necessary for self-fulfillment, and meaningful participation in their society (CAPS, 2011).

This means that for learners to be active participants in their societies, they need to know and value the knowledge that exists within their local and immediate communities.

The National Curriculum Assessment Policy Statement is based on the principles of social transformation, ensuring that educational injustices of the past are redressed and that equal educational opportunities are provided for all sections of the population (CAPS, 2011). In essence, CAPS is addressing the social inequalities of the past. Among other principles of the NCS/CAPS is valuing indigenous knowledge systems; acknowledging the rich history and heritage of South Africa as important contributors to nurturing the values contained in the SA Constitution (DoE, 2005).

Life sciences as defined by CAPS, (2011) is the scientific study of living things from the molecular level to their interactions with one another and the environment. There are three broad specific aims in life sciences according to CAPS, which relate to the purpose of learning sciences. The first specific aim relates to knowing the content of the subject; the second aim relates to doing science or practical work and investigations; and the third aim relates to understanding the applications of life sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science. These aims, as explained in CAPS, are to enable learners to understand that school science can be relevant to their lives outside of the school context and that it enriches their lives.

According to CAPS (2011), all knowledge grows out of the view of how the world works. One of the differences between modern science (and technology) and traditional, indigenous knowledge is that they have their origins in different worldviews (Grange,2007). Learners should be provided opportunities to engage with the knowledge emergent from their cultural contexts (Grange,2007). The Department of Education (DoE) states that Indigenous or traditional technologies and practices in South Africa are not just ways of working, they are ways of knowing, thinking, and acting (DoE, 2002). Traditional technologies and practices often reflect the wisdom of people who lived a long time ago in one place and have a great deal of knowledge about their environment (DoE, 2002, p. 10). Both the teachers and the learners possess this knowledge.

2.6 Why Integrate cultural heritage knowledge during teaching and learning

There have been several scholars who advocate for the integration of CH into school science. To begin this argument, I draw from Seehawer (2018), who says that during her study, teachers had personal reasons that motivated them to integrate this knowledge. One of the teachers in her research cited that her reason for integration was driven by the need to make science relevant to his learner's life realities. He believed that by doing this, learners would be more drawn to his lessons. This is consistent with Nkopodi and Mosimege (2009), who have argued for the use of indigenous games in the teaching and learning of mathematics. Nkopodi and Mosimege (2009) argue that the use of games from our cultural heritage has the potential to improve learning in the classroom. Although their research is based on mathematics studies, it does extend the message to the science community as well to start looking at the incorporation of games from CH to improve the teaching and learning of concepts.

Nkopodi and Mosimege (2009), used the indigenous game called *morabaraba* to improve the teaching and learning of mathematics in the classroom. They argue that using indigenous games in mathematics allows learners the opportunity to relate the mathematical concepts and processes that they encounter in their mathematics classroom to experiences that are outside of their classroom (Nkopodi & Mosimege, 2009). They say further that the familiarity that is created between these games and mathematics helps learners move past their fear of mathematics (Nkopodi & Mosimege, 2009). In the same breath Moloi (2013) says that the incorporation of indigenous games into mathematics classrooms not only helps learners improve academically, it also adds a strong sense of pride in learners' cultural identity.

Seehawer (2018), in her paper, says that teachers integrate CH into their lessons because they believe that this knowledge can be used as a tool to make science more accessible, moving from what is known to the unknown (Mawere,2015). While other teachers believe that there is more than one way of knowing something, they advocate for integration so that they can widen the horizon for their learners. For Breidlid, Glasson, Mhango, Phiri, and Lanier (2010), integration is necessary as it promotes sustainable development, by this they mean that equipping learners with this knowledge may drive learners to think more about using local solutions to address issues that relate to health, a sustainable lifestyle, and protection that is related to the

environment (Breidlid,e.t al, 2010). Integration of CH is important as it is seen as one of the ways that connect learners with their culture thus promoting the involvement of parents and communities in education (Breidlid, et al, 2010).

2.7 Challenges of integrating cultural heritage knowledge into teaching

Several challenges have come up from literature that relate to the integration of CH into science classrooms with other scholars reporting on cases where teachers believed that classroom science and CH are different from each other (Nnadozie, 2009). Many of these challenges emanate from teachers not being fully equipped with examples to use during teaching and learning as well as a lack of inexplicit pedagogies that promote integration. Seehawer (2018), says that it is not surprising that teachers experience challenges relating to the integration of CH into their classrooms, he says this is expected because teacher education does not prepare educators to teach in ways that promote integration. Teachers are trained in Eurocentric ways hence their knowledge of CH is considered to be limited (Khupe, 2014).

Knowledge of cultural heritage is not explicitly specified in the curriculum and different communities have different CHs which makes it difficult to know which one to integrate (Khupe, 2014). The above-mentioned challenges are all practical challenges relating to integration, Seehawer (2018), argues that other challenges with integration are ideological in nature, he terms this intellectual colonization. To explain this, he asks the reader why it is that when they visit a herbalist they feel like they are visiting a lesser qualified medical practitioner. He argues then that intellectual colonization is one of the challenges that act as a barrier to integration, this he says is because some teachers still conform to the perception of CH being inferior to other kinds of knowledge (Seehawer, 2018).

2.8 How can cultural heritage knowledge be incorporated in life sciences classrooms

Naidoo (2010) argues that there is a need to fill the gap between Western knowledge and indigenous knowledge in science classrooms. Several strategies and examples have been suggested by literature to aid in the integration of CH in science classrooms. Nnadozie, (2009) says that in the absence of relevant material to use for integration, teachers could draw knowledge from the CH that they possess or research knowledge that exists in their communities and integrate the relevant knowledge into the curriculum. For example, De Beer & Mothwa,

2013; Fakoyede and Otulaja (2019), say to give learners a good start teachers can infuse the commercialization of indigenous plants and the use of indigenous materials. Learners in life sciences can discuss indigenous plants like Uzaneke, which is reported to have been used in traditional medicine to remedy chronic coughs as well as to provide a protective charm to ward off lightning. Indigenous plants like UmTenatane have been reported to treat painful menstrual cramps, and stalked bulbine roots that have been used in indigenous communities for a long time that is taken to stop vomiting and diarrhea (De Beer & Mothwa, 2013). Teachers can use these examples as an opportunity to introduce the world of CH that is supported by science (Kigozi,2021). Another strategy that can be used is one that was suggested by Fakoyede and Otulaja (2019), these scholars spoke about the incorporation of appropriate cultural material to teach science. To do this, they provided an example of using beadwork in Life Sciences to demonstrate the structures of simple and complex organic sugars in Chemistry (Fakoyede & Otulaja, 2019).

Argumentation pedagogy is another strategy that can be used to incorporate CH into life sciences classrooms (Kigozi,2021). Argumentation is a conversation between two or more parties that involves justifying or disapproving a claim to reach an agreement about a controversial matter at hand (Kigozi,2021). Using argumentation strategy will allow teachers and learners to get a sense of awareness of other people's CH (Òtúlàjà, Cameron, &Msimanga, 2011). This would help teachers and their learners to develop multiple perspectives that would promote the initiation of an argument, with that CH gets integrated into the lesson through argumentation (Òtúlàjà, Cameron, &Msimanga, 2011).

2.9 Theoretical frameworks

This study was grounded in a theoretical framework. A theoretical framework is a structure that summarizes and reviews existing theories that will serve as a roadmap that the researcher uses to develop arguments for their work (Kigosi, 2021). Theoretical frameworks are needed as they provide a basis that scholars can use to interpret their research data as well as articulate the study's theoretical assumptions (Neuman, 2000). After data collection, the results are checked to see if they are in agreement with the framework and if the framework that is chosen can be

used to describe the data that was collected (Kigosi, 2021). This study was guided by constructivism and it emerges in my discussions as well as my findings.

2.9.1 Constructivism

Constructivism is a learning and teaching philosophy that holds the position that learning happens in a process that involves building knowledge from a foundation of prior knowledge and social interactions in a social setting by social actors (Krahenbuhl, 2016). Constructivist learning believes that knowledge emanates from people's beliefs and lived experiences (Schunk, Cobb & Bowers, 1999); as such, learners create their meaning based on old and newly learned information (David, 2015). Two theorists who contributed to constructivist learning theory and child development are Lev Vygotsky and Jean Piaget (Davids, 2015). This research uses the constructivist perspective by Lev Vygotsky.

2.9.2. Vygotsky's social development theory.

Vygotsky (1978), in his social development theory, argues that interactions in a social environment play an important role in the cognitive development of the child. Steiner and Mahn (1996) also put forward that the development of the mind of the child is both social and individual. This is because the concept of internalization considers that the human mind is entangled with social, historical, cultural, and material processes including activities of the brain (Bada & Olusegun, 2015; David, 2020). Internalization is seen as a presentational activity, a process that occurs simultaneously in social practice as well as in the human brain (Steiner & Mahn, 1996). Therefore, the nature and content of an individual's mental process cannot be understood in isolation from the culture of which that is part (Steiner & Mahn, 1996). To elaborate further, I focus on the themes of the Zone of proximal development (ZPD) and interactions with more knowledgeable others (MKO) under Vygotsky's social constructivism.

2.9.3. Zone of Proximal Development (ZPD)

To help explain learning while participating in social interaction within a social environment, Vygotsky highlighted the significance of learning in a socio-cultural environment. Vygotsky (1978) alluded to the fact that when children intermingle with a more competent person, they tend to use their cognitive tools to develop constructs using ZPD (Chaiklin, 2003). The ZPD is defined as the distance between the actual developmental level as determined through independent

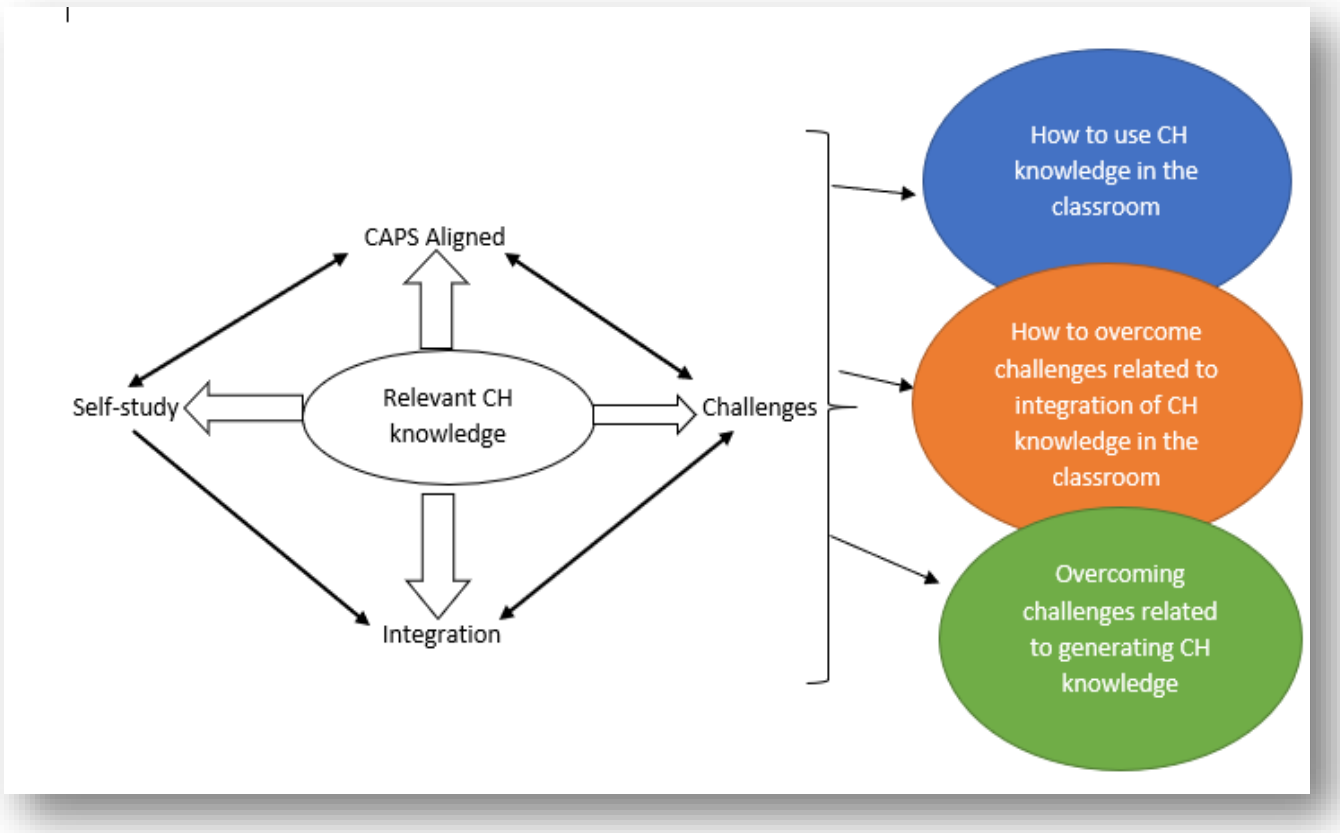
problem-solving and the level of potential development as determined through problem-solving under adult supervision or in collaboration with more capable peers (Steiner & Mahn, 1996). In the context of education, learners learn better when they work in collaboration with others who have more knowledge and skills. Therefore, by providing learners with culturally relevant tasks, you are moving them to their next ZPD level. Learners thus achieve a level of learning that they would not have been able to achieve by themselves, this drives learners to complete more tasks given to them.

2.9.4 More Knowledgeable Other (MKO)

The social development theory states that learning can take place in the presence of an MKO (David, 2010). The term MKO refers to a person or any form of resource that learners use (Abtahi et al., 2017) that has more knowledge and skills than the learners (Mcleod, 2020). Vygotsky suggested that with the help of an MKO, learners can accomplish a higher level of learning (Brau, 2020).

2.10 The conceptual framework for my study

Conceptual framework as defined by Miles and Huberman (1994) is a "graphical "or "narrative "explanation of "the main things to be studied" which include "the key factors, constructs or variables and presumed relationships among them" (Miles & Huberman, 2004, p.18). From this, one can understand a conceptual framework to be a representation of a specific phenomenon to be studied. This study was about me teaching grade 11 learners using knowledge from CH. From the literature review that I presented above, I identified concepts that are important for teaching and learning that involves the use of CH knowledge in the classroom. These concepts and the relationship among them are presented in the conceptual framework below.



According to my literature review, the major aspect in my research is using knowledge from CH to teach the concept of the kidney therefore to do this, my first task was finding the relevant CH knowledge to use during my teaching. This major aspect then needs to be aligned with other aspects to ensure that it can be used effectively in the classroom. The left side of my framework shows the relationship that exist between my major aspect that is relevant CH knowledge in the

center of this framework with the other supporting concepts which are: CAPS aligned, integration, self-study and challenges. These concepts need to work together with this major concept to ensure that it serves a purpose of being integrated in the classroom. Together, these become the input in this framework. The input leads to the output that is on the right side of this framework. Relevant CH at the center means that none of the other concepts can exist in isolation of it in this literature review. CAPS aligned speaks to relevancy of this CH knowledge to CAPS as stated in my literature review that CAPS stipulates policy on what needs to be taught in South African classrooms. According to CAPS (2011), children should acquire and apply knowledge and skills in ways that are meaningful to their lives (lived experience); as such, the curriculum promotes the idea of grounding knowledge in local contexts (realities) while being sensitive to global imperatives (CAPS, 2011). CAPS therefore becomes an important aspect that needs to be considered when one thinks about the relevant CH knowledge to use.

From the above framework there is a relationship that exists between CAPS and challenges as well as a relationship that exists between CAPS and self-study. Challenges have a direct link with CAPS as it was mentioned in my literature review that as much as CAPS supports the use of knowledge from cultural heritage, there are no specific examples given to teachers to aid in the process of teaching this then serves as a shortfall in CAPS which breeds challenges. Challenges with CAPS lead to challenges with integrating the relevant CH knowledge during teaching, the conceptual framework shows that there is a relationship that exists between challenges as well as integration. While this study finds the integration of this knowledge a necessity, it does not shy away from acknowledging that this integration bears some challenges. Nyamupangedengu (2015), says while self-study is set to be a study that focuses on self by self, the process of research however is not about self. She says that self-study is about what an educator can do for their students and education. The link therefore that exists between self-study and CAPS serves the purpose to show that self-study research helps educators to better themselves therefore come up with methodologies to better the implementation of the curriculum.

The link that is also apparent in the framework above is one that exists between self-study and integration. This says to the reader, after generating the relevant CH knowledge, self-study research was be used as a vehicle to drive the integration of this knowledge when teaching about

the kidney. The interaction of all these aspects gave rise to How to use CH knowledge in the classroom, how to overcome challenges related to integration of CH knowledge in the classroom and overcoming challenges related to generating CH knowledge all of which ensure successful integration of CH knowledge into my grade 11 class of life sciences.

2.10.1 Summary of the chapter

In the literature review, I introduced ICH as a body of knowledge that believes in norms, beliefs, and knowledge being acquired by local people through experiences and informal experiments. I also showed that ICH differs from IKS as it recognizes that this knowledge does not remain the same over time however is modified through time and by the environment. The literature review in this study discussed the importance of culturally appropriate education. Drawing from many scholars, this chapter also discussed reasons behind integrating CH knowledge into life sciences classrooms and why the learners would benefit from this integration particularly on concept of the kidney. Among other things was the complexity of this concept that makes its comprehension to be a challenge. This chapter reviewed literature on scholars that advocate for the integration of CH knowledge in the classroom, and how this can be done in the classroom. This chapter also reviewed literature that showed that integration of CH knowledge bears many challenges. One of the challenges cited in this chapter is teacher education that does not prepare educators to teach in ways that promote integration. Teachers are trained in Eurocentric ways hence their knowledge of CH is considered to be limited (Khupe,2014). Lastly, this chapter discussed constructivism as a theoretical framework that guided this study as well as a conceptual framework.

CHAPTER 3

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In this self-study, I investigated my teaching of excretion to a grade 11 class of life sciences in an attempt to improve my pedagogical practice in the classroom. My study has one main research question and three sub-research questions. In this section, I describe how I conducted my study by outlining the research approach, paradigm, and data collection process that I followed to help me answer my research questions. Furthermore, I briefly discuss how my data was analyzed and the ethical considerations I followed in conducting the study.

3.2 Research design

There are many research designs available to choose from depending on what study you want to carry out. Since this is self-study research, deciding on what research design to use was not a difficult task because, from the beginning, I knew that my research was going to be primarily explanatory and that I had reasons and motivations that fueled this research that may need to be explained and understood. I also knew that I would want to understand the underlying reasons behind the responses that were going to be provided by my learners during interviews. After reading about the three types of research designs namely, qualitative, quantitative, and mixed methods, I then realized that qualitative research design embodies all that is needed by my research. The qualitative research design has its strengths and weaknesses, before outlining them, I will start by sharing what the scholars say about qualitative study and qualitative researchers.

Choy (2014) says that qualitative researchers are highly self-aware and that they acknowledge their social self. He further states that before engaging in research, these researchers reflect and assess themselves and their position in a social and historical context. This resonated with me because before engaging in this research, I realized that my Grade 11 learners in the past have had challenges with comprehending the concept of the kidney and the processes that take place in it. I then thought of ways that I could use, ways that exist in my social environment that will help them understand this concept better. It is this paper that made me aware that I carried the

characteristics of a qualitative researcher and that I was on the right track. Strauss and Corbin (1990) say qualitative research design is broadly defined as any kind of research that produces findings not arrived at using statistical procedures or quantifying results. They further say that this research requires explanation, this explanation is used to gain an understanding of underlying reasons, opinions, and motivations of human experiences. In qualitative research, the researcher makes knowledge claims mainly from the perspective of a constructivist using multiple meanings of individual experiences, these meanings are socially and historically constructed (Creswell & Creswell, 2017).

The researcher collects open-ended data that is emerging with the intent of developing themes from the data in this research design (Creswell & Creswell, 2017). The advantages that came with choosing this qualitative method are that I could look deep into my participant's beliefs, and experiences that they have lived as well as the underlying values in the form of textual data. The qualitative method also allowed me to have a close interaction with the participants, which made it easy for me to access and capture their thoughts during the time of our interaction. The disadvantage of this method is that data collection is time-consuming and because as a researcher who is researching her practice and a member of a community, data analysis may be biased (Choy, 2014). Being aware of the disadvantages has helped me to look at ways of overcoming these weaknesses, therefore, allowing me to look closely at the things that might be a shortfall in my research.

3.3 Interpretivist approach

This study followed an interpretivist approach to research. The reason for this is that this approach takes into account the differences that exist in human beings, these include the different cultures, circumstances as well and the development of human beings' social realities that are influenced by time (Alharahsheh & Pius, 2019). This research adopted several qualities from the interpretivist paradigm which are summarised as follows: Firstly, as a researcher who is researching her practice in the classroom, I was the main influence in identifying the research problem and developing research questions that were of interest to my research. Secondly, I was able to have an in-depth individual experience of my participants through discussions that were informal and through interviews (Alharahsheh & Pius, 2019). Thirdly, I explored human

experiences using qualitative designs and methodologies and lastly this approach allowed me to use experience as a highly important aspect that supports scientific research (Alharahsheh & Pius, 2019).

It is after reading about this approach that I saw the possibilities of using the knowledge and experience from my cultural heritage as a methodology that could work and breed good results in the classroom. The disadvantage that came with this approach was that it was less likely to generalize the data that was given and analyzed as it was context-dependent and based on specific viewpoints and values. This research can however still add value given that all communities and cultures are different, one could use an example from their cultural heritage that will suit their context.

3.4 Research method

3.4.1 Case study

A research method that was appropriate for this study was a self-study case study. A case study was chosen and used because it focuses on a particular research problem, or an event or activity of one or few individuals (Stake, 1995). With a case study, I was able to narrow down a very broad field of research into easily researchable concepts (Stake, 1995).

This method worked well with my research as my research stems from a broad field of cultural heritage, with a case study, I was able to narrow down my research to focus on the intangible side of cultural heritage and on its contribution to teaching one concept in the field of life sciences which was that of the kidney. This was done with a group of few individuals which allowed me to look closely at the issue that I was investigating at the time.

Johnson and Onwuegbuzie (2015), in their paper, say that a case study research design is also useful for testing whether a specific theory and model applies to phenomena in the real world. For this research I am hoping to generate new ideas that might be tested by other methods, a case study will help me do that. The strengths of this research design include the fact that the data that was collected was based on my categories of meaning. It also allowed me to describe, in detail, phenomena and occurrences as they emerged in my local contexts (Johnson &

Onwuegbuzie, 2015). This research method, furthermore, is responsive to local situations, conditions, and the needs of all stakeholders involved (Johnson & Onwuegbuzie, 2015). It provides an understanding and description of peoples' personal experiences. Lastly, it is useful for studying a limited number of cases in depth (Johnson & Onwuegbuzie, 2015).

3.4.2 Self-study

A self-study is teacher research that primarily concerns itself with encouraging teachers to be agents of change in the classroom while working collaboratively with colleagues (Samaras,2011). In a self-study, teachers thoroughly and consciously pay strong attention to their actions and the context in which these actions exist as a way of developing a professional activity that is more consciously driven (Samaras, 2002). Samaras (2011), says that the purpose of self-study research is to improve teaching and learning. She says teachers need to ask themselves "What value will this research bring to others?" This deliberate questioning leads to new pedagogies that will improve the teacher's practice in class while also impacting student's learning (Samaras, 2011).

In my five years of teaching, I often asked myself questions about how I could improve the teaching of challenging topics in my grade 11 life sciences class. I often thought about myself as a learner and what would help me comprehend these concepts better. Among other challenging topics is one of the kidneys and the processes that take place inside them. I have seen my learners struggle with comprehending the concept of the kidney and those that were able to partially succeed in assessment would often not remember anything about it after a few weeks of learning about the kidney which suggested that they did not fully understand the concept. When I decided to do my research, I knew that it had to be a self-study because I had taken a course that involved teaching about different research methods and I knew that my primary goal was to improve my pedagogical practice in the classroom.

In self-study research, teachers observe their own experiences in the classroom and initiate questions about their practice (Samaras, 2011). This is done for their personal growth and development. To successfully do this, Samaras (2011) suggests that teachers need to collaborate with a critical friend which can be a colleague(s) in the same workplace or outside of the workplace who possesses the same knowledge. She says that working with a friend or a team helps extend and transform the understanding of an individual. In my research, I collaborated

with a colleague who was with me from the beginning of the research until the end. Their role and contribution to my research will be discussed in full detail in the next chapter. Self-study is similar to reflective practice as well as teacher enquiry (Nyamupangedengu,2015).

Samaras and Freese (2006), say that teachers who consciously study their practice by constantly reflecting on what they do in class engage in reflective practice. This involves looking back at incidences and events that took place during their teaching and learning and learning from those experiences (Nyamupangedengu,2015). There is no special design or formular that is associated with reflective practice (Ball, 2000), it is primarily focused on sharpening teacher's attention when engaging with what is going on with their work (Ball, 2000).

In both reflective practice and self-study teachers are researching their own practice in the classroom. They differ in that, reflective practice focuses on taking steps regarding a specific issue while self-study focuses on producing insight that will be broadly shared with others (Ball,2000). Reflective practice therefore can be taken as a tool to aid in self-study as it offers a platform to teachers who are looking to better their knowledge by looking closely at their practice (Nyamupangedengu,2015). Teacher inquiry involves teachers questioning and conducting a study about their teaching in the classroom (Nyamupangedengu,2015). It focuses on teacher's concerns and engages teachers in the research design, data collection and interpretation. In both teacher inquiry and self-study teachers engage in research while the study becomes the focus therefore self-study is a form of teacher inquiry (Nyamupangedengu,2015).

Challenges associated with doing self-study are that it requires the researcher to work closely with someone else who is a critical friend. A critical friend is supposed to be a trusted colleague who is able to mediate, provoke and support new understandings (Samaras, 2011, p. 5). Finding a critical friend who will meet all the criteria is not always an easy task. Finding a critical friend for this study was a difficult task as this meant that the CF sacrifice their time and commit themselves fully into the task. I had to ask my colleague who I teach with to be my CF during the study. My CF was available for all the planning and lesson observations but could not sit in for the interviews as she had to rush to her own class, this means that there were parts of the

discussions that she missed. Having one critical friend for my study was not enough hence I decided to involve one of the lectures and used her as my other CF.

3.5 Population and sample

This is self-study research, being a self-study means I am a participant in this study who is studying her own practice in the classroom. Classroom practice involves learners who are taught and respond to the teaching as such my grade 11A learners who were part of my teaching were also participants in this study. The population number in this research was twenty-two. purposive sampling was used in this research, learners in my grade 11 class were intentionally selected because they were my life sciences class that I taught.

3.6 Data collecting technique

Data collection serves as one of the most important stages in research as it allows the researcher a chance to gather enough data that will help to answer research questions credibly (Kabir, 2016). Many data collection methods were available to choose from, and my research questions guided me in choosing the best and appropriate techniques for my research. In this study, I used multiple data collection methods. I did this because the literature states that using multiple data collection methods will allow the researcher to produce results that are convincing and authentic (triangulation) (Davis, Golicic & Boerstler, 2011). Data for this study was collected at three points, before the lesson, during the lesson, and after the lesson. Data that was collected before the lesson includes journal entries and notes from my critical friend. Data that was collected during the lesson included audio and video recordings as well as journal entries. Interviews and journal entries made up part of the data that was collected after the teaching of the lesson.

3.6.1 Journaling

Self-study research is a research process that requires transparency (Samaras, 2011). All processes, thoughts, and actions need to be documented before, during, and after the lesson. One way of succeeding in that is by keeping a research journal. Before, during, and after data collection I kept a journal that helped me capture my thoughts about planning the lesson, reporting my observations, and reflecting on the occurrences that took place during classroom interaction. Before coming to the classroom, I imagined how the lesson would go based on the planning at hand, I thought about possible questions that I would receive and possible reactions

to the topic, and all my thoughts were captured in the journal. I used the journal to capture moments that took place during the lesson, and I also wrote all of my reflections immediately after the lesson.

The advantage that came with keeping a journal was that I was able to go back and read it again later on when planning another lesson, Hopkins (2008) states as one of the advantages of keeping a journal, he states in his paper that the advantage of keeping a journal is that it is convenient as the researcher can use it and study it during their own time (Hopkins, 2008), it will also help the researcher to map out any emerging incidence and trends while also providing an ongoing description of the atmosphere in the classroom (Hopkins, 2008). The disadvantages that came with the journal were not much except that jotting down what was happening in between teaching did not come easy as I also had to interact with the class at the same time. I however relied on audio and video recordings to capture what I could have missed during the lesson.

3.6.2 Observation by Critical Friend

The main purpose of self-study research that is carried out by educators is to develop and improve their pedagogical practices in the classroom in a specific context (Noor & Shafee, 2020). Teacher researchers cannot improve their practices by themselves, literature suggests that self-study can be improved by the involvement of a critical friend who can ask provocative questions and provide data to be studied through another lens (Noor & Shafee, 2020). For my research to be successful, I worked with a critical friend who was part of planning the lessons, observed the lessons, and gave feedback as we reflected on how the lesson went at the end. The critical friend is a fellow life sciences colleague who teaches the same grade and is also a postgraduate scholar herself. The use of a critical friend showed great strength as feedback that was provided by a peer allowed me to reflect on and improve on what was identified as areas of improvement. The positive feedback also boosted my esteem and made me eager to continue my quest with great confidence.

3.7 Data collecting tools

Data collection tools refer to tools used to collect research data (Annum, 2017). In this research, multiple data collecting tools were used, the reason for this drew from literature which states that research that uses multiple data collecting tools has the potential to produce authentic and

convincing results as opposed to using one data collection tool (Davis, Golicic & Boerstler, 2011). The research instruments are going to be, semi-structured interviews, and audio and video recordings.

3.7.1 Semi-structured interviews

Annum (2017) defines an interview as communication in which verbal questions are presented by the interviewer to draw out oral responses from the interviewee. The interviews were conducted at the end of the two lessons with two small focus groups of learners. The questions that I asked were designed to prompt their knowledge of the kidney and to get a sense of what their thoughts were about the use of knowledge from their culture to teach a concept in life sciences. The interview questions were also designed in a way that helped my learners who were not yet drawing from knowledge from their cultural heritage to consider doing so. The advantages of using semi-structured interviews are that they were a practical way to gather data (Annum, 2017). They allowed me to target a specific group which was a small focus group in a grade 11 life sciences class which I chose and managed in ways that assisted my research. This group was chosen based on the following criteria: learners had to represent different genders, come from different ethnic groups, have similar socio-economic status and be of the same age group. I was able to pick and choose questions that were asked as well as the format to use which was open-ended, this helped me gather vast amounts of data on the subject at hand. The disadvantage that came with this was that it was time-consuming and because my lessons were in-between other classes it meant that I had to negotiate with the next teacher for 15 minutes extra time after the lesson.

3.7.2 Audio recordings and video recordings

Audio recordings and video recordings were done during teaching and learning. Before each lesson, I arranged with my classroom assistant to assist in video recording my lesson, I also arranged for an audio recorder to be available before the start of the lesson. The use of the video recorder as well as the audio recorder allowed me to capture immediate actions and reactions as they occurred, it also captured the body language and facial expressions of the participants which were later analyzed to get a better understanding of the classroom atmosphere during the lesson. As I was teaching, asking learners questions related to their cultural heritage, their

expressions were captured by the video recording. The video recordings were analyzed and contributed greatly to helping me analyze data that will be discussed in detail in the next chapter of this paper. All of these tools together helped me to answer the research questions that fueled this study.

3.8 Data analysis

3.8.1 Narrative Inquiry/Teacher's Narratives

Gilbert, (2008) says that narrative analysis is used in an attempt to gather data while also gaining a greater understanding of the social world. He further says that narrative analysis focuses on making sense of human experiences and the motivations behind them by focusing on stories people tell within a given context (Gilbert, 2008). According to Polkinghorne (1995), there's a distinction between narrative analysis and analysis of narratives. In an analysis of narratives, the researcher identifies and creates themes that exist in stories using paradigm thinking and in narrative analysis the researcher uses descriptions of events to create a story with a connected series of occurrences that form a plot (Polkinghorne 1995). In my research, I followed narrative analysis. My self-study research looks closely at myself and my practice in the classroom. Nyamupangedengu (2015) says that through a story, one can understand an individual sense of self. She further says that these stories then can be told as narratives (Nyamupangedengu, 2015). According to Nyamupangedengu (2015), teachers who go through intentional processes of reflection can tell a story about their experiences.

My self-study research is primarily explanatory, its focus is to gain a deeper understanding of the underlying reasons behind the strategies I choose to employ during my lesson and there's no better way of revealing that than using a story to take the reader through the events that took place and the reasons behind them.

Butina (2015) points out that in qualitative research the stories themselves that come out from the narrative inquiry become raw data, she further says that many disciplines have used this approach to learn more about the identity, culture, and historical background of the narrator/researcher. Narrative data can be derived from interviews that solicit stories, focus groups, written autobiographies, and biographies (Butina, 2015). My research being a self-study,

the stories that I analyzed emanated from my teaching and learner's engagement as well as interviews with focus groups. My thinking was guided by the socio-cultural theory that is discussed in detail in chapter two.

My data analysis will follow the following structure: My experiences and motivations, the narrative texts, my work with a critical friend, planning new pedagogies for improved learning, enacting, documenting, and assessing my research process as well as generating and sharing what I have learned/reflections. My experiences and motivations will take the reader through my journey of teaching life sciences for five years and from that journey came motivations that led to this study. The narrative text will describe and explain all my planning and my observations during teaching. My work with critical friends will discuss the role that the critical friends played in ensuring that this study becomes a success and how their contributions helped transform my thoughts and understanding.

Planning new pedagogies will discuss different strategies that I used (those that worked and those that did not work) to improve my teaching of excretion in grade 11 life sciences class. Under enacting, documenting, and assessing my research process I show transparency of my research by showing how I documented the whole process of this research. Samaras and Roberts (2011), in their paper, say that for self-study research to be successful, the research process has to be transparent, it has to be clearly and accurately documented through dialogue and critique with colleagues. Lastly, my data analysis will discuss my reflections and what I have learned as I was conducting this study.

Several benefits came with using a narrative approach to analyzing my data, as mentioned in Butina (2015) humans are natural storytellers hence telling a story came naturally to me. Secondly, this approach allowed me to give thick descriptions of scenarios and occurrences which led to me gathering in-depth data easily, Lastly, it allowed me to use the reflections that I wrote in my journal to create a story that became solid data for my study. The disadvantages that came with this were that it took a long time to prepare to gather this data as it included a lot of writing in the journal, lesson plans, and reflections that helped me unpack my data in ways that can be understood by the reader.

3.9 Validity and reliability

Validity in research is seen as one of the most important aspects and therefore is required for both research that is qualitative and quantitative (Nyamupangedengu, 2015). Validity has been defined by many scholars over the years, Scaife (2004), views validity in the same way that self-study research views it. According to Scaife (2004) validity should be understood as the trustworthiness and usefulness of the claims that are made based on the data that is collected. Cohen et al. (2007), say however that research cannot be 100 percent valid. Reasons supporting this claim include the fact that research relies on participants hence their opinions, perspectives, subjectivity and attitudes of respondents in a qualitative study will always bring some level of biasness to the study. In self-study, validity rests on the presentation of the actual practices, the data gathering methods, the observations and the interpretations in enough detail that the relevant community can judge trustworthiness and usefulness (Nyamupangedengu,2015).

Scaife (2004) defined reliability as "the extent to which a data-gathering process produces similar results in similar conditions" (p.68.). Nyamupangedengu (2015) says that the idea of reliability in self-study research however is not separated from validity as both focus to ensure the trust worthiness of the claims that are made from the study. In self-study research reliability checks include collaboration, dialogue and critique (Nyamupangedengu, 2015). As part of collaboration, dialogue and critique, I checked the coding of my audio and video transcripts with my critical friend as well as our assistant and the coding of my interview transcripts with my supervisor. Miles and Huberman (1994), say that check coding is a powerful tool for reliability as it allows for the coding of the same set of data to be done by two researchers which will then lead to a discussion of difficulties and any other issues associated with it.

3.10 Ethical consideration

"Ethics has to do with the application of moral principles to prevent harming the subject that is involved in the research" (Ngxola, 2012, p. 43)

As a Wits student in the school of education, to get approval from ethics I applied for permission to conduct my research at the human research ethics committee of the University of the Witwatersrand. I also applied for ethics in the Gauteng Department of Education (GDE) ethics

committee, this is because my research is a self-study that will involve my learner's engagement in the classroom hence ethics from GDE had to be granted. Before commencing with my research, I sent a letter seeking permission to conduct the study in my school from the principal, I also sent permission-seeking letters that explained what my research was and why it was done to the parents of the learners as they are still minors according to SA law, as well as the learners. I further gave out consent forms to the school principal, the parents of the learners, and the learners. The consent forms were to affirm to the committee that I will take full responsibility and ensure my participant's anonymity and confidentiality to the public and also affirm that I will create a comfortable environment for them while participating. The forms also stated that participants can withdraw from the research at any time when they start feeling uncomfortable.

For confidentiality and anonymity, I did not use the school's real name or the learner's name, each individual is given a unique number that I will use for reference. For the group discussion, I asked learners not to mention their names but simply indicate when they have something to say. Data that was collected is kept safe in my supervisor's office for a period of three years, thereafter it can be disposed of. Audios are protected by a password and cannot be accessed easily by anyone.

CHAPTER 4

4. DATA ANALYSIS

4.1 Introduction

According to the literature that I reviewed about teaching the kidney in chapter two, a conceptual understanding of the kidney can be built if learners are taught the excretory system through constructivism. This is because using constructivism as a lens to teach the excretory system means that learners will be able to apply the knowledge from their daily lives to a concept in life sciences (Ristanto, Rahayu, and Mutmainah, 2021). The use of knowledge from my cultural background was therefore an important tool that I had to bring to the classroom as this knowledge was the one that was going to influence my teaching as well as my study.

In this chapter, I discuss my experience and motivations that led to this study. I also describe and explain all my planning and my observations during teaching. I further describe the role and contributions of my critical friend as well as pedagogies for improved learning. Lastly, I discuss generating and sharing what I have learned/reflections. What I present in this chapter, will help me answer my second and third research questions: What relevant CH on the concept of the kidney does the teacher bring to the teaching and learning process at grade 11? What are the teacher's views on the challenges of integrating CH into the teaching and learning of the kidney at grade 11 Life Sciences?

4.2 My experience and motivation

4.2.1 Turning points in my career as a teacher which became the motivation for this study.

Bullock (2011, p. 105) defines a turning point as a rich description of a problematic issue that invites careful analysis and helps one to understand pedagogical practice systematically'. When I look back at my six years of teaching life sciences, I realize that I have several turning points in my career. I did not know that what I felt was given a name in literature and that it was called

turning points until I read a paper by Nyamupangedengu (2015), who speaks about the turning points in her career. My turning points are named and described below.

Turning point number one

In 2017 when I had just graduated the previous year and had started teaching that year. I went into the classroom with high confidence knowing that I have been doing well in my teaching practicals for the past four years of studying for my degree. I was given a class of grade 11 life sciences to teach and the first few topics that I taught went well because I was teaching amongst others plant diversity and animal diversity which covered mostly things that learners were able to see at that point, I was sure that I was doing well as a new teacher. The challenge started when I started teaching topics that included physiological processes like glomerular filtration and tubular re-absorption. My learners became distant when I started teaching excretion, the level of interaction went down, and their grades went down on the topic test they wrote for summative assessment. This was my turning point as a teacher as I found myself wondering why this was happening and how I could remedy the situation.

Turning point number two

In the years 2017-2018, I enrolled as a postgraduate student at Wits University doing my honors degree. The first year focused mainly on course work and the second year focused on research. My research topic focused on the role of indigenous knowledge in the classroom. I read a lot about indigenous knowledge, what it was, and what contributions can be made by it in the classroom. This was my turning point as a teacher as I realized that I could use this way of knowing to help my learners move from one level of understanding to the next. The limitation was I did not know how to go about doing it.

Turning point number Three

As I continued my academic journey and enrolled for my master's degree. I wondered a lot about what my research topic would be, I thought a lot about my previous study and how I passionately believed that the use of knowledge from culture can help my learners understand life sciences better. I knew I wanted to do that, but I still did not know how to properly execute it until I had

a meeting with my supervisor and he asked me what I wanted to do and why. My supervisor picked up that I wanted to improve my pedagogy in the classroom using knowledge from my cultural heritage and then suggested that I do self-study research. This was my turning point as I had found a way of doing what I was passionate about and I also had an idea of how to do it. I read a paper by Samaras and Roberts (2011) that shed more light on what I needed to do.

4.2.2 Professional and Personal Motivation

My motivation to carry out this study was both professional and personal. Professionally, it was linked to the need to have the best methodology to help my learners succeed academically and obtain good results. This was driven by my motivation which is being passionate about teaching life sciences and wanting to change the narrative about young teachers struggling to effectively teach when they enter the field of teaching. When I was in high school, I often understood my teachers more when they included examples from my daily life when explaining a concept. When I decided that I wanted to do my master's I knew that my study had to look at the use of local knowledge to help enhance the teaching and learning of life sciences in the classroom as this had been one way that helped me as a learner to understand concepts better.

4.3 Planning My Teaching

Farrell (2002) defines lesson planning as decisions that a teacher makes daily to ensure that the lesson becomes successful. He says this plan describes how students will move towards accomplishing the stipulated objectives (Farrell, 2002). Shen, Yunhou, & Fan (2007), in addition, say that teachers can explore numerous aspects of pedagogical content knowledge through lesson planning. They further say that when a teacher develops a lesson plan, they get a chance to think intensely about the topic including how the topic may be represented by other sources of knowledge like textbooks or in aspects of the curriculum (Shen, Yunhou & Fan, 2007).

Through planning, teachers can develop activities or methods that will ensure that learners grasp the content at hand (Shen, Yunhou & Fan, 2007). Planning my teaching was one of the most important aspects of my self-study. To successfully plan my teaching, I needed to understand the context of the school which includes the type of learners I have as well as their background information. This was not a challenge as I have worked in the school for six years and I was the teacher of my grade eleven class from the beginning of the year. To get a sense of how in touch

or out of touch they were with knowledge from their cultural heritage, I asked them to share some of the cultural activities that they have seen being practiced at home while growing up and now. I asked this question a few weeks before planning my actual lesson, but I was in the process of thinking about it, the responses I received were overwhelming as my learners had a lot of information to share.

Learner 1: Maa'm at home we are still traditional or let me say my grandfather maa'm is still traditional. For example, ma'am, when my aunti (aunt) was getting married my grandfather and other elders in the family slaughtered a sheep and took its inyongo (gallbladder) and splashed it over my aunti and her husband's legs as a way of combining the ancestors of my aunti and her husband.

Learner 2: Yes maa'm, *lenna* (me too), I saw that happen when my cousin sister got married.

Teacher: Learner 2, who slaughtered the sheep in your family?

Learner 2: Eish ma'am, I can't remember who did it but in my family it was not a sheep but a goat, yaaa….. ma'am, I remember it was a goat.

Teacher: Is it possible that a female slaughtered the goat?

Class: haaaaaa….nooooooooooo (chorusing)

Learner3: That will never happen ma'am

Teacher: Why is that?

Learner 3: *Kesetho* ma'am (it is culture ma'am), only males actually older males *bontate* (older male) are allowed to slaughter animals in our culture.

Teacher: Is this the same with all of your families, in this class?

Class: Yes maa'm (chorusing).

Teacher: Thank you, boys and girls. Are there any other cultural activities that you observed at home while growing up and now?

Learner 4: Yes maa'm, *ziningi* (they are many) *thina siyaye sibone kwenziwa umemulo* (we normally see the coming-of-age ritual being done) *futhi nathi siyafuna ukwemuliswa* (we also want the ritual to be done in our honor as well).

Teacher: That is interesting learner 4, can you briefly share the details or this ritual and say why you would also want it done in your honor.

Learner 4: Ok ma'am, is it okay for me to explain it ngesizulu ma'am?

Teacher: Ofcose, by all means I will translate to the others afterwards.

Learner 4: *Okokuqala maa'm, umemulo wenzelwa intombi eziphethe kahle, usuke ubongwa kahle kahle ngokuziphatha kahle kwakho. Uhlatshelwa inkomo maa'm, inkomo! Bese kuyasinwa uphiwe nomkhonto nezipho, uhlonywe nemali ekhanda.* Kumnandi nje (Firstly maa'm, this ritual is done for a female who has been on their best behavior as a way of saying thank you for growing up and taking good care of yourself, keeping yourself pure. During this ritual, they slaughter a cow for you ma'am, a cow! There will be singing and dancing, you are given a spear and other gifts. They attach money on the hat that you will be wearing. It is nice).

Teacher: Thank you so much learner 4 for sharing this experience with all of us and to everyone who shared their knowledge and experience. Umemulo is indeed one of the most beautiful practices that we still have KwaZulu, I myself have witness its beauty at some point in my life. Other cultures like the Vhenda cultures and the Sotho cultures also have a similar practice. I am not sure about the Setswana culture, can Setswana pupils in the class find that one out for us I will see you again tomorrow, we can continue this conversation tomorrow.

My Reflection:

For me, teaching that incorporates knowledge from our culture is something that should be done especially in subjects that have a direct link like some concepts that I have identified in the sciences (both physical sciences and life sciences) that link with practices that exist in my culture. Some of these concepts are 1. Ecosystems and Structures (including indigenous knowledge of habitats of plants and animals; indigenous housing structures) 2. Energy and Systems & Control (including

traditional energy sources; traditional musical instruments) 3. Processing (including traditional processing of raw materials; metal processing; food processing.

Hearing all the responses from my learners was a huge relief because I had doubts about this methodology of teaching. From this I learned that the use of knowledge from our cultural heritage has a place in the classroom and that it will contribute meaningfully during the lesson as my learners responded positively to my probing question about knowledge from their cultural heritage. After all, like me, most of my learners spend most of their lifetime in the urban areas as they were born and raised there. I happened to be raised by a family that despite having moved away from their rural homes, still carried their culture and norms with them, I think my learners are raised in similar households.

As I was planning my lesson, I also had to make sure that my lesson and methodology were in line with caps. To remind the reader, in chapter two I reviewed literature that speaks about the three broad specific aims in life sciences according to caps. The third aim speaks about understanding the applications of life sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science. Recognizing that my research was in line with caps, I started planning my teaching.

To begin my planning, I went to the subject annual teaching plan (ATP) to check how long we are given to cover excretion. I found that excretion is covered in a period of three weeks, in a week I see my grade elevens four times for a duration of an hour. I began thinking about the objectives of the lesson, and what is it that I wanted my learners to know about this topic. I listed down all the concepts that learners needed to know and this included: the structure of the urinary system, the position of the kidneys, ureters, bladder, and the urethra. The structure of the kidney and functions, the nephron structure and function: ultra-filtration, re-absorption, tubular excretion, pH control, formation of urine as well as homeostatic control of water and salts. From this I identified the big ideas as well as the subordinate ideas under this topic; see Table 1.1 below.

Table 1.1 Table shows the big ideas and subordinate ideas under the topic of Excretion

Big Ideas	Subordinate ideas
Urinary system	• Position of the kidneys • Ureters • Bladder • Urethra
Internal structure of kidney	• Renal cortex • Renal medulla • Renal pelvis
Nephron structure	• Afferent arteriole • Efferent arteriole • Bowman's capsule • Glomerulus • Podocytes
Homeostatic control of water and salts	• The role of ADH • The role of Aldosterone

Mitchell, Keast, and Panizzon (2016), argue that teaching that involves organizing a topic into small and big ideas promotes a deep understanding of a concept. They say that this way of teaching is pedagogically powerful as it offers clear direction on what to teach which enhances student learning. My decision to organize my teaching into small and big ideas was influenced by reading the article cited above, this way of organizing this topic made it less overwhelming and made it easy for me to look at each big idea and think about knowledge from my culture that links with the topic. It was at this point that I had to start thinking about the relevant CH on the concept of the kidney that I would bring to teaching and learning in my grade 11 class.

My reflection

Having been born and raised in the urban areas it was not so easy for me to instantly think about examples from my culture that could link with the concept of the kidney. My focus was on learners understanding the structure of the kidney and the processes that take place inside the functional units of the kidneys which are the nephrons. As mentioned earlier I was fortunate that my family

still carried and practiced culture, I thought about what is it that I saw being practiced that I could use to teach about the kidney and its processes. I wrote down questions in my journal that would help me think about the kidney about my culture. These questions were: What do you call kidneys in your language? Is there any cultural significance of kidneys you know from your culture? Do you eat kidneys in your family? Is it everyone or specific individuals? From this I learned that it is going to be difficult for a teacher who has lived their live in an urban setting their whole life with no rural background or attachment to generate CH knowledge and use it in the classroom therefor exposure to the background of CH knowledge becomes imperative to teachers who will integrate this knowledge, it makes things easy for them. Teachers who have no background of this knowledge however can still succeed in integrating, their task however will be much greater.

As we (and my critical friend) attempted to answer my questions, I realized that I had forgotten what kidneys were called in my language and I was not proud of that moment. I asked my critical friend what we called them in our language as both of us are IsiZulu speaking. My critical friend knew that they were called izinso. We then proceeded to the next question, we both did not know the cultural significance of the kidney so we both had to go and research, we also did not know who eats kidneys in our culture and also had to research that too. My CF both came back with the answers to these questions two days after our first meeting compiled our notes and continued with planning the lesson.

CF answer to cultural significance of the kidney

Males have always been the ones to consume kidneys in the past however times have changed and with things getting more expensive kidneys started being one of the foods that was easy to access financially and over time, everyone regardless of their gender started eating kidneys in the families. Reasons for males being the ones to eat the kidneys relate to the fact that, in the past it was a known practice that there were parts of meat from a slaughtered animal that were designated to females and others designated to males. Kidneys were seen as one of those that were eaten by only males.

My answer to cultural significance of the kidney

For this question, I had to go beyond CH knowledge in my culture, what I found is that males in the past used to be the one's eating the kidneys. The reason for this was centered around the fact that the internal parts of the kidneys are delicate and highly protected by the tissues surrounding them as such, males were the ones that sought protection as they were going to wars therefore eating the kidneys meant that they will also be protected in the same way that the internal parts of the kidneys are protected. Kidneys therefore were seen as protective charm for the males.

CF answer to who eats kidneys in her culture

It is both females and males now, used to be males only in the past.

My answer to who easts kidneys in my culture

There are no restrictions to who gets to eat the kidney in my culture now.

I think more than anything, planning this lesson challenged us both and showed us how much we knew and did not know about our culture. I learned from this experience that integrating knowledge from cultural heritage in the lesson required educators to be willing to go an extra mile for their lessons, to be willing to spend extra time researching about this knowledge as this is not always apparent on planning and teaching materials. Teachers like me, who have spent most of their lives in the urban areas have an even greater task to research practices and CH knowledge that will be used in the classroom.

4.4 Role and contribution of my critical friend

My critical friend is a colleague with whom I teach life sciences at my school. We both have grade 11 classes and planning lessons together was not new to us as we have been doing it for the past three years to ensure that our teaching and pace was consistent across all our classes so that assessment can be administered at the same time. My CF helped me with planning all my lessons as we normally plan together, the difference this time was that our planning was guided by my research topics which was not an issue for her. My CF observed all my teaching and gave feedback at the end of each lesson. For some reason, teaching to collect data felt different and

overwhelming, I found myself in a state of worry and panic, I was anxious about the whole teaching as if I had never taught the class before. My CF became a great comfort during that time, she reminded me all the time that this research was to improve our teaching in the classroom and that whatever comes from it is going to be a lesson. She used “our” teaching because she said she benefited from this as much as I did because we were planning together, and she teaches the same grade. My CF however did not take part in the interviews with focus groups at the end of the lesson as she had to rush to her class immediately after the lesson.

4.4.1 Feedback from university lecture

During the course of my research, I requested a few meetings with one of the lecturers from the university whose PhD thesis was a self-study and she was also part of the staff in the division of science and a close friend to my supervisor. In this research, I treated her feedback as feedback from a critical friend and I discussed my research in ways that I would discuss with my CF. She gave me insight into what she thought about my lessons after teaching, I reflected on the feedback that she gave me just like I reflected on the feedback that my CF gave me. Her contributions were very meaningful and made me realize that while it was good for me to have a critical friend who worked with me, it would have been much more helpful for me to have another critical friend who was either more academically inclined or in the same space as me about our academic status. This emerged as our discussions were not only content-related but also research-related.

4.5 Pedagogies for Improved Learning

Samaras and Roberts (2011) say that improved learning is one of the purposes of self-study. They argue that improved learning involves teachers knowing pedagogies that work and those that do not work during their teaching (Samaras and Roberts, 2011). They further say that teachers will learn from their mistakes like learners do as they continue in their quest to learn what works for them. Similarly, I have introduced new pedagogies in my teaching with the hope that these pedagogies will work but also open to learning from the shortfalls that these pedagogies may bring. These pedagogies involved the use of knowledge from my cultural heritage as well as knowledge from learner’s cultural heritage to explain the structure of the kidney as well as the process of ultrafiltration that takes place in the glomerulus of the Malpighian body. The use of

knowledge from our culture was used to explain the structure of the kidney. The process of making umqombothi was compared to the process of ultrafiltration and used to identify similarities in these two processes which re-enforced the knowledge of ultrafiltration that learners needed to understand.

4.5.1 Lesson Part One
(See lesson plan 1 in appendix A)

The first part of my lesson looked at the structure of the kidney. The first thing we did in class was to answer the questions I had that guided my planning. I had already explained to the learners that our lesson was going to draw from their cultural heritage to explain the concept of the kidney. The first question was: what do you call kidneys in your language?

Class: No response (everyone was smiling and looking at each other)

All my learners like me in the class did not know what kidneys were called in their language. My class has a total of twenty-two learners, from three ethnic groups namely: IsiZulu, Sesotho and Setswana. Majority of the class is boys who are thirteen in total and girls who are nine in total. Learners in my class range from ages between sixteen to seventeen with the exception of one boy who is nineteen years of age. My CF noticed the learner's silence as she was part of the lesson, raised her hand and gave the isiZulu answer, others were then asked to go and find out at home. Learners came back with their answers to the first question the following day, the Sesotho learners told the class that kidneys are called *liphio* in their language and Setswana leaners told the class that kidneys in their language are called *Philo*. The two words sound the same but are spelled differently. They sound the same because Sesotho and Setswana historically belong to the same clan.

We proceeded to the second question, I asked learners if there were specific individuals in their families who eat kidneys or if they all are allowed to eat them. One learner responded that in Setswana culture, only uncles are allowed to eat the kidney. The second learner also answered that in their Sesotho culture, only males are allowed to eat kidneys. Neither of these learners knew the reason for males being the ones that eat the kidneys.

From my research in isiZulu culture, I found that males used to be the ones encouraged to eat kidneys a long time ago however things have recently changed as females also eat kidneys now. Reasons for this were associated with the structure of the kidney being tough and highly protected and thus it was believed that eating a particular organ led to the incorporation of its strength. Males used to be the ones that were seen as leaders of the communities and families hence they were the ones seen to require the most protection. I shared this information with my class and one learner suggested that the other reason could be that males were the ones who were going to war and hence the ones that sought protection. The idea of bringing this information to the classroom was to use this information from our culture to build emphasis on how the delicate parts of the internal part of the kidney are protected. We then proceeded to look at the internal structure of the kidney and identified all the internal parts of the kidney as well as the external parts of the kidney that protect the delicate internal parts.

To do this, I drew the structure of the kidney on the whiteboard, using different colors to indicate the internal and external parts of the kidney we began to label the structure. These labels included the renal capsule which is the outer part that is made up of tough and fibrous proteins as well as the surrounding adipose tissue which is body fat that further protects the internal parts of the kidney. For this lesson, real cow kidneys were brought to class to be observed. I arranged my learners into groups of four and five, each group received one kidney to cut open and observe its internal parts as well as its protective outer part. This was necessary for learners to internalize this knowledge and structure. I chose to draw the diagram on the board and not use an already annotated diagram from the textbook because I wanted learners to pay full attention to what I was doing at the front and to follow every label at the same time (**See figures 4.5.1 A and figure 4.5.1 B)**

Figures 4.5.1 A Teaching the internal structure of the kidney

Figures 4.5.1 B: Showing the internal structure of the kidney.

My reflection

After teaching this lesson, I requested a meeting with my lecturer CF to share how my lesson went. I was confident that everything went well because the learners were responsive during the lesson. Our meeting was virtual, we recorded the meeting so that I could go back and listen to our discussions at a later stage. This was my first lesson, I described what I did during the lesson and how my learners responded. My lecturer CF asked me to remind her of my research topic, she responded that for her the lesson appeared to use knowledge from science to teach cultural knowledge, what she got from this was the opposite of what I wanted to do. When she pointed that out, my exact words were "Oh my God, what have I done" I wondered how I missed that and I thought that I should remove it from my research and start again. My supervisor denied that and told me that it was all part of my data collection. I went over my second lesson with my lecture

CF, the lesson that I had to teach a day after the first lesson, this I did to avoid what I did with the first lesson, we then both agreed that the second lesson serves the purpose of what I intend to do.

From this I learned at first hand the importance of sharing your plans with a critical friend as suggested by scholars in self-study. The journey of self-study is not one that should be travelled alone and it is important that educators who are doing self-study research have more than one critical friend and if at all possible, to have a critical friend that is more accomplished in the field than them.

4.5.2 Lesson Part Two
(See lesson plan 2 in appendix B)

The focus of the second lesson was on the nephron and its role in the kidney. Nephrons are functional units of the kidney, their key function is filtering of blood, and regulating water, salt, waste, and other vital substances required by the body (Gebhardt, Preethlall, Pillay, and Farham, 2012). The nephron can be divided into two, that is the Malpighian body and the renal tubule (Gebhardt et al., 2012). This lesson focused on glomerular filtration/ultrafiltration that takes place in the Malpighian body of the nephron. This is the first step of the formation of urine and the one that learners need to fully grasp for them to understand what happens during tubular re-absorption, tubular secretion, and excretion, the final stage of urine formation. For this lesson, the cultural heritage that I brought into the lesson was the making of *umqombothi*. *Umqombothi*, is a product steeped in the history and culture of people from Africa. *Umqombothi* is beer made from sorghum and maize that has been brewed by African people for centuries.

To begin my lesson, we had to re-cap the previous lesson on the structure of the kidney. We had mentioned that the role of the kidney is to filter all waste from the blood and produce urine hence going back to the structure helped in remembering that information that was the basis of lesson two. In this lesson, we identified the whole structure of the nephron, I then told the learners that we were going to zoom into the Malpighian body and discuss the process of ultrafiltration**. Figure 4.5.2 A** shows a photograph of the Malpighian body that I drew on the

board for learners. **Figure 4.5.2 B** is showing a video of the process of umqombothi that learners were to watch during the lesson and figure **4.5.2 C** is showing part of the video zooming into the woman applying pressure using her hands on mabele so that *umqombothi* liquid can be separated from it using a sieve.

Figure 4.5.2 A

A diagram of the Malpighian body and a video of umqombothi

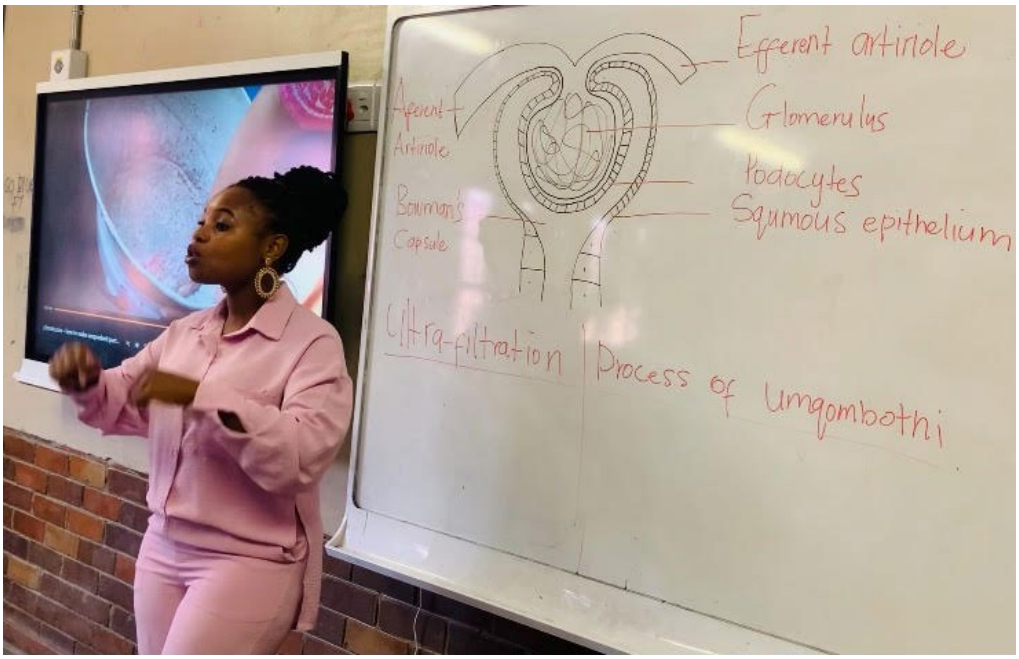


Figure 4.5.2 B

A photo of *umqombothi* mixture in a sieve

Figure 4.5.2 C

The woman is applying pressure on the mixture.

My plan for this lesson was to teach the process of ultrafiltration and make learners watch the video of the making of *umqombothi* then ask learners to draw a table of similarities that they observe for both these processes. This lesson followed that structure. **Table 1.1.2 A** The similarities that learners identified after I teach ultrafiltration and watching the video. **Table 1.1.2 B** shows the similarities that were added by me after learners identified theirs.

Table 1.1.2 A shows similarities between ultrafiltration and the process of *umqombothi*

Ultrafiltration	**Formation of *umqombothi***
Blood filters unwanted substances	Mabele are filtered
Filtrate remains in the bowman's capsule	Alcohol (umqombhothi) remained in the backet
Blood enters through the afferent arteriole in high pressure for effective filtration.	A large quantity of the mixture is poured in the sieve so that mabele can be filtered effectively.

Similarities that were added by me

Table 1.1.2 B

Ultrafiltration	**Formation of *Umqombothi***
Podocytes form a filtration barrier; their size determines what forms the filtrate.	The sieve forms a filtration barrier, determining what forms *umqombhothi.*
The thickness of the afferent arteriole allows blood to enter in high pressure, the pressure drives the process of filtration.	A large quantity of the mixture is poured in the sieve, the woman applies pressure with her hand which drives the process of filtration. **See figure 4.5.2 B and C**

My reflections

The second lesson had gone very well for me. My critical friend had invited two student teachers that were under her supervision to come and observe the lesson and they both were very excited after the lesson and complimented the lesson so loudly, that felt good. The lesson took longer than an hour, I had decided that my interview with the focus group was going to be during lunch but my learners begged me to negotiate with their geography teacher so that we could do the interviews immediately so I did that. It felt really good to see my learners behaving in this manner, they were all very excited. When we got to my HOD's office for the interview, I was surprised to learn that not all my learners were culturally inclined. One of my learners from the group of seven learners I had, had never seen umqombhothi being brewed at home as she comes from a strictly Christian family that does not practice any form of culture. Me and my CF discussed this before planning the lesson, we however dismissed the thought because we knew of umqombothi as something very common to the majority of the population of black people. What we did not realize is that like the learner said for her, it felt like she had to learn two processes at the same time as she has no experience of that being done at home. While it was easy for other learners to easily associate the two, it was not easy for her. The pedagogical insights here are that while it is important for us as educators to come up with pedagogies that improve our practice, it is equally important to ensure that these pedagogies are tailored to every learner in the classroom.

4.5.3 Interview with focus group

Below is a list of interview questions that I used with my focus group after the two lessons. The initial number of learners that I wanted to use for my focus group was four or five learners but as we were going to the office, two more learners asked to be part of the interview and were allowed to.

INTERVIEW QUESTIONS

Investigation of how a teacher's cultural heritage can be used during teaching and Learning of the kidney in grade 11 life sciences

1. What is the function of the kidneys and why is it important that we learn about them?
2. How difficult or easy is it to understand the concept of the kidney?
3. What do you understand about the term cultural heritage?
4. Do you think knowledge from cultural heritage can be used to teach all topics in life sciences?
5. Do you think the use of cultural heritage during teaching about the kidney was helpful?
6. Do you think examples from one's cultural heritage can be used to help learners understand the concept of the kidney better?
7. Do you think that the use of cultural heritage moves you away from the actual concept of the kidney?
8. What do you think are the challenges of integrating CH into the teaching and learning of the kidney in a grade 11 life sciences class?
9. Would you recommend this way of teaching/learning to someone else?
10. What recommendations would you give to the researcher to make the next lesson better?

It is at this point of research that the distinction between a qualitative study and a quantitative study is clearly shown. In chapter three I explained that my research would follow a qualitative

research design as it is research that requires explanation, this explanation is used to gain an understanding of underlying reasons, opinions, and motivations of human experiences (Choy, 2014). When I interviewed my focus group, many of the questions that were asked needed more than a yes or no answer, learners had to explain and account for their responses which gave a clear understanding of what they were thinking. Since the interview involved a small group of learners, it allowed them a chance to speak openly and freely about their thoughts and feelings on the matter. The first interview question was based on the content that learners have already done in class, so it was easy for all of them to answer the question.

Teacher: What is the function of the kidneys and why is it important that we learn about them?

Learner 1: ma'am, the function of the kidneys is to form urine

Teacher: Thank you learner 1, is that the only function of the kidney?

Class : No (Chorusing….)

Teacher: Can anyone therefore tell us the other functions

Learner 2: Filtration of blood by removing waste products from the blood and produce urine

Learner 3: Also, ma'am, to regulate salt levels in the blood through that structure ma'am that is on top of the kidneys.

Teacher: Thank you, learner, 2 and 3, it is good that you remembered that detail learner 3 as it will be the next thing we look at on the kidneys.

Our interview rule was that only one person gets to talk at the time, we then took the hand of the one who will counter the response or would like to add. All learners were encouraged to at least answer one question. The second question had mixed responses as fourteen learners felt that it was very easy to understand while eight said it was not necessarily difficult, they said that it was not easy too but moderate. With the third interview question, I picked up that the learners that were able to answer gave me a response that was based on what I had explained to them before starting with the first lesson. I asked them a follow-up question that was not part of the questions above to get a better understanding of their response, the question was: *Did you know*

about the term cultural heritage before I introduced it to you in class? Collectively, learners chorused a no.

The fourth research question had mixed responses too. At first, some learners said yes and others said no. After a few minutes, the ones that had said yes at the beginning said after giving it another thought it was a no. The follow-up question from me was why is that? This question was directed to those that started with a yes and then turned to a no. These learners said:

Learner 1: eish ma'am, at first, I had not thought about the topic of micro-organisms and now that I have, I can't think of any cultural knowledge that we could use to teach that topic.

Learner 2: ma'am, some things that are done in our cultures are done in secrecy so we might not be able to share them.

Learner 3: ma'am, I think using culture to teach all the concepts in life sciences might confuse us, especially those of us who are Christians at home and do not know anything about culture so no ma'am, not every topic in life sciences can be linked.

The fifth interview question brought back everyone to a normal state as the previous question had created a heated debate among the learners. For this question, six learners chorused a loud yes and one said not necessarily. She said in her exact words "But ma'am, it was not bad kehore haketsebe moqombothi" This she said in her home language Setswana, meaning that it was not bad, the only issue was that she did not know the process of *umqombothi.* In the next interview question, the same learner then cited that she was Christian and not as culturally inclined as other learners. For question seven, all learners answered no because they said they were able to answer questions related to the kidney after the lesson. Question eight of the interview questions asked about the challenges, at this point all six learners looked at the one learner and all laughed and waited to get the answer from her and she smiled and said:

Learner: 'Yes ma'am, like me if you do not practice culture at home you will struggle to follow the lessons at first, I struggled with the process of *umqombothi* that was shown in the video and then after a while I got it".

For question number nine, learners all chorused a yes. Question ten had learners recommending things like games to make the lesson more fun, quizzes, and music and some said the use of more knowledge from their culture to teach concepts.

My reflections

After the interview process, I reflected immediately on my journal and my exact words were ýooo lento wumsenzi omuningi yazi' meaning this is a lot of work. I felt exhausted and relieved at the same time that both lessons had gone well and learners responded well to the interview questions. I had to remind myself that this research was done so that I could improve my practice in the class and that just because one learner did not approve of this way of teaching did not mean that it could not be modified to accommodate everyone in the class. I was happy that the majority of the learners welcomed this way and benefited from the lesson, I however could not stop thinking about a way that I can use to accommodate a learner who is not culturally inclined when the majority of the learners are, after a few minutes of worry, I laughed it out and said to myself maybe my PhD thesis will need to cover that and immediately closed my journal.

4.6 Observations during my teaching

My self-study research involved a critical friend observing my actions as they were enacted in class. This observation tool was provided to them as a guideline to know what to look for as they were observing the lesson. This tool was guided by my research questions.

OBESRVATION GUIDLINE

- What relevant CH on the concept of the kidney does the teacher bring to the teaching and learning process at grade 11?
- Is the knowledge from CH helping the learners to understand the concept of the kidney better
- Are you able to find a link between examples that are used from CH and the concept of the kidney being taught?

Any questions relating to the lesson may be asked by the critical friend observing during or after the lesson.

Lesson one	**Lesson two**
• Knowledge about significance of kidneys in culture • Knowledge about why males are often the one's that eat kidneys in different culture.	• Knowledge about the process of brewing umqombothi in African culture. • Knowledge about the process of filtration that takes place when making umqombothi
• I think so	• Definitely
• I am able to find the link.	• The link is very apparent here. The teacher shows two processes that are similar and finds similarities that links them together. This explanation was very good, I benefited a lot from this lesson.

Observations for this study were guided by an observation tool that was given to my critical friend who observed my two lessons. For both lessons, my CF was able to identify the relevant CH on the concept of the kidney that I brought to class. This was good to know as the lessons were centered around using this knowledge for better conceptual understanding. When I shared my teaching with one of the university lecturers, they gave me a different perspective on the same lesson. From this, it was apparent that when one engages in a self-study, it works at a better advantage if you have more than one CF as that will give more insight into the research. Samaras

and Roberts (2011) say that working with colleagues during self-study will transform the understanding of the individual and having more than one CF helps with greater transformation.

For the second guiding question on the tool, under lesson one my CF friend's response was "I think so" and under lesson two her response was "Definitely" with no further explanation or addition. Their response carries a connotation of being uncertain which does not benefit the teacher who is doing self-study that aims to improve their practice in the classroom. Samaras and Freese (2006) talk about openness during collaboration in a self-study. In their paper they acknowledge that sharing concerns or dilemmas with colleagues may be uncomfortable and not easy, they also say that self-study requires a mindset that is willing to share and also receive criticism. It is only then that educators can transform their minds (Samaras & Freese, 2006).

A preventative method to this situation was to have a conversation about this paper with my CF before starting with the lessons, this would help her know that her input is valuable, good and bad is what will help me develop to be better. Another way to prevent the situation was to expand the tool itself and develop it in a way that pushes an individual to share their thoughts thoroughly as this makes them a better collaborator too. As Samaras and Freese (2006) say it takes a lot of practice to be a collaborator who encourages while also being a CF who asks provocative questions and critically examines issues and my CF was doing this for the first time.

In the third guiding question, my CF gave a vague response for the first lesson however for the second lesson, they gave a very detailed response. In the second lesson, they identified what they saw as a link and shared at the end that the information was beneficial to them. From this one can conclude that the link was not so apparent for my CF in the first lesson but they opted not to say. This research was a learning experience for both me and my CF. Their contribution to this research is what makes it a self-study.

My reflections

For me, choosing to have one critical friend for my research acted as a limitation for my study. I opted for one CF because there are only two life sciences teachers in my school and lessons were carried out on normal day hours as such, I did not think that there was another way around it. I realized that there was another way of doing it after I read Nyamupangedengu (2015) 's, self-

study thesis where her CF was far away however she would send her video recordings to her lessons and obtain feedback virtually. Unfortunately, I read this thesis after completing my data collection process. The feedback from my CF was very helpful although I feel that it would have been more substantial if I had more than one CF observing my lessons and giving feedback.

4.7 Summary of chapter

The main research question for this study "How can a teacher integrate cultural heritage (CH) into the teaching and learning of the kidney at Grade 11 Life Sciences?" helped me think of pedagogies that I could employ during my teaching that will allow for this knowledge to be successfully integrated during my teaching. My second research question acted as a guideline to help me achieve what my main research question was seeking, this is because for me to be able to integrate CH into my teaching I had to first think about the relevant CH on the concept of the kidney that I needed to bring to the classroom. In a nutshell, for me to be able to answer my main research question I had to answer my second research question first. My third research question is similar to my first (main) research question as both were concerned about how this knowledge is integrated. In this chapter, I showed how during my two lessons I Integrated CH into teaching the kidney. Relevant knowledge from my CH was brought into the classroom and used during the lessons. The first lesson used guiding questions that probed learners to think about the importance of kidneys in their cultures and related that to the structure of the kidney. The second lesson used the process of making *umqombothi* to explain glomerular filtration that takes place in the Malpighian body. This chapter showed how I integrated CH into teaching of the kidney, it answered the first, the second, and the third research questions. In my next chapter, I will discuss how I addressed my research questions thoroughly in the next chapter.

Chapter 5

5. Findings, Discussion of Findings, Recommendations, and Conclusions

5.1 Introduction

This self-study research focused on investigating how the use of Cultural Heritage in a Life Sciences class of Grade 11 can help develop a conceptual understanding of the kidney. A qualitative research design was used to carry out my study as well as multiple data collection techniques. My data collection techniques included: journalling and observation by critical friend. My data-collecting tools included: semi-structured interviews, audio recordings as well and video recordings. To ensure credibility, my learners who were participants in this study were encouraged to support their statements with reasons during interviews, this was done to ensure that the engagement in class was prolonged and clear for clarity. For the study to be trustworthy, transcripts from the interviews were sent to the participants for member checking, and the setting as well as sample and sample size was provided.

This chapter will be presented in four sections. The first section will discuss how I addressed my research questions, the second section will present limitations to the study, and the third section will present conclusions, and recommendations and suggest possibilities for future research. Lastly, I reflect on my journey as a master's student.

5.2 Addressing Research Questions

The purpose of my study was to investigate my teaching of the kidney using examples from my cultural heritage. My concern when I began this study was how to teach my grade eleven learners for understanding. The study was guided by the following research questions:

My main research question.

How can I integrate Cultural Heritage (CH) into the teaching and learning of the kidney at Grade 11 Life Sciences?

Sub-research questions

1. What relevant CH on the concept of the kidney do I bring to the teaching and learning process in Grade 11?

2. How can I use the relevant CH in teaching and learning about the kidney among Grade 11 learners?

3. What are my views on the challenges of integrating CH into the teaching and learning of the kidney at Grade 11 Life Sciences?

Key Finding 1: *Learners bring CH knowledge to class, and it is the teacher's responsibility to combine with their own CH to select appropriate CH knowledge for the syllabus concept to be developed*

In chapter four, learners brought their CH knowledge of the process of making *umqombothi*. This knowledge was the same across all learners in their different cultural backgrounds and the same with my CH knowledge. The CH knowledge relating to the process of filtration was relevant to the concept of glomerular filtration, it embodied concepts that were similar to filtration which made it easy to use the knowledge as a tool to help learners understand the concept better.

To integrate CH when teaching the concept of the kidney I first; identified the relevant knowledge from CH that relates to the concept of the kidney. Secondly, I looked for links that exist between CH and the concept of the kidney, thirdly, I checked my CH against the learner's CH to establish the similarities and differences in our knowledge. As stated in chapter four I had to research this knowledge before the lessons as it was not available on the annual teaching plan. This was suggested by Nnadozie, (2009) from my literature review who says that in the absence of relevant material to use for integration, teachers could draw knowledge from the CH that they possess or research knowledge that exists in their communities and integrate the relevant knowledge in the curriculum.

The relevant knowledge of cultural heritage that I brought into the classroom involved the cultural significance of the kidney which linked to teaching the structure of the kidney as well as using the process of making *umqombothi* to help learners understand the concept of glomerular filtration better. I brought this knowledge while teaching the kidney because In my literature

review, scholars such as Reasoner (2011), argue that kidneys are one of the most complex organs in the human body and thus teaching the kidney may be overwhelming and challenging. Ristanto, Rahayu, and Mutmainah, (2021) say that to successfully build a conceptual understanding of the kidney, learners have to be taught the excretory system through constructivism.

Constructivism as a theory-guided teaching and learning of the kidney in my Grade 11 class of life sciences. See chapter four, **section 4.5.2** where learners as suggested by the theory of constructivism engaged with concepts that involved knowledge from their socio-cultural environment. Learners used the process of making umqombothi which is a practice that is carried out in their social and cultural environment. Also, from this lesson, one would note that learners were asked to identify concepts that were similar between the process of filtration and that of the formation of *umqombothi* see table **1.1.2 A** for reference.

Learners first engaged in this task on their own and were later assisted by me. In doing this, learners were given space to see what they could achieve without the assistance of the teacher and later, learners were provided with guidance from the teacher to see what they could achieve when they had this assistance. This is using pedagogies that are guided by the concept of the Zone of Proximal Development under the theory of constructivism. By assisting the learners, they became more confident to continue with the task and achieved a greater understanding of the concept that they would not otherwise have done by themselves, learners moved to the next level of ZDP. the video that was used to aid learners' understanding is a tool that can be referred to as an MKO along with the teacher in class. The use of these MKOs helped learners understand the concept better as suggested by Vygotsky's constructivism.

Key finding 2: *The teacher can use the learner's CH knowledge through a socio-cultural pedagogical process*

Bringing learner's knowledge from home about the roles of the kidney in their cultures and using a familiar process from their CH to explain a new complex process of ultra-filtration relates to the theory of constructivism, this helps learners to see alignment in their lives, draws them to learning and makes them actively involved in the process (Mandikonza, 2012). During that

process, learners acquire knowledge that is meaningful to their lives and grounded in local contexts (Caps, 2011).

Before conducting my lessons, It was important for me to ask probing questions to learners as evident in chapter four. Learners were probed to establish if my CH and the learners's CH were similar or different. I did this because, from the literature, I found that Òtúlàjà, Cameron, and Msimanga, (2011) mentioned that different learners may embody different CH hence if not addressed properly, differences may lead to clashes that may hinder the process of learning. However, when the differences are properly addressed, they become a good tool in the classroom as they give learners and the teacher the opportunity to learn from each other's CH (Òtúlàjà, Cameron and Msimanga, 2011).

Key finding 3: *Teachers can use CH for comparative purposes*

When appropriate CH for a concept in life sciences is not available, teachers can find CH for comparative purposes as evident in my previous chapter. In chapter four I showed how I used knowledge from CH for teaching and learning the kidney in grade eleven. Through comparing similarities that existed between filtration and the process of *umqombothi,* Learners were able to understand the concept of filtration where for example, podocytes are semi-permeable and allow only water and small solutes to pass through which ultimately forms the glomerular filtrate similarly with the process of *umqombothi* that uses a semi-permeable sieve allowing liquid and not *amavovo* to pass through and that liquid ultimately forming the *mqombothi* beer. More similarities are evident in table 1.1.2 A and 1.1.12 B of chapter four above. I used this knowledge as a vehicle to move learners from one point to another, learners used this familiar knowledge that they could relate to to learn a new concept in life sciences. This is learning that involves learning first, concepts that are familiar and able to relate to, when learners fully understand the concept, it makes it easy for them to apply it at an abstract level (Mandikonza, 2012).

I deem it important to also mention that while using knowledge from CH for comparison purposes, teachers should be careful that they do not use science knowledge to teach CH. This was pointed out in my reflections in chapter four, where I received feedback from my lecturer CF, who shared that for her, the first lesson appeared to use knowledge of science to teach CH **see**

reflections in section 4.5.1 In this lesson, learners were taught the structure of the kidney with the highlight on how the delicate internal parts of the kidney were protected by the outer parts that were made up of strong and fibrous tissues. From this, learners got to understand why only males were encouraged to eat kidneys in some cultures. This therefore shows that a careful analysis should be made when working with comparing the two knowledge systems.

Key finding 4*: Challenges to integrating CH in the teaching of the kidney include……*

In chapter four, I showed how there were challenges that came with integrating CH into my teaching. The first challenge I came across was with learners who identify as members of a religious group that has no background in CH and does not encourage any cultural practices. These learners experienced clashes between their beliefs and CH brought into the class (Seehawer 2018). Clashes that exist between CH and Christianity are not a new occurrence, Otulaja et al. (2011) in their paper agree that in South Africa some churches embrace the use of CH while others do not. They argue however that many parts of CH are not spiritually rooted but have to do with the science of our everyday lives (Otulaja et al., 2011).

literature also says that learners who do not practice any culture from home are being introduced to this knowledge to help them widen their perspective and offer them alternatives as well as broaden their horizons (Aikenhead and Elliott, 2010). These scholars argue that there are many ways in the world to know or do the same thing in a different way (Aikenhead & Elliott, 2010). Another challenge that I experienced was no available CH to use in my teaching, and nothing cited in the curriculum as noted (Khupe, 2014). My views on the challenges that I came across

when integrating CH into the classroom is that they made integration daunting at first however, as I overcame each one of them one step at a time, I realized that none of them were serious obstacles and I am glad that I embraced these challenges and did not allow them to deter me from completing my study.

5.3 Limitations to the study

Challenges with a self-study

Doing a self-study was challenging for me especially at the beginning of the study. When I began this journey, during the process of writing my proposal I was confident about the study and was ready to get started with it. I realized when I started with the actual research work that I was not well equipped with knowledge about self-study and that self-study was not my supervisor's field of expertise, knowing that made me anxious about doing the study. Everything was new to me, no one in my circle had done self-study research before, my peers who are also doing masters with me, were all doing something similar which meant that they were able to share ideas while I only had my supervisor at the time. As we proceeded with my supervisor, he suggested that I discuss my work with one of the lectures at the university who had done a self-study for their thesis and after having a meeting with the lecturer, I realized that this was something that I was passionate about and that me and my supervisor were on the right track of things. I then started engaging with the work of Samaras who then shed even more light on what self-study was. At that point, things were looking up but still not easy because the more I read up on self-study the more I realized that self-study required a lot of work which required a lot of time. The second challenge that came with doing a self-study was that I had to work with someone else who was going to be a critical friend. A CF Should be someone that you can open up to and trust,

someone to whom you can be vulnerable and someone who can be provocative and challenge you to think differently (Samaras, 2011), getting the right person to be my CF was not an easy task hence my research had one official CF and I used feedback from the university lecture as feedback from a CF.

5.4 Conclusions

Learners in my Grade 11 life sciences class show great enthusiasm for lessons that involve pedagogies that bring personal relevance to them as learners. The use of CH in the classroom helps learners to find meaning in what is being taught in class. In this chapter above, I discussed how I addressed my research questions, from these findings, one can conclude the following:

1. The use of CH has a place in life sciences classroom
2. Not all learners come from culturally inclined homes.
3. There's a need to address issues related to integrating CH into life sciences classrooms
4. There is a need for us as teachers to constantly improve our pedagogies in the classroom.

It was demonstrated from findings on both interview questions and observations that integration of CH into teaching the kidney was welcomed by grade eleven life sciences learners as well as my CF. My findings show that learners can relate more to classroom science when they know that it also exists in their homes. My findings also showed that not all learners come from backgrounds that uphold their culture and therefore it is important for teachers to always find pedagogies that will benefit all learners in the classroom. In this chapter, I have identified issues related to my integration of CH when teaching the kidney. The issues that existed in my lesson, are issues that many scholars have identified as well, this then appears to me as an invitation to all communities of science to sit down and come up with solutions to these issues. Lastly, findings in this chapter show that there is always room to improve as a teacher in the classroom. As a teacher who embarked on a journey of self-study, I have come across many surprises, good and bad about myself as a professional that have made me leave this experience as a better teacher and researcher therefore there is always a need for educators to better themselves in their practice.

Recommendations

As I have stated above my data suggests that the use of CH has a place in life sciences classrooms. Integration of this knowledge into the curriculum however remains a challenge hence this cannot just be a task of educators in the classroom alone but rather a responsibility of policymakers as well as authorities in the education sector as a whole. Collaborative projects that involve parents,

teachers, learners, elders in the community, and local authorities can be established as a community of practice where knowledge about cultural heritage is discussed along with the concepts in the curriculum. This may help with coming up with enough examples to use during class as opposed to teachers having to do all the research alone.

Authorities in the higher education sector also have the responsibility to transform or decolonize teacher education in universities. Teachers in training could be trained in ways that involve the use of pedagogies that promote the integration of CH so that when they move into the workspace they are equipped with this knowledge and integration for them may not be a big challenge. To sum this up, I argue for two things: The first one is empowering teachers with pedagogies that promote the integration of CH into their lessons as early as when they are trained in their institutions. Secondly, explicit examples from CH that educators can use during teaching and learning are cited in teachers' annual teaching plans.

5.6 Reflections

My journey on the Masters can be described as both challenging and beautiful. From it, I learned that just because something is not easy, it does not mean that it will remain like that forever, there are always ways to overcome what appears to be the greatest obstacles. During this journey, I have grown both personally and professionally as an academic. In many ways, conducting this research increased my level of professional competency, l learned better ways to plan and organize my work and because I had to adhere to very strict deadlines set by my supervisor, I also learned better ways of managing my time.

Doing my master's has taught me the importance of critically analyzing discussions and getting the main elements from discussions to help build an argument, this has pushed me in ways I did not realize to be more of a critical reader than before. Revising my work and editing it constantly as suggested by my supervisor felt like torture, but I realized in the end that it was necessary to produce quality work. Completing this research report feels like the first time I completed my ten-kilometer run, I still cannot believe that it is finally done. Choosing to do self-study as my methodology was one of the greatest gifts I could give myself as a teacher in practice and academics, it is through self-study that I had to confront all my weaknesses and realize my strengths in the classroom. I am aware of myself through a professional lens and that makes me

a better teacher than before. Engaging in self-study research was a very beneficial experience for me as such it increased my motivation to study further and carry out more research. In a nutshell, my plans to carry out my PhD are in the pipeline, and I am looking forward to all the lessons that will come with it.

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APPENDIX A

APPENDIX A

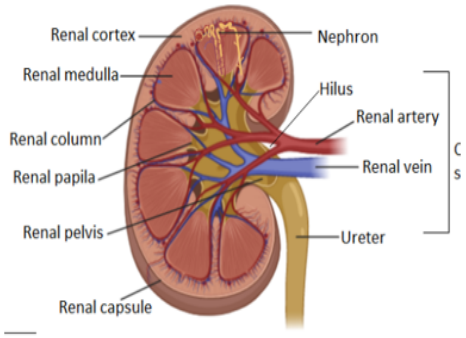
LESSON PLAN 1

LESSON TOPIC: Urinary system.

DURATION : 1 HOUR

Lesson objectives **Learners should know:**	**Cultural beliefs on the structure of the kidney.**	**Resources**	**Learner activity**
• Position of the kidneys, ureters, bladder and urethra.	▪ What do you call kidneys in your language? ▪ Is there any cultural significance of kidneys you know from your culture? ▪ Do you eat kidneys in your family? ▪ If yes, Is it every one or specific individuals?	▪ Cow kidney (Learners are to view the structure of cow kidney to observe the external part of the kidney and dissect the kidney to view the internal parts of the kidney. ▪ Whiteboard and marker (Teacher will draw an annotated diagram of the kidney that learners will use as a reference to identify the internal parts of the kidney.	▪ Learners are to dissect the kidney of the cow and view the internal part of the kidney. ▪ Learners are to draw and label the structure of the kidney and answer the following questions **1.** What is the main function of the kidney? **2.** Where are kidneys located in human body? **3.** Name two ways in which the delicate internal parts of the kidney are protected.

• External structure of the kidney			

• Internal structure of the kidney		 Internal structure of Kidney	

APPENDIX B

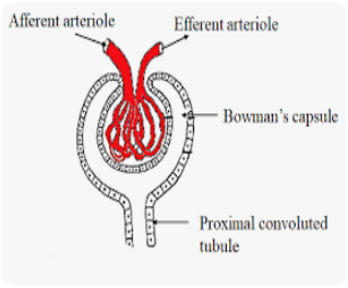
APPENDIX B

LESSON PLAN 2

LESSON TOPIC: The process of glomerular filtration

DURATION : 1 HOUR

Lesson objectives **Learners should know:**	**Cultural beliefs on the structure of the kidney.**	**Resources**	**Learner activity**
▪ How to draw and label the structure of the Malpighian body	▪ Ask learners if they know what umqombothi is	▪ White board and marker (teacher will draw an annotated diagram of the Malpighian body that clear distinguishes the sizes of the afferent and the efferent arterioles. ▪ Video that shows the process of making umqombothi.	▪ Learners will work in pairs to complete a table of similarities between the two processes and share their findings. ▪ Learners will answer the following questions 1. What forms filtrate in the bowman's capsule? 2. How is the Malpighian body adapted to suite its function?

• what ultra-filtration /glomerular filtration is.	▪ Ask individual learners to narrate their experiences / knowledge about the process of making umqombothi		
• How to describe the process of ultra-filtration	▪ Learners are to share with the class what this process entails		
• What forms filtrate and why			

APPENDIX C

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	16 MARCH 2023
Validity of Research Approval:	20 MARCH 2023— 30 SEPTEMBER 2023
Name of Researcher:	NKABINDE N
Address of Researcher:	2397 MAGROVE STREET
	EXT 2
	PROTEA GLEN
Telephone Number:	062 172 5925
Email address:	722900@students.wits.ac.za
Research Topic:	INVESTIGATION OF HOW A TEACHER'S CULTURAL HERITAGE CAN BE USED DURING TEACHING AND LEARNING OF THE KIDNEY IN GRADE 11 LIFE SCIENCES
Type of qualification	MASTER OF EDUCATION
Number and type of schools:	ONE SECONDARY SCHOOL

Number and type of schools:	ONE SECONDARY SCHOOL
Districtis/HO	JOHANNESBURG WEST

Re: Approval in Respect ofRequest to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the condit• s listed below be flouted:

Office of the Director: Education Research and Knowledge Management

GAUTENG DEPARTMENT OF EDUCATION
JOHANNESBURG WEST
20 -03- 2023
P.O. BOX 1995 FLORIDA 1710
ISEBE LEZENFUNDO LA SE GAUTENG
LEPAFA LA THUTO LA GAUTENG

APPENDIX D

SCHOOL OF EDUCATION ETHICS COMMITTEE

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

CLEARANCE CERTIFICATE	PROTOCOL NUMBER: 2023ECE021M
PROJECT TITLE	Investigation of how a teacher's cultural heritage can be used during teaching and Learning of the kidney in grade 11 life sciences
INVESTIGATOR	**Nkabinde Nonkululeko**
SCHOOL/DEPARTMENT OF INVESTIGATOR	Wits School of Education
DATE CONSIDERED	11-Apr-23
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	**Minimal risk**
EXPIRY DATE	Date of submission of the Research Report

DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	**Minimal risk**
EXPIRY DATE	Date of submission of the Research Report
ISSUE DATE OF CERTIFICATE	21-Apr-23
CHAIRPERSON	Dr. Batseba Mofolo-Mbokane

cc: Caleb Mandikonza

DECLARATION OF INVESTIGATOR

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

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

_____ _____/_____/_____

Signature **Date**

APPENDIX E

Permission letter for the School's Principal

17-February 2023

Dear Ms. Ntsienyane

My name is Nonkululeko Nkabinde, I am a master's student in the School of Education at the University of the Witwatersrand.

I am researching on: Investigating how cultural heritage can be used to teach the concept of the kidney in the grade 11 class of life sciences

My research involves the school and learners' participation. To conduct my research, learners' voices will be recorded on audio devices during classroom-based activities. Learners will also be asked to take part in small focus groups/discussions after class engagement. Other data collection methods that I will be using involve observations and interviews.

My colleague will be invited to observe the classroom interactions and will take down notes of the proceedings. I will invite some of the students for one-on-one interviews.

The reason why I have chosen your school is that I am an employee at your school and my research is a self-study research where I research my practice as a teacher and find ways of improving teaching and learning in my classroom.

I am inviting your school to participate in this research as this will benefit the learners in the class which ultimately will benefit the results of the school.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission at any time during this project without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study.

The names of the research participants and the identity of the school will be kept confidential at all times and in all academic writing about the study. Your privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed between 3-5 years after the completion of the project.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,

N.Nkabinde

NAME: Nonkululeko Nkabinde

ADDRESS: Mongagana Street
Zone 1 Meadowlands
1852
EMAIL: Thutolore.Secondary141002@gmail.com
TELEPHONE NUMBERS : (011) -936-0545

NB If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the university Human Research Ethics Committee.
(Non-medical), telephone +27(0) 11 717 1408 or email hrecnon-medical@wits.ac.za

APPENDIX F

INFORMATION SHEET LEARNERS

DATE: 17-February 2023

Dear Learner

My name is Nonkululeko Nkabinde and I am a Masters's student in the School of Education at the University of the Witwatersrand.

I am researching on: Investigating how cultural heritage can be used to teach the concept of the kidney in grade 11 class of life sciences

My investigation involves learners in my life sciences grade 11 class.
I am inviting you to take part in my research which involves learner participation. To conduct my research, your voices will be recorded on audio devices during classroom-based activities. You will also be asked to take part in small focus group discussions after class engagement. Other data collection methods that I will be using involve observations and as well as one on one interviews.

My colleague will be invited to observe the classroom interactions and will take down notes of the proceedings. I will invite some of the students for one-on-one interviews.

This research process is not a test, it is not for marks and it is voluntary, which means that you do not have to do it if you do not want to. In addition, if you decide halfway through that you prefer to stop, this is completely your choice and will not affect you negatively in any way.

I will not be using your real name but I will make one up so no one can identify you. All information about you will be kept confidential in all my writing about the study. All collected information will be stored safely and destroyed between 3-5 years after I have completed my project.

Your parents have also been given an information sheet and consent form, but at the end of the day, you decide to join us in the study.

I look forward to working with you!

Please feel free to contact me if you have any questions.

Thank you

SIGNATURE
N.Nkabinde

NAME : Nonkululeko Nkabinde
ADDRESS: Mongagane Street
Zone 1 Meadowlands
EMAIL
Thutolore.Secondary141002@gmail.com
TELEPHONE NUMBERS
(011) 936-0545

NB If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the university Human Research Ethics Committee.
(Non-medical), telephone +27(0) 11 717 1408 or email hrecnon-medical@wits.ac.za

APPENDIX G

Learner Assent Form

Please fill in the reply slip below if you agree to participate in my study called Investigation of how a teacher's cultural heritage can be used during
teaching and learning about the kidney in grade 11 life sciences

My name is: _____

Permission to be interviewed

I would like to be interviewed for this study. YES/NO
I know that I can stop the interview at any time and don't have to answer all the questions asked. YES/NO

Informed Consent

I understand that:

· My name and information will be kept confidential and safe and my name and the name of my school will not be revealed.
· I do not have to answer every question and can withdraw from the study at any time.
· I can ask not to be audiotaped, photographed, and/or videotaped
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

Learner Assent Form

Please fill in the reply slip below if you agree to participate in my study called Investigation of how a teacher's cultural heritage can be used during
teaching and learning about the kidney in grade 11 life sciences

My name is: _____

Permission to be audiotaped
I agree to be audiotaped during this lesson only YES/NO

I know that the audiotaped will be used for this project only YES/NO

Informed Consent
I understand that:
· My name and information will be kept confidential and safe and my name and the name of my school will not be revealed.
· I do not have to answer every question and can withdraw from the study at any time.
· I can ask not to be audiotaped, photographed, and/or videotaped
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

Learner Assent Form

Please fill in the reply slip below if you agree to participate in my study called Investigation of how a teacher's cultural heritage can be used during
teaching and learning about the kidney in grade 11 life sciences

My name is: _____

Permission to be videotaped
I agree to be videotaped during this lesson only YES/NO

I know that the videotapes will be used for this project only YES/NO

Informed Consent
I understand that:
· My name and information will be kept confidential and safe and my name and the name of my school will not be revealed.
· I do not have to answer every question and can withdraw from the study at any time.
· I can ask not to be audiotaped, photographed, and/or videotaped
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

APPENDIX H

DATE: 17-February 2023

INFORMATION SHEET PARENTS

Dear Parent

My name is Nonkululeko Nkabinde and I am a Masters's student in the School of Education at the University of the Witwatersrand.

I am researching investigating how cultural heritage can be used to teach the concept of the kidney in grade 11 class of life sciences

My research involves looking at ways of improving the teaching and learning of life sciences concepts in my grade 11 life classes.

The reason why I have chosen your child's class is that the study is based on grade 11 learners who are doing life sciences as a subject.
I am inviting you to permit your child to take part in my research which will involve learner's participation. To conduct my research, learners' voices will be recorded on audio devices as well as video devices during classroom-based activities. Learners will also be asked to take part in small focus group discussions after class engagement. Other data collection methods that I will be using involve observations and interviews.

My colleague will be invited to observe the classroom interactions and will take down notes of the proceedings. I will invite some of the students for one-on-one interviews.

Your child will not be advantaged or disadvantaged in any way. S/he will be reassured that s/he can withdraw her/his permission at any time during this project without any penalty. There are no foreseeable risks in participating and your child will not be paid for this study.

Your child's name and identity will be always kept confidential and in all academic writing about the study. His/her privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed between 3-5 years after the completion of the project.

Please let me know if you require any further information.

Thank you very much for your help.

Yours sincerely,

SIGNATURE
N.Nkabinde

NAME : Nonkululeko Nkabinde
ADDRESS Monganana Street

Zone 1 Meadowlands
EMAIL
Thutolore.Secondary141002@gmail.com
TELEPHONE NUMBERS
011 936 0545

NB If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the university Human Research Ethics Committee.
(Non-medical), telephone +27(0) 11 717 1408 or email hrecnon-medical@wits.ac.za

Parent's Assent Form

Please fill in and return the reply slip below indicating your willingness to allow your child to participate in the research project called: Investigation of how a teacher's cultural heritage can be used during teaching and learning of the kidney in grade 11 life sciences.

I, _____ the parent of _____

Permission to observe my child in class

I agree that my child may be observed in class. YES/NO

Permission to be interviewed

I agree that my child may be interviewed for this study. YES/NO
I know that he/she can stop the interview at any time and doesn't have to answer all the questions asked. YES/NO

Informed Consent

I understand that:

· my child's name and information will be kept confidential and safe and my name and the name of my school will not be revealed.
· He/she does not have to answer every question and can withdraw from the study at any time.
· He/she can ask not to be audiotaped, photographed, and/or videotape
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

Parent's Assent Form

Please fill in and return the reply slip below indicating your willingness to allow your child to participate in the research project called: Investigation of how a teacher's cultural heritage can be used during teaching and learning of the kidney in grade 11 life sciences.

I, _____ the parent of _____

Permission to be videotaped

I agree that my child may be videotaped during this lesson only. YES/NO
I know that the videotapes will be used for this project only YES/NO

Informed Consent

I understand that:

· My child's name and information will be kept confidential and safe and my name and the name of school will not be revealed.
· He/she does not have to answer every question and can withdraw from the study at any time.
· He/she can ask not to be audiotaped, photographed, and/or videotape
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

Parent's Assent Form

Please fill in and return the reply slip below indicating your willingness to allow your child to participate in the research project called: Investigation of how a teacher's cultural heritage can be used during teaching and learning of the kidney in grade 11 life sciences.

I, _____ the parent of _____

Permission to be audiotaped

I agree that my child may be audiotaped during interviews or observations. YES/NO
I know that the audiotapes will be used for this project only YES/NO

Informed Consent

I understand that:

· My child's name and information will be kept confidential and safe and my name and the name of school will not be revealed.
· He/she does not have to answer every question and can withdraw from the study at any time.
· He/she can ask not to be audiotaped, photographed, and/or videotape
· All the data collected during this study will be destroyed within 3-5 years after the completion of my project.

Sign_____ Date_____

APPENDIX I

INTERVIEW QUESTIONS

Investigation of how a teacher's cultural heritage can be used during teaching and Learning of the kidney in grade 11 life sciences

1. What is the function of the kidneys and why is it important that we learn about them?
2. How difficult or easy is it to understand the concept of the kidney?
3. What do you understand about the term cultural heritage?
4. Do you think knowledge from cultural heritage can be used to teach all topics in life sciences?
5. Do you think the use of cultural heritage during teaching about the kidney was helpful?
6. Do you think examples from one's cultural heritage can be used to help learners understand the concept of the kidney better?
7. Do you think that the use of cultural heritage moves you away from the actual concept of the kidney?
8. What do you think are the challenges of integrating CH into the teaching and learning of the kidney in a grade 11 life sciences class?
9. Would you recommend this way of teaching/learning to someone else?
10. What recommendations would you give to the researcher to make the next lesson better?